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Position of legal economic clinic on the map of business support institutions in Croatia

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Abstract

Business support institutions, as part of business infrastructure in Croatia, are among the best rated determinants for growth and development of small and medium-sized enterprises (SMEs). At the same time, other determinants, such as government policies and programs, education, R&D transfer, internal dynamics, etc., are rated below average by different studies (GEM, Doing Business, Business Environment and Enterprise Performance Study). Taking into account the number of business support organizations (centers for entrepreneurship, development agencies, business incubators and parks, technology centers, etc.) per capita, Croatia has one business support institution per 50,000 inhabitants, which could provide necessary help for everyone interested in starting a business with growth potential. Despite such a large number of business support institutions, entrepreneurs, especially those in the growth phase, very rarely seek professional advice. Among the main reasons for not using professional advice, entrepreneurs pointed out that business advisers do not have the necessary knowledge, that they have had bad experiences in the past, and that they have ultimately managed to solve the problem on their own. The purpose of this research is to check if there is space in the Croatian business ecosystem for another business advice provider – the Legal Economic Clinic, which focuses on the problems of start-up companies. The main issues and obstacles will be identified using primary data (analysis of the advice provided to entrepreneurs by the Legal Economic Clinic in the period 2013-2015), while secondary data will be used as a resource for finding answers and solutions. The main findings will help business support institutions to better position their services and ensure the level and quality of advice that can help start-up entrepreneurs solve their problems efficiently.

Keywords: Legal Economic Clinic, clinical education, business support organizations, business advisers, small and medium-sized companies

Introduction

Small and medium-sized enterprises (SMEs) are the backbone of the European economy. SMEs account for 99.8% of all EU28 companies (Annual Report on SMEs 2013/2014) and employ 88.8 million people (66.9% of all employees). Similar figures can be found in the Croatian economy – 99.7% of all companies are micro, small or medium-sized, and they employ 68.4% of all employees (Small and Medium Enterprises Report-Croatia 2015). SMEs foster economic growth and employment and therefore play a vital role in today’s world economy (Audet and St-Jean, 2007). The importance of SMEs and fostering their creation is especially significant for the alleviation of poverty. In third countries, entrepreneurship and new venture creation are seen as an escape from poverty and opportunity for all (Hauber, 2007). However, SMEs are vulnerable and only a small number of them survive for more than five years (Baldwin et al., 2000).
In order to increase the number of SMEs that have survived this very vulnerable period, governments on national, regional and local levels profusely support the creation, growth and development of SMEs with subsidies and deductions. In the period from 2008 to 2013, Croatian government has spent EUR 5.75m just for the development of business infrastructure. However, the barriers that hinder further growth and development of SMEs have remained almost the same.

**Literature review**

Identification of obstacles that hinder further growth of SMEs is among the most popular topics among researchers. Researchers have identified many determinants that influence the growth of SMEs. Watson et al. (1998) concluded that successful enterprise is a complex phenomenon and that internal and external factors affect business performance. While they place an emphasis on internal characteristics, especially characteristics of the founder, other researchers, like Audet and St-Jean (2007) and Audretsch et al. (2014), will shift their attention to business infrastructure and business ecosystem. The perspective of the researchers and policy makers has dramatically changed over the years, from creating programs that influence the entrepreneurs themselves (education, training), toward the necessity of creating policies and regulations that should change the whole business ecosystem. Cooper (1993), as well as Bruyat and Julien (2000) claim that environment can change all the phases of the growth process of SMEs (Picture 1).

The interest in the business ecosystem and the obstacles to growth and development of SMEs is even bigger in transition countries (Meyer and Peng, 2005). As Manolova et al. (2008) pointed out, the shape and pace of entrepreneurship in transition countries is extremely under the influence of institutional environment. The reforms that made entrepreneurship possible in transition countries have also created the need for business support institutions. Institutional environment will influence the decision-making processes in SMEs, but will also have an effect on “entrepreneurial climate” (Doern, 2011). For start-ups, institutional environment will define, create and limit entrepreneurial opportunities (Manolova et al., 2008).

In their attempts to foster start-up companies, governments often neglect
the needs of growing companies. Mason and Brown (2014) pointed out that there is shortage of growing companies even in environments which are conducive to start-ups. This problem has been identified even in the environments that have been identified as the most favorable for entrepreneurial activity (Mason and Brown, 2014). The key policy challenge is to address the most important obstacles for SMEs in different phases of development.

Governments and public authorities throughout the world have recognized the importance of SMEs and created different business support institutions, whose aim is to support and assist entrepreneurs. Despite all these efforts, entrepreneurs do not make maximum use of the services available (Audet and St-Jean, 2007). There are a number of reasons, but throughout the literature, there are five that are most common: lack of confidence in support institutions, the services are of poor quality, poor fit between the services available and the needs of SMEs, poor marketing services, and rates that are above what SME owners are willing to pay (Curran and Blackburn, 2000). Having in mind that only one-third of SMEs have used the services of support institutions (Audet and St-Jean, 2007), creation of policies and support institutions that can better fulfill the needs of SMEs in all phases of their development can be crucial for the development of the SME sector, especially in transition countries. But, when do SME owners seek help from business support institutions? Answer to that question can be find in research results of many researchers, and all of them (Audet and St-Jean, 2007; Boter and Lundstrom, 2005; Argirova and Michaelis, 2003) agree on the following: when SME owners do seek help, they usually have issues related to accounting, finance and law.

**Business support institutions in Croatia**

The Croatian Government, like other public authorities throughout the world, recognized both the importance and the vulnerability of the SME sector. The first business support institutions were founded in 1997, but after that they bloomed very fast throughout Croatia. The importance of the SME sector can also be seen through the establishment of the Ministry for SME and Crafts. Although the first strategic approach to the development of the SME sector was made in 2008, when the first Strategy for the development of the SME sector in Croatia was adopted, establishment of business support institutions in Croatia was one of the most important tasks of the Ministry. By 2012, Croatia has reached the number of 88 different business support institutions – 21 development agencies, 10 agencies for local development, 16 business incubators, 6 technology parks and 35 entrepreneurship centers (SME Observatory in Croatia, 2013). All those business support institutions are focused on offering general advice to SMEs, providing information on incentives and subsidies, and consultancy services in the process of writing EU projects and other applications. According to the SME Observatory in Croatia data, business support institutions were employing around 700 people in 2012 (35% were employed in development agencies, 31% in entrepreneurship centers, 22% in business incubators and 12% in technology parks). The GEM results in 2015 have shown that Croatia has scored above GEM countries in physical infrastructure and commercial and professional infrastructure, but scored lower for government programs aimed at the promotion of the SME sector. Taking into account the number of business support institutions per capita, Croatia has one institution per every 50,000 inhabitants, which provides very good access to information.
and advice for all entrepreneurs. But, looking at the results of different reports on obstacles for start-up and growing entrepreneurs, there was hardly any improvement in that field in the period from 2008 to 2012 (Table 1).

Table 1: The biggest obstacles to the development of the SME sector in Croatia, research results for business ecosystem in Croatia

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<td>2008</td>
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<td>dealing with licenses, employing workers, protecting investors</td>
<td>weak judiciary and corruption</td>
<td>access to finance, government policies and programs</td>
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<td>2009</td>
<td>access to finance, informal sector and corruption</td>
<td>dealing with construction permits, employing workers, protecting investors</td>
<td>weak judiciary and corruption</td>
<td>access to finance, government policies and programs</td>
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<td>2013</td>
<td>access to finance, informal sector and corruption</td>
<td>dealing with construction permits, protecting investors and trading across borders</td>
<td>weak judiciary and corruption</td>
<td>access to finance, government policies and programs</td>
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<td>2014</td>
<td>access to finance, informal sector and corruption</td>
<td>dealing with construction permits, registering properties and trading across borders</td>
<td>weak judiciary and corruption</td>
<td>access to finance, government policies and programs</td>
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Experts in GEM research, as well as the results of analysis in the SME Observatory in Croatia in 2013 gave recommendations to work on providing quality advice in business support institutions according to the life-stage of SMEs, to focus on a certain field of providing advice, instead of providing general advice, and help entrepreneurs to manage their companies more effectively. According to GEM conclusions and recommendations, “extensive institutional presence is not a guarantee for providing adequate and quality service.”

Methodology

The main goal of this research is to identify the most common issues of Croatian SMEs and to find an answer to the
question is there a place for another business support institution among all the other institutions that already operate in Croatia. For that purpose, research of secondary data about the consultancy market in Croatia was used, combined with statistical data about the advice provided to entrepreneurs through the Legal Economic Clinic. The Legal Economic Clinic was founded in 2013, based on an Agreement between the Faculty of Economics and the Faculty of Law in Osijek and two business support institutions – Business Incubator BIOS Ltd and Center for Entrepreneurship Osijek. The main goal of the Clinic is to provide quality and comprehensive, holistic advice for all start-up entrepreneurs. The Clinic is a place where students can gain practical experience and work on real-life problems. Students are working in interdisciplinary teams, under the supervision of two mentors – one with a law and one with an economic background. The Clinic has brought together in one place all experts who are willing to teach students and share their experience on a pro bono basis – lawyers, judges, professors, business consultants. Although the Clinic exists for only 3 years, more than 85 start-up entrepreneurs have received advice and help they needed. In that period, majority of problems required an interdisciplinary approach and solution (38%), 37% of the problems that start-up entrepreneurs had were related to legal issues and 12% were economic problems (13% were not defined).

The secondary data provided insight into the nature of the problems that entrepreneurs encounter and into the sources of advice that they were given. The research was conducted on 303 Croatian small and medium-sized enterprises. According to activity, 31% of enterprises were from the trade sector, 17% were in production, and 52% were service companies. According to size, companies that have participated in the research are micro (82%), small (12%) and medium (6%). Majority of the companies in the research were oriented towards the Croatian market (62.4%), and only 9.6% were oriented towards foreign markets. Company classification according to ownership structure showed that 94.7% of respondents are independent entities, while 5% are part of a bigger company.

Results of the research showed that Croatian entrepreneurs (51.8%) usually have various legal issues, which is in line with previous research. Problems in financial management (43.9% of respondents) and in sales and marketing (43.6%) follow (Figure 2).
Respondents were asked how many times in the last year have they hired an external consultant, and only 9% answered that they had hired a consultant several times. The majority of respondents, 78%, answered that they did not ask for help from consultants. SME owners used recommendations and word of mouth (mostly recommendations from other SME owners) when choosing among consultants and consultancy companies. Government subsidies for using consultancy services were extremely important, while providing services on _pro bono_ basis could be the reason to ask for external help for 12.3% of respondents. More reasonably priced services of consultants could motivate 21.2% of respondents to ask for advice.

SME owners appreciate knowledge and expertise, but they also look for consultants that understand their business process. Croatian SME owners have more trust in domestic consultancy companies than in foreign companies. The results also showed that they prefer university and academic community (13.2%) over professional associations and business support institutions (11.2%).

When asked about the reasons for not using consultancy services, 67% of respondents said that they managed to solve the problem on their own, while 15.5% answered that the price was not acceptable (Figure 3).

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Figure 2. The most common problems of Croatian entrepreneurs

Research results

The results of secondary data analysis showed the most common problems and attitudes in the SME owner–consultant relationship. The majority of SME owners that have participated in the research have expressed their dissatisfaction with the price and the overall experience with consultants. Bringing experts together in one place, the Legal Economic Clinic can offer services to SME owners, which cannot be found in business support institutions. Entrepreneurs usually need advice when they have legal issues, but the data from the Legal Economic Clinic showed that most of them needed holistic, interdisciplinary advice.

Work on pro bono basis could be the reason for SME owners to choose the Clinic over other consultancy companies and business support institutions, but SME owners seek quality service.

The nature of the problem will definitely influence the decision to use external advice. SME owners mostly ask for help when they have issues related to law and regulations. The portfolio of services provided by business support institutions does not include legal advice, and that is surely the unique selling proposition of the Legal Economic Clinic.

Business support institutions are mainly established by regional and local governments. One of the most common reasons why SME owners are not asking for advice is their distrust in public institutions. The Legal Economic Clinic cooperates with different partners, but as a part of the academic community, it ensures independent and objective approach to the issue.

Figure 3. Reasons for not requesting help from consulting companies or business support institutions

Conclusion and recommendations for further research

A number of business support institutions make their services available to everyone, but unfortunately, they do not cover the needs of SME owners whose companies are in different phases of development. All business support institutions offer general advice that cannot answer the most important questions of SME owners. Nevertheless, SME owners do not trust public institutions and they would probably not be willing to share all information about their company that is necessary to provide quality advice and solutions (problem of asymmetric information). Since all business support institutions in Croatia offer general advice (there is no specialization), SME owners do not find them experienced enough and familiar with their activity and processes. Analysis of cases in the Legal Economic Clinic showed that SME owners have more trust in academics and the academic community, and that they appreciate a comprehensive, holistic approach to their problems. Although SME owners emphasized expertise and experience, price of the services is very important and probably one of the decisive factors in the process of choosing a consultant or a business adviser. Work on pro bono basis makes the Clinic one of the first choices for SME owners when they are in need of external help.

Although Croatia is rather well covered with a network of business support institutions, their services, especially consultancy and advice, do not meet the needs of SME owners on the market. Specialization and experience in solving specific problems can ensure reputation and better use of services of business support institutions. On the other hand, the Legal Economic Clinic managed to find its place on the map of the dense network of business support institutions. Providing different types of advice and ensuring different approach to problems of SME owners opened the space for entry of one more business support institution to the market.

In order to better meet the needs of SME owners, further research should focus on policies and regulations that could ensure maximum use of services available on the market, as well as on creation of a business ecosystem that minimizes obstacles to further growth and development of SMEs.

Legal Economic Clinic is not the prototype of a solution to all problems, but it could be a part of a new and more supportive business ecosystem. A more detailed analysis of the services available, especially those offered by business support institutions, could provide valuable data for further research and recommendations.

References


Innovative Entrepreneurship at the University of Twente – a ‘best practice’ case study

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Abstract
The Twente region of the Netherlands suffered a dramatic decline in its traditional industry (textiles) in the 1970’s, and it created severe economic problems for the region. From the 1980’s the industry of Twente was reoriented, it turned towards advanced technology and business services. The University of Twente (UT) played a crucial role in this transformation with its innovative initiatives in entrepreneurship and nowadays it is globally renowned for its record of spin-off companies. The UT has established close links with industry from its inception, and at the beginning of the 1980’s entrepreneurship as a university mission started to take shape. In 1984 the UT has created probably the most famous formal spin-off support program, the TOP (Tijdelijke Ondernemers Plaatsen; Temporary Entrepreneurial Positions). The TOP start-up program supports employees, graduates and students in setting up their own companies: this is done by offering interest-free loans, technical facilities, housing, advice and courses. Each year about 15 to 20 people take part in the TOP program, they are called TOPpers. By now more than 700 companies had emerged from the TOP. These TOP companies offers employment to 5 thousand employees. TOP is a best practice model in the Netherlands and abroad (e.g. Warwick, Edinburgh, Wales).

Since then several other initiatives have been launched by or with the cooperation of the UT, such as special business courses and training programs for students and entrepreneurs, business and technology (incubator) parks, regional innovation platform, the establishment of the Dutch Institute for Knowledge-intensive Entrepreneurship and several business development programs. These initiatives strengthen the entrepreneurial character of the UT and serves its role in the regional development of Twente.

Introduction
The Twente region of the Netherlands suffered a dramatic decline in its traditional industry (textiles) in the 1970’s, and it created severe economic problems for the region. From the 1980’s the industry of Twente was reoriented, it turned towards advanced technology and business services. The University of Twente (UT) played a crucial role in this transformation with its innovative initiatives in entrepreneurship and nowadays it is globally renowned for its record of spin-off companies. The UT has established close links with industry from its inception, and at the beginning of the 1980’s entrepreneurship as a university mission started to take shape. In 1984 the UT has created probably the most famous formal spin-off support program, the TOP (Tijdelijke Ondernemers Plaatsen; Temporary Entrepreneurial Positions). The TOP start-up program supports employees, graduates and students in setting up their own companies: this is done by offering interest-free loans, technical facilities, housing, advice and courses. Each year about 15 to 20 people take part in the TOP program, they are called TOPpers. By now more than 700 companies had emerged from the TOP. These TOP companies offers employment to 5 thousand employees. TOP is a best practice model in the Netherlands and abroad (e.g. Warwick, Edinburgh, Wales).

Since then several other initiatives have been launched by or with the cooperation of the UT, such as special business courses and training programs for students and entrepreneurs, business and technology (incubator) parks, regional innovation platform, the establishment of the Dutch Institute for Knowledge-intensive Entrepreneurship and several business development programs. These initiatives strengthen the entrepreneurial character of the UT and serves its role in the regional development of Twente.

Keywords: entrepreneurial university, regional engagement, spin-off companies, holistic approach
The case of Twente is an excellent example of how a region, after losing its traditional industry can reorient itself towards modern, hi-tech businesses with the help of its university that finds its mission in entrepreneurship and regional engagement.

**Triggering factors of the University of Twente becoming an entrepreneurial university with regional focus**

Enschede is a municipality and a city in the eastern Netherlands in the province of Overijssel and in the Twente region. Historically Enschede was a large production center for textiles. In the 1970s textile production in Enschede came to a halt due to fierce competition, mainly from the Far East. This had a profound effect on the city population. Enschede became one of the poorest municipalities in the Netherlands and (de facto) went bankrupt. The biggest challenge of the city is to prevent higher educated (wealthy) citizens from moving to the west (Randstad). (Urbact 2010) An important answer to this challenge was the establishment of an -- entrepreneurial -- university. In the mid-1980s the Technische Hogeschool Twente was reinventing itself as “University of Twente: the entrepreneurial university”, and attempting to mobilise regional stakeholder networks to win support in the Dutch government for its own ambitions to develop a wider set of curricula and courses. From the mid-1970s, crisis in the textiles industry stimulated senior managers in the university to seek new rationales for the university, which included increasing the regional impact of UT.

It was a must not only for the survival of the region, but also for the university to reinvent itself. The institution began life as the Technical Polytechnic of Twente. The collapse of textiles in Twente in the 1970s, as well as the abandonment of some of the features trialled by THT during this time left the institution as an apparent luxury which the recession-hit Netherlands could ill afford, culminating in parliamentary calls for its closure. What had been conceived of as a small and perfectly formed technical polytechnic had transformed itself into a somewhat detached elite institution following traditional paths and failing to engage widely with business interests, particularly following the collapse of textiles and associated mechanical industries. There was considerable pressure from government to close the university, which at the time was educating some 2,500 students with around 100 professors, a very intensive staff/student ratio. In response to this crisis of legitimacy, the university management decided to both increase the number of students, but at the same time to increase the engagement of the university with its community. A great deal of effort was taken to increase the impact of the university on its region, culminating in its rebranding as the entrepreneurial university. (Bennenworth 2005)

We may conclude that a crisis caused by the changing external environment was the main triggering factor of the ‘Twente story’ both on regional and institutional level.

**Entrepreneurial initiatives at the University of Twente**

1. **The TOP program**

   The TOP was launched in 1984 at the University of Twente. The mission of the TOP is to stimulate as many people -- graduates and researchers -- as possible to create a company on the fields of
knowledge of the University of Twente that have a good possibility to survive in the long-term, and to provide assistance in the incubation period. Of those going through the program 80% have been graduates and researchers, 15% from other universities and 5% from industry. The entrepreneurs cover a very wide range of business types, from consultancy, to manufacturing, and other service provision, although always tightly linked back to the originating university department. Prerequisites for entering the TOP program are having a business idea that matches with the interest of staff-members in one of the research-groups of the university and having a consistent business plan. On that basis, the TOP coaching committee makes its decision on whether the entrepreneur is suitable for the program. On average 20 people are on the TOP program at any one time.

In the frame of the one-year support program, the university offers an interest-free loan (starting with 12,000 EUR, now 25,000 EUR) that must be repaid in 4 years starting in the year after leaving the TOP program, office space, secretarial support, the use of laboratory and other university facilities and connection to a university research group, thus access to knowledge and technology. But also, advice and training in preparing a business plan and working out management, marketing, and financing strategies, a scientific and/or a business mentor. The access to university-involved networks and the use of university image is also an important factor.

In the mid-1990s the Student Union, together with the TOP management, developed a version for student-entrepreneurs – the University Student Enterprises (USE). Students are supported via training, networks, and (office) facilities. There are some 130 student-entrepreneurs on campus and companies employ other students on a free-lance basis – approximately 600 students are involved. (Bennenworth 2005, Sijde, Ridder 2008, Sijgers et al. 2005, Urbact 2010)

While the TOP program has been a core component in the positioning of the University of Twente as an Entrepreneurial University other significant developments have taken place to support the entrepreneurial positioning of the university. Most of these developments were carried in cooperation with other regional actors, such as: local government, development agency, companies, enterprises and other higher educational institutions.

2. Incubation and industrial parks

The first one is the creation of the Business and Technology Centre (BTC) Twente. In 1982 this incubator centre opened its doors for innovative technological companies and especially young companies originating from the university, providing accommodation facilities and business support. In the BTC companies could hire flexible office and production space, which would enable them to ‘grow’ with their markets. This was created as a public-private partnership between two corporate partners (a bank and an American computer company), the regional development agency and the two regional universities, UT and Saxion. The concept of the BTC model was that this would be a place where university spin-out companies could move, remaining physically close to the university, whilst establishing their independence from their parent research groups. (Bennenworth 2005, Sijde, Ridder 2008)

In 1989 the Twente Business and Science Park was established. It is a high-value industrial park for knowledge-
intensive companies, as well as for the University of Twente. The UT plays an active role in the park through an intense cooperation with science companies, including facility and laboratory sharing and exchanges of personnel. (Urbact 2010)

A recent development is the Kennispark (Knowledge Park), which extends the BSP and includes (part) of the university campus. Kennispark builds on the history of the UT as an entrepreneurial university and is a joint development between the University, the City of Enschede and the Province of Overijssel. It has a key focus on the commercialisation of university knowledge alongside the stimulation of student entrepreneurship and local area development. Kennispark delivers this through the operation of three key program areas; facilitating the starting and growing of businesses; stimulating innovation in existing companies and developing an inspiring area for innovative businesses. The area is the location of 335 companies of which 75% are technology-based or innovation-active and support 5549 jobs. Kennispark support 40 new spin-off companies per year (Sijde, Ridder 2008, Urbact 2010)

3. Entrepreneurial training programs

It’s a crucial factor in the systematic entrepreneurial development at the UT that a training program was added to the support system right at the beginning. Around 1984 an elective training course was developed: “Become your own Boss”. In this course the students were taught how to write and present a business plan. At the end of the 1980s a second course called “Growth Program” was developed. Although this course was primarily developed for owner-managers of enterprises, who were preparing the next stage of their companies, the course was set up in such a manner, that students supported the entrepreneurs by doing the ‘leg work’ (finding information, writing sections of the business plan). Via this course for the entrepreneurs, the students got an insight into the of enterprises.

The teaching of entrepreneurship really got started in 1999; the year the Entrepreneurship minor started. The Business Administration Master also had a track called “Innovation and Entrepreneurship”. Now there are two extracurricular courses as well: The first one is designed for pupils of the fifth grade of secondary schools (17 years of age) and is an introduction to entrepreneurship. The other one is the Entrepreneurship Adventure, designed for bachelor and master students and is organized by the Student Union. There is a PhD track in Innovation and Entrepreneurship in the Twente Graduate School. (Groen 2011, Sijde, Ridder 2008)

4. Organizational development

Parallel to these developments, the UT has adapted its internal structures and procedures to facilitate its entrepreneurial activities. In 1979 the UT established as one of the first universities in The Netherlands and in Europe a technology transfer office. The Transferpunt (Transferpoint) was created to help SMEs gain access to the university staff, the idea being that large firms already had the resources to access university staff, but small firms were much more likely to make a positive contribution to the region. Besides the central offices each research institutes appointed business development managers. (Bennenworth 2005, Sijde et al 2006)

The university had created a holding company for investing in its spin-
offs from the TOP scheme, through the Holding Technopolis Twente. The HTT is still the formal company through which shareholdings in related companies are held. (Bennenworth 2005)

In 1987 the Faculty of Technology and Management established the Centre for Innovation and Entrepreneurship (CIOT). Since 2000 TOP belongs to the CIOT, where it is managed both as an entrepreneurship stimulation activity but also an academic research project. In 2001 CIOT developed into the national Dutch Institute for Knowledge-intensive Entrepreneurship called Nikos in 2002, with a largely extended mission. Nikos consolidates the university’s expertise and experience otherwise scattered in different departments in a professional academic team, qualified to do research, teach, offer consultancy, training and business development support. (Sijde, Ridder 2008, Sijde et al. 2006, Urbact 2010)

5. Networking

In 1989 the Technology Kring (Circle) Twente (TKT) was created. It is an active network of 180 high tech businesses in Twente with a particular focus on cooperation and exchange of information. Members are often small, young, high tech innovation and product developing companies. They form a link between the university and business. TKT’s primary activities include sharing knowledge, exchange of experience and expertise, enhancing cooperation between members, supporting business development and enhancement of market profile and strengthening the position of the Twente region as a knowledge area. (Urbact 2010)

Although KTK is independent from the university, TOPpers have a central role in it.

6. Support schemes

The Twente Innovation Platform was formed on the initiative of the province of Overijssel. It is represented by the regional government, educational and research institutions and businesses. Worth 400 million euro over 7 years with the aim of establishing 12,000 jobs in the Twente region, the platform is aimed at supporting 5 clusters of activity, namely; construction, technology and health, safety and technology, food and materials and high-tech systems. (Urbact 2010)

 VentureLab Twente is a business support program that is designed for high growth, high technology based businesses both national and international. It is supporting 350 participants in 4 years, creating 200 SMEs, and in total supporting 3000 direct and 6000 employment places. VentureLab Twente provides office facilities (free office space) with access to newly developed technologies, venture capitalists and relevant networks of (international) companies and scientists. Students can also study and graduate from VentureLab. (Groen 2011, Urbact 2010)

Summing up, entrepreneurial initiatives at the University of Twente include business support for students, faculty and entrepreneurs; education and training; research focusing on entrepreneurship; organizational development; incubation and technology parks – infrastructure development and networking.

Key success factors in the ‘Twente story’

In the following section I identify the most important external and internal factors that contributed to the success of the entrepreneurial developments in Twente.
1. Supportive legislation and funding

The new law for higher education in 1993 created the promotion of regional economic development as one of the statutory purposes of the research active universities. According to the law in the Netherlands each university has three different tasks: education, research and service to the community. This last aspect includes knowledge and technology transfer. When UT was founded, the government had legislated for the new institution to enjoy considerable flexibility to experiment.

As far as the financial support is concerned, the region was eligible for the receipt of European Regional Development Funding. It was clear that the motor of this regional economy was the knowledge agglomeration that was building up around the University of Twente. The structural funds were therefore spent in supporting the mutual vision of an entrepreneurial university driving forwards regional economic development. TOP received financial support, first from Dutch Ministry of Economic Affairs and later from the European Social Fund. The ministry also supported the operation of the Technology Transfer Office for 5 years. (Benneworth 2005, Urbact 2010)

2. Institutional context

Although the university was created relatively recently, it established close links with industry from its inception, and from the 1970s, has been targeting increasing its regional impact. Over a period of 30 years the UT has a rather consistent policy with respect to entrepreneurship. (Benneworth 2005)

The institution was founded in 1961 as a technical college (technische hogeschool), the Netherlands’ third higher vocational institute of technology. It became a university in 1986. The Dutch government’s decision to locate the new institute in Enschede was based on the rich industrial heritage of the city. Another important consideration was the fact that the local economy needed a boost to compensate for the dwindling textile industry. Thus, it is important to emphasize that the institution was established with the definite mission of serving the local economy. (Urbact 2010)

The entrepreneurial university journey began in 1980 with an initial study, which identified that most of the alumni was enterprise-active, and that 80% of the staff were supportive of enterprise development. As a result, the overwhelming consensus was that within the university “people who develop new companies should be supported”. As Victor van der Chijs, President of the University of Twente’s Executive Board says: “Collaboration and entrepreneurship have been part of the university’s DNA since the university was founded.” The mission statement of the UT explicitly states that the university regards itself as an entrepreneurial research university. While it strives to operate in national and international fields, the mission statement also stresses that the university would like to see its educational and research activity contribute to the economic and social development of its regional environment. (Sijgers et al. 2005) It also may be a positive factor that at the beginning there was a shortage of staff available to take up academic appointments because of the relatively limited pool within the other two technical universities, and because some subjects were not covered elsewhere in the Netherlands. This provided UT with the...
opportunity to recruit people from industry as much as from other universities, and ensured that the professoriate did not have a purely academic perspective on their problem solving. (Bennenworth 2005)

3. Key agents

A central role in the entrepreneurial shift was played by the rector, Professor Van den Kroonenburg. As a professor in electrical engineering he was a firm believer in commercializing knowledge. He argued that the university played a critical role in building a new knowledge economy in the Twente region. He also realized that regional mobilization on its own was insufficient to address Twente’s structural problems. He began engaging with external actors to help with the realization of his vision of disseminating university knowledge into the external environment. He actively engaged with business support organizations in the region, apparently as vehicles who could help transform the university culture, and do things which he, as Rector responsible for scientific direction within the university, could not promote. An important part of Kroonenburg’s activity was this external liaison role; he obtained national funding for regional projects. He used his national contacts to persuade the Ministry of Economic Affairs of the value of what Twente were doing. This led to funding for the TOP program so the university could build up the ‘revolving fund’, which has been the foundation of the scheme since its inception. (Bennenworth 2005)

The Student Union is another addition to the entrepreneurial character of the UT. It is the only organization of its kind in the Netherlands. It encompasses all the university’s students and student organizations in the fields of culture, social activity, sports, study, and other activities. It was founded in 1999. About 6000 students and 90 student organizations are affiliated with the Student Union. It is specifically aimed at stimulating student activism, that is students learning other skills and competencies – outside of their education program. The Student Union is a student lead umbrella organization for all the student organizations at the University of Twente. The union is responsible for every extra-curricular activity that takes place at the university. With the help of regional business (banks, consultancy firms, etc), some of them regional firms, the Student Union organizes training programs to students that have a management role in their student organization. The entrepreneurial character of the Student Union also derives from the fact that it runs its own Union buildings and offers facilities and other support to students that run their own business as a student entrepreneur. The latter takes place through USE, University Student Enterprises. USE is part of the Student Union and may be regarded as the students’ counterpart to the successful TOP program that offers credit and other support to graduates and university employees starting their own business. (Sijgers et al 2005)

Regional actors, such as the local government, the development agency and entrepreneurs also played key roles in the integrated success story of Twente and its university (triple helix). The efforts and initiatives of the UT made an integral part of the development strategy of the region, and several developments, such as Kennispark or Twente Innovation Platform are the outcomes of the joint efforts of all the local actors.

4. Underlying principles
The University of Twente places great emphasis on the useful application of knowledge in society (cf. the ‘ivory tower’ approach). Patents, life-long learning programs and spin-off companies testify to this commitment, as does the university’s intensive involvement in research programs that enhance knowledge infrastructure in the Netherlands. The University of Twente see entrepreneurs as a bridge between university and industry. The focus of the University of Twente has been clearly inside-out, reflecting the university-industry linkage philosophy. (Urbact 2010) It is also important that Kroonenberg realized the relationship between the reinvention of the university and the reinvention of the region. He stressed the general point that the economic success of the Dutch economy was dependent on the success of SMEs, and it would take a special type of university to get their technology effectively into such firms. (Van den Kroonenburg, 1983, cited in Bennenworth 2005) The TOP-Program recognizes that there is a gap between fundamental research and the application of knowledge in surrounding society and that entrepreneurs with access to research groups and their knowledge and expertise and facilities can bridge that gap. (Urbact 2010)

The philosophy of Nikos also seems crucial. It says that you can only teach entrepreneurship, when you are also involved in putting entrepreneurship in practice (e.g. being involved in spin-off and start-up programs), and in research. Theory and practice should cross fertilize each other – for the benefit of teaching as well as to further entrepreneurship as a scientific discipline. (Sijde, Ridder 2008)

Integration of business support, teaching, research, networking, organizational and infrastructure development was the basic underlying principle of Twente’s innovative entrepreneurship right from the beginning, and it naturally evoked the cooperation of local actors.

Positive effects of the entrepreneurial initiatives

The entrepreneurial initiatives of the UT significantly contributed to the fact that the region of Twente had managed to overcome the weaknesses and the lock-in which were a consequence of its industrial monoculture focused around textiles. The most important area where the university contributed was in the attraction of inward investment, particularly in the field of ICT; possibly the biggest success was in the attraction and retention of a research laboratory from the Swedish mobile telephony company, Ericsson, but Lucent, KPN, and Logica all established research activities in the region, ostensibly to access the knowledge facilities at the university in terms of both graduates and professors. Spin-offs have contributed to the building of a set of innovation capacities around the university which have increased the overall innovation capacity of the region. This in turn has increased the attractiveness of the region to external partners, who have invested in the region to exploit those capacities. (Bennenworth 2005)

Cultural challenges

At first there was considerable cultural resistance at the UT to the idea of business engagement. Students seemed skeptical of the validity of trying to bridge between these two activities (scientific work and business). Besides, there were relatively few examples of where the professors themselves were active in commercialization and had established
their own companies. This appears to have been a reflection of the emphasis within the Dutch academic system on the primacy of scientific outputs and an undervaluation of commercial outputs. Despite a rhetoric that the university is entrepreneurial, the attitude of the professors towards entrepreneurship remained ambiguous. There seemed to be something of an antipathy amongst professors to mixing academic and practical research.

TOP was the most important and enduring signal of a cultural shift within the university. There was a consensus that the TOP program was successful on a variety of levels, from hitting its target of 15 companies per year, to transforming the university culture, to making the region more attractive, to increasing the esteem of the university in the eyes of the professorial technology transfer community. A clear sign of the cultural change is the fact that up to 2010 UT has produced 600 spin-off companies; more than any other Dutch university, and it was elected several times as the most entrepreneurial university in the Netherlands. (Bennenworth 2005, Urbact 2010)

**Conclusions for Hungarian higher education**

The Twente story is an excellent example of a region and its higher education to successfully change its path hand in hand by a well-defined and consistent development strategy and cooperation. The decline of the traditional textile industry in Twente resulted in a situation for the region and its higher education institution that is quite similar to the state of some industrial cities in the 1990s in Hungary. But while the University of Twente reacted with innovative solutions pioneering in entrepreneurial projects specifically designed for the development of the region, Hungarian cities like Miskolc or Veszprém have chosen the “traditional” way. They added non-specific educational programs – like economics or arts – to their portfolio pursuing the status of a science university with a general role. Local engagement is still not a key element in Hungarian universities’ mission, nor is the attempt to serve the local labor market and to truly cooperate with the local actors.

The case of Twente also shows how the fate of a region and its higher education may be intertwined. Without the university playing its part as a locally engaged entrepreneurial institution the region would not have been able to reorient itself towards hi-tech, knowledge intensive industries and services, to keep its educated workforce and attract venture capital. Similarly, without the receptiveness and cooperation of the local actors the UT could not have found a viable new mission and could not only survive its crisis but become a number one in university entrepreneurship. If either of them had chosen a different strategy (the university had gone for a mission independent from the ‘spiritus loci’ or the region had had a vision without higher education in its core) Twente would not necessary be a success story.

Twente is a textbook example of proactiveness. The university reinvented itself by finding a new mission and being fully initiative. Measuring threats and opportunities, sizing up local needs, following a consistent development strategy, finding partners, fraying out support the UT had not been waiting for other constituents to decide and act. But we must also add that being experimental and initiative was not only accepted or supported by the ministry, but it was even an expectation. This attitude of the government inevitably contributed to the proactiveness of the university. In a
political climate where being experimental and initiative is favored a university has more chance to invent itself than in a system where following regulations and waiting for centralized decisions is an established and honored behavior. Legal background is an important element here. Instead of detailed regulations, Western European laws for higher education tend to be only frameworks giving more space to institutions to define their mission and operations. It is also important that the Dutch law for higher education made the promotion of regional economic development as one of the statutory purposes of the research active universities.

The case also proves the importance of a change champion and a visionary leader. All the accounts of the entrepreneurial journey of the UT emphasize the role of Professor Van den Kroonenburg. Such people are vital for any organization, but extremely crucial in a traditional university context. In Hungary, where the expected achievements and performance of department heads, deans and rectors are not set, agreed and appraised, it depends exclusively on the individual leader, on his abilities, commitment and aspirations whether he creates, initiates, develops, pursues -- or just operates and retains the organization he inherited from his predecessor. Here volunteering change champions and visionary leaders are essential to progress.

The role of the student union in Twente also must be emphasized. It plays a very progressive and active part in the entrepreneurial activities of the university; organizing training programs, support schemes and running student enterprises. In Hungary, there is a long debate about the role students should have in running the university. Having 1/3 or 1/4 of the senate and faculty council seats, having the right to vote in all issues, being able to (s)elect rectors, deans and professors they may have an excessive influence in decision making. By assuming tasks and responsibilities the Twente Student Union takes, Hungarian student bodies may obtain a significant role in operating the university without being balance tips in issues that should not be the concern of students.

From the ‘Twente ideas’ I highlight the importance of SMEs in the economy and the recognition that it is much harder to take high technology to SMEs than to corporations. It is obvious that corporations like Mercedes or Audi play a crucial role in Hungarian economy, but the ability of small and medium enterprises to sustain, develop and innovate will also be a determining factor. Thus, cooperation and knowledge transfer between universities and SMEs is essential, and the way Twente established it may be an example to follow for some of our higher education institutions.

And finally, I assume the most important edification of the Twente case study is the holistic approach of university entrepreneurship. Entrepreneurial initiatives at the UT include business support for students, faculty and entrepreneurs; education and training; research focusing on entrepreneurship; organizational development; incubation and technology parks – infrastructure development and networking. Teaching without practice does not make students entrepreneurs, practice without financial and professional support cannot be efficient, individuals without networking have less chance to success, activities without the necessary organizational and infrastructural background are ineffective, the university without the other local actors cannot fulfil its regional role, excluding either students from the enterprises or practicing entrepreneurs from the
university is a waste. In Hungary, some elements of the entrepreneurship idea have already emerged in higher education: there are several spin-offs, business courses are included in most of the educational programs, more and more research concerning university entrepreneurship is carried out, dual training was established etc., but the holistic approach is still missing on both governmental and institutional level.

References


Brief biography of the author

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Dr. Keczer Gabriella is an associate professor of University of Szeged, Faculty of Pedagogy, Hungary. She earned a master degree in History and English, a second degree in Economics, and a PhD and habilitation in Business Administration and Management. She has courses on management, project management, nonprofit management, entrepreneurship and economics. She is the author of more than 80 publications mainly on university governance, the author of four books on educational and university management, and the co-author of two books on management and project management. She is the chair of the organizing committee of the „Taylor” conference series on management held annually, and the editor-in-chief of an academic journal on management.
Assessing Entrepreneurial Potential of University: Empirical Evidence from Croatia

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Abstract
Today’s environment is characterized by high uncertainty and complexity, which forces all systems to make significant changes in order to survive, including universities. Nowadays, the role of universities is widely discussed because the focus has shifted from teaching and research to the “third mission” of university, which means increasing involvement in socio-economic development of its surroundings and stimulating technology commercialization. Universities should not focus just on transferring knowledge to students or producing new knowledge, but also on implementation and usage of that knowledge in solving the problems of industry and society in which they operate. Universities need to find a way to act more innovatively to create a more engaging environment for researchers and students, and to collaborate with their stakeholders. In order to achieve this, they need to become entrepreneurial organizations.

This paper deals with the main characteristics of entrepreneurial university and uses the cases of two Croatian universities to demonstrate how far they are from being entrepreneurial. Croatia has gone through many changes in the past three decades; from a socialist country and socialist self-management to a democratic government and capitalism. The question arises, to what extent did these two Croatian universities adapt to the new circumstances and how close are they to fulfilling their third mission and becoming entrepreneurial. Analyses of these universities show that some elements of entrepreneurial universities exist at both universities but they are not systematically developed and usually not part of strategic plans of the universities. This paper gives recommendations of what is missing and what needs to be done in order to become an entrepreneurial institution.

Keywords: Entrepreneurial university, “Third mission” of University, Innovation, Entrepreneurship, Croatian universities

Introduction
Today’s environment is characterized by high uncertainty and complexity, which forces all systems to make significant changes in order to survive, including universities (as a part of the environment). The levels of uncertainty and complexity in any environment and the associated threats and opportunities dictate the need for entrepreneurial response (Gibb, 2013). Universities are facing higher levels of uncertainty and complexity in their environment as well as greater entrepreneurial pressures from within, because of different challenges to the
The concept of the university as a “protected place for individual research and teaching” (Gibb, 2013).

Pressures for easier access to higher education, expectation from the government about involvement of universities in socio-economic development of the country and demands for implementation of principles of market economy and organizational management at universities create a completely new context for development of higher education. Their role should not simply be focused on producing new knowledge, but also on disseminating it to industry and society (Guerrero et al., 2012). With the emergence of university’s “third mission”, in addition to teaching and research, emphasis is also placed on socio-economic development, research and technology commercialization (Ranga, 2014). Universities cannot be seen only as a part of the national education system, protected by the government and responsible only for educational programs and research. In a highly competitive world, universities need to compete for students, research and financing and they need to take care of developing relationships with their stakeholders, which demands a complete change in their way of doing business (Oberman Peterka, 2008). Pressures in this respect have increased with the global recession (Gibb, 2013). In order to fulfill their task, universities need to redefine their mission, vision and activities and replace their traditional approach with a new, contemporary approach, which has been named “entrepreneurial approach” (Oberman Peterka, 2011). Entrepreneurial character of university does not mean that universities will become too dependent on industry, neither that they will become “all-purpose shopping malls” (Clark, 2001). Entrepreneurial universities are active actors in society that influence their environment (industry) in the same way that the environment (industry) influences them. These are institutions that are capable of change in complex and uncertain environment, without compromising their mission. (Oberman Peterka, 2008).

Being an entrepreneurial higher education institution depends, to a large extent, upon individuals and innovative ways of doing things and therefore recognizing and building – in innovative ways – on what already exists (Gibb et al., 2014).

This paper consists of three parts: the first part provides a literature review about the entrepreneurial university and the main characteristics of entrepreneurial university, the second part focuses on the situation in the Croatian higher education system and gives a comparison of two Croatian public universities in the context of being an entrepreneurial university, and the third part gives recommendations of what needs to be done in order to become an entrepreneurial institution.

**Literature review and contextualization**

Emergence of entrepreneurial university is an answer to the growing importance of knowledge in national and regional innovation systems since university is an agent of effective and creative creation of new knowledge and technology and their transfer from university to society (Etzkowitz, 2000). In knowledge-based economy, university is becoming (or should become, authors’ remark) a key institution of the innovation system – as a producer of human capital and as a base for the development of new businesses, and, besides government and industry, it is becoming an unavoidable element of societal development. These three
institutional spheres (government, industry and university), according to Etzkowitz et al. (2000) are interconnected in the Triple Helix model. Connections between these spheres are happening in different phases of innovation processes. The Triple Helix model can help in understanding the concept of entrepreneurial university, but it does not explain what entrepreneurial university is or how to create and develop relationships between these three institutional spheres. In two thirds of cases, partnerships between university, business sector and government do not lead to fulfillment of common goals and they usually end in failure (Hagen, 2002), mostly because of different business cultures and differences in the way they operate. (Cyert and Goodman, 1997, cited by Hagen, 2002: 209). However, when successful, cooperation can lead to synergistic effects, which are explained by the Triple Helix model. Thus, a university can be referred to as an entrepreneurial university if it embraces its role within the Triple Helix model, its “third mission” of contribution to regional and national development (Philpott et al., 2011). In that sense, entrepreneurial university becomes something that all universities should strive to become.

Nowadays, the role of universities is widely discussed because the focus has shifted from teaching and research to the “third mission” of university, with increasing involvement in socio-economic development and technology commercialization (Ranga, 2014). Strengthening the role of university as an active creator of innovation is motivated by university’s increased interest in knowledge capitalization, which leads to strengthening connections between university and industry, but also between university and government. Governments all around world are focusing on developing potential of university for creating innovation and knowledge-based economy development (Etzkowitz et al., 2000). Technology transfer offices (TTO) have been established at many universities. Together with government programs for enhancing technology transfer, they help academics search for economic and technological potential of their research. Besides TTOs, universities are becoming involved in other activities connected with knowledge capitalization and technology transfer, such as establishing business incubators, centers for entrepreneurship, etc. Universities are also acquiring equity in certain companies and thus technology and knowledge transfer activities are becoming an important part of income of some universities.

The research of entrepreneurial university began in late 1990, with Clark (1998, 2001) and Gibb (2002, 2005), who have developed characteristics of entrepreneurial university. According to Clark (1998, 2001), there are five basic elements of entrepreneurial university: strong leadership, diversified financing, developed university periphery, stimulated academic heartland and integrated entrepreneurial culture. Gibb (2013) has developed a broader definition of entrepreneurial higher education institution in which he states that “entrepreneurial higher education institutions are designed to empower staff and students to demonstrate enterprise, innovation and creativity in research, teaching and pursuit and use of knowledge across boundaries. They contribute effectively to the enhancement of learning in a societal environment characterized by high levels of uncertainty and complexity and they are dedicated to creating public value via a process of open engagement, mutual learning, discovery and exchange
with all stakeholders in society – local, national and international.” Facing many challenges, universities need to find a way to act more innovatively, creating more engaging programs, while taking more responsibility for employability of their students. They need to collaborate with their stakeholders, with industry and government, in synergy, to disseminate the knowledge and embrace their role in carrying out necessary changes. Changes need to start from individuals, then building on to institutional change, to be able to cope with demanding environment.

According to Ranga (2014) the entrepreneurial university has nine core activities, as follows: (1) joint research projects; (2) technology transfer and research commercialization; (3) spin-off formation by academic faculty, students, alumni; (4) engagement in strategic partnerships and venture capital; (5) mobility of university researchers to industry and of industry researchers to academia; (6) professional education to companies (lifelong learning); (7) involvement in local and regional development projects through various models of public-private partnership; (8) entrepreneurial education for students; and (9) internationalization.

From this definition, we can see that concept of entrepreneurial university goes even beyond the concept of the Triple Helix to a wider stakeholder model, which is centrally concerned with how universities can negotiate pressure from a wide range of stakeholders (Gibb and Haskins, 2013).

European Commission (2014) highlights the following three challenges that seem to be particularly relevant for higher education and drive their innovation: challenges from globalization, challenges from the changing supply of and demand for higher education and challenges from changes in higher education funding. Taking in consideration all these challenges, European Commission and other international organizations (such as OECD, World Bank, etc.) put a strong accent on stressing the importance of changing the way in which HEIs operate. As a result of these initiatives, in November 2013, the European Commission and the OECD LEED Forum (supported by a panel of six independent experts) launched a tool for measuring entrepreneurial and innovative potential of universities (HEInnovate) (https://heinnovate.eu/about, January 05, 2017). This tool corresponds with previous research on entrepreneurial university and measures seven areas of entrepreneurial/innovative university: leadership and governance, organizational capacity (funding, people and incentives), entrepreneurial teaching and learning, preparing and supporting entrepreneurs, knowledge exchange and collaboration, the internationalized institution and measuring impact. This tool is intended to be self-evaluation tool that allows stakeholders (internal and external) of HEIs to come together, compare their assessments internally, start discussion, and define the priorities and steps for the change process. In three year of its existence, more than 100 HEIs from Europe have used this tool to assess their entrepreneurial and innovative potential (https://heinnovate.eu/about, January 05, 2017).

At the end of this discussion we can conclude that the change process is long and difficult, and that there is no unique solution how to transform a university into an entrepreneurial university; each university has to find its own specific pathways, its own specific configuration how to bring about change that is reflected by situation, resources and environment in which each university operates (Clark, 2004).
Methodology

This paper will compare two Croatian public universities according to characteristics of entrepreneurial university, developed by Ranga (2014) and will try to see how similar or different they are, what is missing and what can be done in order for them to become more entrepreneurial.

In order to understand the comparison and conclusions, it is important to know the context in which Croatian universities operate. According to the Agency for Science and Higher Education (AZVO, https://www.azvo.hr/en/, January 05, 2017), there are currently 119 institutions of higher education in Croatia: 8 public universities, 2 private universities, 68 graduate and art academies and one university center within a public university. There are also 4 private universities of applied sciences, 11 public universities of applied sciences, 22 private colleges and 3 public colleges. Even though faculties are part of universities in Croatia, they have autonomy and therefore are not so closely connected to the university and there is no clear identity of the university as a whole, as it is the case in United States or in some European countries. Because of this fragmentation within the university, communication between its constituent units is slow and scarce; there is poor information flow among faculties, university employees and students.

Josip Juraj Strossmayer University of Osijek is one of seven public universities in Croatia with eleven faculties, five university departments and one Academy of Arts. The University was founded in 1975 and it had 18,004 students enrolled in the academic year 2015/2016 (www.unios.hr, January 05, 2017).

The University of Rijeka was founded in 1973 and it consists of ten faculties and three departments, as well as several scientific and development centers, joint services, other constituents and organizations. Currently, there are 16,654 students enrolled in the academic year 2015/2016 at the University of Rijeka.

As it can be seen, these two universities are quite similar in context of year of establishment, number of students and regional importance, because of which they are easily comparable. They can learn from each other, although they can develop their own ways of being innovative and entrepreneurial.

Results and discussion

Taking into consideration the core activities of entrepreneurial university developed by Ranga (2014), the available resources, such as Strategy of Josip Juraj Strossmayer University of Osijek 2011–20201 and University of Rijeka Strategy 2014-20202, articles and internet sources, an assessment of entrepreneurial potential of these two universities was made. Activities of entrepreneurial university are closely related and often overlapping with each other and therefore it is not easy to draw a straight line between certain activities. Activities of entrepreneurial university, such as joint research projects, technology transfer and research commercialization, formation of spin-offs by academic staff, students and alumni, involvement in strategic partnerships and venture capital, mobility of university researchers to industry, and of industry researchers

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to academia, providing professional education to companies (lifelong learning), involvement in local and regional development projects through various models of public-private partnerships, entrepreneurial education for students and internationalization are closely linked and they are analyzed as a whole.

Analysis of the Josip Juraj Strossmayer University of Osijek (University of Osijek)

Cooperation between industry and university is crucial for fulfillment of university’s third mission in terms of producing knowledge and research that could contribute to social and economic development. The most common way of using knowledge and research as tools for improving socio-economic development are joint research projects. One of the key reasons for encouraging joint research projects at the University lies in fact that “the university is a potential seedbed for new interdisciplinary scientific fields and new industrial sectors, each cross-fertilizing the other” (Etzkowitz, 2003). At the University of Osijek, there are cases where companies from industry are looking for opinions and scientific studies from faculties, but there is no evidence of formal cooperation between faculties and the university or cooperation between faculties and industry that could result in new interdisciplinary scientific projects or knowledge that could contribute to economic development. When looking at the Strategy of Josip Juraj Strossmayer University, one of the strategic goals of the university is to be profiled as a research-oriented university. Productivity of scientific work at the University is currently measured by the number of articles published in well-known journals, while not taking into consideration the real value, impact and contribution to socio-economic development. Putting the number of published articles as one of the key requirements for promotion to higher academic rank is encouraging “publishing just to publish” without encouraging publishing scientific work based on knowledge and research that could contribute to social and economic development. However, this is the problem of all Croatian and many European universities, and one of the reasons why universities are rarely involved in projects with industry.

Encouraging joint research projects through mobility of university researchers to industry, and that of industry researchers to academia is an important activity of entrepreneurial university. At the Josip Juraj Strossmayer University, mobility is very low on both sides due to the opinion that scientists should work at the university and focus on scientific work and “production” of articles, while industry researchers should focus on practical work in their own industry. It is also very difficult to involve industry researchers into teaching at universities, due to strict regulations prescribing who can teach at a university and what kind of academic title they need to have (which is very difficult to achieve while being employed in industry).

Another thing closely related to this problem is the fact that the University is located in the part of Croatia that is still feeling the effects of heavy industry loses during the 1990’s war and the global economic crisis of 2008. Not many industrial companies have managed to survive those unfortunate times and those that did invest little in research and development in their own departments. Without engaging in joint research projects, it is not possible to create a stimulating environment for technology
transfer, research commercialization, and formation of spin-offs.

Even though the university has made significant steps in creating an environment for technology transfer by establishing the Tera Tehnopolis technology park in 2009, the conditions for technology transfer at the university are still relatively poor. Tera Tehnopolis serves both as a business incubator and as a technology transfer office. Even though Tera Tehnopolis’s business incubator has around twenty companies in the incubation process, more than half of those companies are not actually technology and innovation-oriented, but rather service-oriented, involved in activities such as bookkeeping, marketing solutions, etc. As mentioned before, faculties have autonomy in their work, as well as in research and commercialization of research. In line with that, some faculties commercialize their research better and are better at offering services to industry. For example, the Faculty of Food Technology has established the Center for Development and Technological Engineering CERT ING and the FOODLINKS Center in order to improve cooperation and knowledge transfer with industry. Those centers are still a part of the faculty, but this could be a first step in the creation of spin-offs by the faculty (and university) in the future. When looking at the number of spin-off firms created by faculties or the university, there is no official information about their existence or number.

Creating a stimulating environment for research, technology transfer and start-up firms represent a challenge, especially when there is a lack of financial resources. In more developed countries universities easily engage in strategic partnerships with government and industry, but there are also different financing options available, such as venture capital funds. Venture capital industry is much less developed in the EU than in the US (Ranga, 2014), and it is poorly developed in Croatia with only a few venture capital funds operating in the whole country. In February 2015, a new venture fund was established in Osijek, named Frank Ventures with the main goal of financing ten start-ups in their first year with HRK 600,000 (Biberović, 2015). This venture capital fund was established by private investors and until today (2017) it has not made a single investment.

The faculties and the University are still mainly financed by government funds with only a small portion of self-financing. According to research on European universities, 69% of funding of Croatian universities comes from the government and only a small part from the industry and the private sector (Dominics et al., 2011). A portion of the funding comes from professional education offered through lifelong learning programs. The University offers a range of lifelong learning programs at different faculties. One of the goals stated in the strategy is the establishment of a lifelong learning center. In addition to the establishment of such a center, the University should constantly revise its lifelong programs (as well as all other educational programs at the University) in order to make them more useful to participants by including new, modern and entrepreneurial content. Considering the limitation of government funding, the faculties and the University itself are trying to fund more activities through European projects. The University is participating in European Union funding programs such as Erasmus+ and Horizon2020, which provide the opportunity to network and research with people from throughout Europe. A relatively small number of faculties and employees is involved in such research projects. Even though this seems
to be a good funding option at the present, the University should focus more on commercialization of its own knowledge, and create stable funding from the industry and the private sector.

European funded projects also give faculties opportunity to build strategic partnerships and its employees and students the possibility to get international experience. When talking about mobility and internationalization of both university staff and students, they are at the same low levels as the participation in international research projects. The interest of domestic students to be included in international mobility is greater than the interest of international students to come to the Josip Juraj Strossmayer University of Osijek. This claim is confirmed by the fact that in the winter semester of the academic year 2014/2015 there were only 15 Erasmus students enrolled in classes at the Josip Juraj Strossmayer University. One of the problems is that no programs at the University of Osijek are taught in English. Another problem that prevents better internationalization could lie in the fact that students prefer to choose universities that are situated on the coast and are more attractive geographically. Yet another can be found in the fact that Croatian students are not willing to enroll in courses taught in English language, which leaves incoming students limited only to student - professor consultations. Language barriers are not the only problem for domestic students. There is still a certain number of university professors that do not speak English and therefore cannot give lectures for foreign students.

One of the key activities of entrepreneurial university is entrepreneurial education for students. Although entrepreneurship is offered as an elective course to all university students, real entrepreneurial education is offered merely at the Faculty of Economics at all education levels, from the undergraduate to the doctorate level. Making entrepreneurial content and courses available to all University students should be in University’s focus in the future. It is very important to enhance entrepreneurship across campus because entrepreneurship education is helping develop entrepreneurial skills, attitudes and behaviors that could enhance employability of students (which is currently a huge problem in whole Croatia).

Analysis of the University of Rijeka

Findings of the study by Kalar and Antoncic (2015) imply that it is not enough simply to announce entrepreneurial orientation of the university in strategy documents, because there are still some academics who believe that, upon introducing the third mission of the university, the main missions of university will be neglected. Therefore, it is necessary to persuade academics to believe in the necessity of entrepreneurial orientation of the university, not just by writing new policies and measures, but also by providing real action and support. The University of Rijeka wrote a new strategy for the period 2014 – 2020. The strategy has many important goals and objectives with indicators and measures, but without an action plan or the necessary steps to be taken. A strong leader is needed, one that will encourage entrepreneurial orientation of the university. The rector of the University of Rijeka seems to have predispositions to make changes. He sees the necessity for university integration, as well as collaboration with industry and government. He is supporting technology and knowledge transfer and is strongly
in favor of internationalization of the University (Erasmus mobility and EU funds, but also visibility of the university at the international level). Considering that his field of work is medicine, he had additional education in the field of management, but he would benefit from entrepreneurial education as well.

Activity of technology and knowledge transfer and research commercialization is covered from multiple aspects at the University of Rijeka. Their Science and Technology Park, Technology Innovation Center, Technology Transfer Office and Center for Proteomics have achieved great results in this area. Although they need to ensure greater visibility of their work and projects at regional and national levels, they have government support and they are internationally recognized as a desirable partner in projects and studies. In 2008, University of Rijeka founded the Science and Technology Park of the University of Rijeka (StepRi). The main idea behind establishing this kind of institution was to promote and encourage entrepreneurship-based knowledge and new technologies, but also to encourage research commercialization. They offer subsidized offices and lab spaces for startups and spin-offs, entrepreneurial education and consulting. They have close cooperation with the government (Ministry of Entrepreneurship and Crafts and Croatian Agency for SMEs and Investments). StepRi has been a partner in the Enterprise Europe Network since 2011, which allows it to offer advisory services for internationalization of companies. Technology Innovation Center (TIC) is one of the first entrepreneurial steps made by the University of Rijeka. The idea came from the University of Rijeka in 1994, and three years after, in 1997 the center was founded by the University of Rijeka, Primorje-Gorski Kotar County, City of Rijeka and Privredna bank Zagreb. It is a scientific – technological incubator, with the main goal of assisting in science and technology transfer. TIC has established a foundation called FIPRO. The aim of the foundation is to finance the manufacture of prototypes. The University of Rijeka Technology Transfer Office was founded in 2009. Its main tasks are promoting culture of innovations, intellectual property protection and technology transfer from university to industry. The Center for Proteomics was founded in 2006 at the University of Rijeka, Faculty of Medicine. They are known for their collaboration with academia and industry. It is financed through international grants and commercial activities. The Center has collaborated on numerous projects with research institutes, universities and SMEs from Southeast Europe, European Union and USA. Examples of ongoing projects are PACINNO and Becoming Entrepreneurial. PACINNO (Platform for trans-Academic Cooperation in Innovation) has three areas of work: research of best practices of innovative SMEs, education of human resources and knowledge transfer. Becoming Entrepreneurial is a project for knowledge transfer from the University of Rijeka Faculty of Medicine to the biotechnology business sector. The Foundation of the University of Rijeka is a nonprofit organization which offers financial support for the activities that are not financially supported by the government. Those activities are related to teaching, research and contributing to the community. It was founded by the University of Rijeka, City of Rijeka and Primorje-Gorski Kotar County in 2003. It is financed from contributions of founders and donations. The Foundation is a part of the United Nations worldwide initiative...
Global Compact, as well as a member of the international organization The Talloires Network.

University of Rijeka offers numerous lifelong learning programs. Strip Ltd. is a company founded by the University of Rijeka with the aim to develop lifelong learning programs and to promote entrepreneurship. They have carried out several projects, and their most recent project is Ricount – development and implementation of lifelong learning programs using new technologies. Through an on-line platform it is possible to participate in three education modules: Entrepreneurship, EU funds management and Module for employees of the Jadran Galenski Laboratorij company (which is direct professional education for the company). There is also the Center for Applied Psychology, which can be considered as a spin-off. It offers education for government bodies and companies (services offered to clients are programs and projects related to research, education, prevention, counseling and evaluation of existing projects). Entrepreneurship education is offered only to the students of the Faculty of Economics at undergraduate and graduate level. But, content of these programs is not truly entrepreneurially-oriented. Additionally, the Center for Local Economic Development is a remarkable channel for greater involvement of the University in local and regional development projects, but should include the University as a whole, not just the Faculty of Economics.

Mobility of university researchers to industry and that of industry researchers to university is a vague area. Involvement of entrepreneurs in education is low. Activities such as “...the use of entrepreneurs in teaching; joint entrepreneurial ventures in research; the offering of status to entrepreneurs as Fellows and Professors of Practice; levels of graduate placement with SMEs (Gibb, 2012)” are also an area with room for improvement at the University of Rijeka.

University of Rijeka has been participating in Erasmus mobility programs since the academic year 2009/2010, when 35 students and 7 university employees visited universities in Poland, Austria and Italy, with a budget of EUR 70,752. In the academic year 2013/2014, 121 students and 30 university employees visited different European universities, and the University of Rijeka had 79 incoming students. The situation was even better in the academic year 2014/2015, when 137 students and 25 university employees used Erasmus mobility, and there were 154 incoming students at the University of Rijeka.

Conclusion

National, regional and EU policies for innovation, entrepreneurship and higher education should contribute to creating a stimulating environment for the development of entrepreneurial universities. Based on analysis and research, European Commission gave policy recommendations for policy makers and higher education institutions. Recommendations for policy makers address the need for clear regulatory frame for online learning, quality assurance, clarifying the funding implications, intended outcomes and timescale for the innovation. Recommendations for higher institutions focus on changing the landscape of teaching and learning in higher education through engaging faculty members in new innovative practice, stimulating those who engage in such a practice and review existing organizational boundaries and linkages. Secondly,
they focus on technology and student performance and, finally, on globalization and internationalization strategies. All of these recommendations are very important for Croatian policy makers and universities because they could serve as guidelines to start the processes of change and as guidelines how to become more innovative and entrepreneurial. All of these changes are not easy and they cannot be done overnight.

Changes at the Josip Juraj Strossmayer University of Osijek usually come from enthusiastic individuals and since they are not part of strategic decisions of University leadership, it takes more time to carry them out. Another obstacle is the current policy and laws that do not stimulate innovative initiatives of university employees. Something that the University and its faculties should focus on is the integration of University in terms of starting cooperation among university employees, creating stimulating reward programs for employees and create a supportive environment for interdisciplinary work. Connecting employees through creation of University intranet, and organizing weekly meetings of university researchers and industry researchers and representatives for the purpose of networking is one of possible ways for creating a stimulating environment for joint research projects that could later result in developing other activities of entrepreneurial and innovative university. It takes willingness of the University leadership and all employees, but also changing of certain policies at the national level, that could contribute to making the University more entrepreneurial. National policy should undergo changes, especially in the area of requirements for promotion to higher academic rank, where the emphasis should be on publishing research that contributes to socio-economic development, and in the area of rewarding innovative employees. Changing ourselves and encouraging others to change is the step forward in creating entrepreneurial university in Osijek. It only depends on how many people are willing to make that step.

There are considerable and important efforts at the University of Rijeka directed at becoming an entrepreneurial university. Entrepreneurial orientation of the university is more visible in strategic documents and in the support from the university leadership, but still, quite often and in many activities, it is just the effort of individuals. Information about achievements are scattered and there is a lack of communication within the university. University of Rijeka took the entrepreneurial path, but the idea of entrepreneurship has to be spread throughout the University and it has to be transformed into widespread activities. An Alumni association could be a great step for integration. Some faculties and departments have their own Alumni associations, but it is necessary to have University’s Alumni, which would lead to closer connections and create a stronger identity of the University. Alumni members would thereby get a chance for greater involvement in University’s activities. This could be the basis for future strategic partnerships, joint research projects, or other activities. It is important to note that the University of Rijeka and its constituent units are highly oriented towards internationalization and are putting significant efforts into making partnerships and research projects with universities from Europe and the world, financed by EU funds and international grants. At the end of 2013, almost 7% of University’s budget was coming from EU research funds (Strategy 2014-2020). That percentage should increase with the years.

Both observed universities have some
characteristics of entrepreneurial university and both have taken some steps towards becoming more innovative and responsible and have started introducing activities that are connected to the “third mission”. But, in most cases, those changes are just starting and are still dependent on individual initiative, and a lot of energy and effort is still needed to become entrepreneurial and innovative. What is missing in both cases is more communication between university departments, more support from the university leadership and more supportive environment for interdisciplinary and collaborative work between researchers themselves and between researchers and industries. In order to keep their role as key players in economic development and as knowledge creators, universities need to change faster, involving all stakeholders in the process of change.

Finally, it should be mentioned that this paper has some limitations. This paper is written on the basis of publicly available information, which might have been limited. Because of unavailability of some data, it is possible that some facts have not been taken into account when making conclusions. Nevertheless, this paper is a good basis for further research of entrepreneurial potential of the University of Osijek and the University of Rijeka.

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Different Influence of University-Industry Cooperation on Innovative Activities within Croatia, Czech Republic and Hungary

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Abstract

The ability of cooperation between economic subjects seems to be a crucial part of the positive economic environment that is necessary in gaining a competitive advantage and during the process of innovation creation. Innovation represents modern engine of economic growth and, therefore, many various economic actors cooperate increasingly. The cooperation has no boundaries, we called it trans-sector cooperation (mostly university-industry and the government can be also incorporated). The knowledge and industrial sector cooperation is the most common now. The knowledge sector is perceived as a contractor (or creator) of various knowledge. Industrial enterprises use this knowledge for the emergence of innovation and also for commercialization. The advantages of cooperation are mutual, because it gives the possibility of implementing further basic and applied thereafter (industrially exploitable) research for the universities. The research institutions acquire also the additional resources and the cooperation allows to their students to engage in practical issues. The enterprises acquire from the cooperation relatively cheap source of new knowledge, access to instrument and technological equipment. In regions, there the different tools on the principle knowledge sharing and cooperation is becoming more common. These include for instance the industrial clusters or business networking, as well as regional innovation systems and global production chains. The application of public incentives and subsidies from public budgets are often applied because these tools are perceived as the tools of regional policy. But there is the question about the efficiency of this public support, as well as about the efficiency of the cooperation among the mentioned entities. Therefore, we analyse influence of University-Industry cooperation and of public financing (from national and European funds) on the growth of turnover from innovated products in manufacturing industries in Croatia, Czech Republic and Hungary by using own multiple linear regression models and data from the Community Innovation Survey (harmonized questionnaire, which is part of the EU’s science and technology statistics) between the years 2010-2012. In total, we analysed 7 189 firms, and results show, that this kind of cooperation influence firms’ innovation activities differently within each country. Therefore, we provide a comparison of the results between countries and some practical implications for policy makers.

Keywords: university, industry, cooperation, innovation activities, manufacturing

Introduction

Individual market players are trying to have an effective business strategy, which includes even the most efficient use of production factors, which are available for the firm. It turns out that firms precisely
differ from other in its ability to generate innovations, in ability to come to the market with new products or those which are demanded by other firms (in terms of individual orders; Gnyawali & Srivastava, 2013). For the ability of the firm to generate innovations within a short time and under economic conditions, it is necessary to fulfil some certain preconditions. The internal settings of the firm and the quality of available resources are the important prerequisites for every firm. These factors can be involved there: mainly the production factors (hard infrastructure, capital equipment, technology, etc.), but also soft infrastructure, which is consisted from suitable structure of employees and their abilities and competencies (Blöchliger, 2013). Their knowledge, but also the ability to be creative and innovative, to come up with new ideas and improvements of existing production, are essential elements of an internal firm environment what is necessary for innovations (Hung & Chou, 2013).

Another prerequisite is the existence of the company in an innovative environment (innovation ecosystem), i.e. an environment that encourages the development of innovations. There are many suitable partners for cooperation are appeared, knowledge-intensive and the most demanding customers, who are forcing the firms to innovate and come up with new products. Innovative environment can help to stimulate the cooperative relationships between firms and possibly other entities that can play an important role in cooperative chains. They especially knowledge-intensive organizations, their main activity is research and development (De Marchi & Grandinetti, 2013).

The remainder of this paper is divided in the following way. The first section is focused on the problematic of the university-industry collaboration. The second section describes the methodology and analysis results. The last section brings the conclusions and some political implications and recommendations.

Theoretical Background

Various knowledge-intensive production processes require the different environments and knowledge inputs. For emergent high-technology industries, we see that the firm chooses so called searching strategy for innovation inputs. It also includes the networking and cooperation in the development of innovations (Laursen & Salter, 2014; Cheng & Huizingh, 2014). This special type of market (market of collaboration) is characterized by very strong competition in the field of technologies and products. In this market we recorded strong dynamics and dependence on technological discoveries, but it reduces the technological uncertainty and the competition is mainly focused on costs (Parida, Westerberg & Frishammar, 2012).

From the observation of the practice we see, that different firms need to build their competitive advantage on the different type of knowledge, depending on the firm’s life cycle or the new product’s life cycle. It has been proven in many studies that tacit knowledge is very important for the early phases of the product development. For the successful application in the market and commercialization it is necessary to use the relationships between firms and other organizations. The knowledge transfer (or acquisition) is the significant synergistic effect in the application of knowledge and creation of new innovative products (Laursen, 2012). All this is subject of geographical proximity in many
industries. It multiplies the effectiveness of cooperative links (Prevenzer, 1997; Broekel & Boschma, 2012). This applies not only to firms but also to proximity to the knowledge-intensive institutions. It has been demonstrated that high-quality research at universities may increase the agglomeration of the innovation activities. However, the knowledge of skilled workers is grouped together in all phases of the industrial cycle (Audretsch, 1998).

In mature industries, the firms should rely on the codified knowledge what becomes the basic substance of innovation (Robertson and Smith, 2008). However, development and globalization trends bring new knowledge and technologies and the firms have to react quickly. It entails the constant need for adaptation of firms, their investments in technology (Freddi, 2009; von Tunzelmann, 2009) and well-skilled labour force seeking.

These changes are costly and time consuming especially in high-technology sectors (McGahan and Silverman, 2001). Therefore, many firms in the high-tech productions rely on the availability of technology and knowledge what are produced by universities and research institutes. Mature industries conversely acquire market knowledge from customers or competitors. Robertson and Smith (2008) argue that, in mature industries, market knowledge provides the framework for the recombination and creation of knowledge through problem solving, via a range of activities and R&D (Freitas, Marques & Silva, 2013; Mina, Bascavusoglu-Moreau & Hughes, 2014).

Especially emergent industries will cooperate with universities much more frequently. The firms have the opportunity to gain scientific support for development of their products (Powell et al, 1996; Lee, 2000). The effective cooperation will be implemented based on personal contacts (not merely on formal level; Furman a MacGarvie, 2009). Taking into account the objectives of the involved organizations, also the students and alumni will be involved in research in framework of the university-industry collaboration (Freitas, Marques & e Silva, 2013). The results can be published for the first in the form of conference (or journal) papers, and later in form of patents (Furman and MacGarvie, 2009).

The university-industry cooperation is one form of cooperation form. The aim of this article is to examine the influence of the university-industry cooperation on innovative activities of the selected firms. The analysis will be conducted in selected EU countries. It will be interesting to see which of innovation environmental indicators (in a selected sample of firms) influence the variable and what impact they will have on the variable if they act alone or in combination.

Data and methodology

In our analyses, we created original multiple linear regression models to investigate the relationship between one dependent variable, represented by the % of turnover in new or improved products introduced during 2010–2012 (= innovation performance), and a number of selected independent variables (6 different groups of determinants affecting innovation activities – see Table 1: Independent variables). As a data source, we used harmonized questionnaire Community Innovation Survey (CIS) that was conducted between the years 2010-2012 by Eurostat. CIS is part of the EU’s science and technology statistics and is carried out every two years by the EU member states and a number of ESS member countries. In total, we analysed...
7,189 firms from the manufacturing industries (NACE Categories 10-33) in Croatia, Czech Republic and Hungary by using own multiple linear regression models. These models are commonly used for these kinds of analyses (e.g., Nieto & Quevedo, 2005; Chen & Huang, 2009; Schneider & Spieth, 2013). Data from Eurostat we don’t consider as censored or truncated (as in study of Doran & Ryan, 2016).

Multiple linear regression models take the general form as follows (Chatterjee & Hadi, 2013):

\[ y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_n x_n + \varepsilon \]

\( (1) \)

where

- \( y \) is a dependent variable;
- \( x_1, x_2 \ldots x_n \) are independent variables;
- \( \varepsilon \) is an error term that accounts for the variability in \( y \) that cannot be explained by the linear effect of the \( n \) independent variables;
- \( \beta_1, \beta_2 \ldots \beta_n \), called the regression parameters or coefficients, are unknown constants to be determined (estimated) from the data.

Verification of whether the data from the Community Innovation Survey were correlated was conducted by using Spearman’s test. The general formula for Spearman’s rank correlation coefficient takes the general form as follows (Weinberg & Abramowitz, 2002; Borradaile, 2013):

\[ r_s = 1 - \frac{6 \sum d^2}{N(N^2 - 1)} \]

\( (2) \)

Spearman’s coefficient \( r_s \) measures the strength of the linear relationship between each two variables when the values of each variable are rank-ordered from 1 to \( N \), where \( N \) represents the number of pairs of values (the \( N \) cases of each variable are assigned integer values from 1 to \( N \) inclusive, and no two cases share the same value). The difference between ranks for each case is represented by \( d \). All calculations were made using the statistical software STATISTICA (StatSoft Inc., 2011). The values of Spearman’s test rejected the hypothesis that the data are correlated with a level of significance at \( p<0.05 \). After fulfilling the first prerequisite (uncorrelated data) and the rejection of multicollinearity in the model, the analysis itself was conducted.
<table>
<thead>
<tr>
<th>Financing</th>
<th>Cooperation</th>
<th>Innovation</th>
<th>Expenditures</th>
<th>Firm Activities</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public funding from local or regional authorities (FUNLOC)</td>
<td>Cooperation arrangements on innovation activities (CO)</td>
<td>Introduced a new or significantly improved product into the market (INN_G)</td>
<td>Intramural R&amp;D (RRDIN)</td>
<td>Merge with or take over another enterprise (ENMRG)</td>
<td>The largest market in terms of turnover between 2010-2012 (LARMAR)</td>
</tr>
<tr>
<td>Public funding from the central government (FUNGMT)</td>
<td>Other enterprises within an enterprise group (COGP)</td>
<td>Introduced a new or significantly improved service into the market (INN_S)</td>
<td>Extramural R&amp;D (RRDEX)</td>
<td>Sell, close, or outsource some of the company’s tasks or functions (ENOUT)</td>
<td>Participation in a group of enterprises (GP)</td>
</tr>
<tr>
<td>Public financial support from the EU (FUNEU)</td>
<td>Suppliers of equipment, materials, components, or software (COSUP)</td>
<td>Introduced a new or significantly improved process into the market: method of production; logistic, delivery, or distribution system; supporting activities (INN_P)</td>
<td>Acquisition of machinery (RMAC)</td>
<td>Establish new subsidiaries in [home country] or in other European countries (ENNWEUR)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clients or customers (COCUS)</td>
<td>Acquisition of external knowledge (ROEK)</td>
<td></td>
<td>Establish new subsidiaries outside Europe (ENNWOTH)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Consultants and commercial labs (COCONS)</td>
<td></td>
<td>All other activities (ROTR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Competitors or other enterprises in the sector (COCOMP)</td>
<td></td>
<td>Total expenditures on innovation activities (RALL)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Universities or other higher education institutions (COUNI)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Government or public research institutes (COGOV)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Results of regression analyses in Croatia, Czech Republic and Hungary

In the first step, we analysed single effects of each determinant of innovation activities on firms’ innovation performance within the countries. Results in Table 2 show that determinants of innovation activities vary across countries because every country has different initial conditions and background for innovation activities.

Table 2 Comparison of determinants of innovation activities between the countries

<table>
<thead>
<tr>
<th></th>
<th>Croatia R=0.616;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Czech Rep. R=0.502;</td>
</tr>
<tr>
<td></td>
<td>Hungary R=0.985;</td>
</tr>
<tr>
<td></td>
<td>p=3.35E-11;</td>
</tr>
<tr>
<td></td>
<td>p=0.380;</td>
</tr>
<tr>
<td></td>
<td>p=0.970;</td>
</tr>
<tr>
<td></td>
<td>p=3.1E-05;</td>
</tr>
<tr>
<td>FUNGMT</td>
<td>0.117</td>
</tr>
<tr>
<td>FUNEU</td>
<td>-</td>
</tr>
<tr>
<td>COGP</td>
<td>-</td>
</tr>
<tr>
<td>COSUP</td>
<td>-</td>
</tr>
<tr>
<td>COCUS</td>
<td>0.035**</td>
</tr>
<tr>
<td>COCOMP</td>
<td>0.055*</td>
</tr>
<tr>
<td>COUNI</td>
<td>0.149</td>
</tr>
<tr>
<td>COGOV</td>
<td>0.128</td>
</tr>
<tr>
<td>INN G</td>
<td>-</td>
</tr>
<tr>
<td>INN S</td>
<td>-</td>
</tr>
<tr>
<td>INN P</td>
<td>-</td>
</tr>
<tr>
<td>RRDIN</td>
<td>0.825</td>
</tr>
<tr>
<td>RRDEX</td>
<td>0.569</td>
</tr>
<tr>
<td>RMAC</td>
<td>0.701</td>
</tr>
<tr>
<td>ROEK</td>
<td>0.653</td>
</tr>
<tr>
<td>ENMRG</td>
<td>0.482</td>
</tr>
<tr>
<td>ENOUT</td>
<td>0.000***</td>
</tr>
<tr>
<td>LARMAR</td>
<td>0.186</td>
</tr>
</tbody>
</table>

Legend: significant at P<0.1; ** significant at P<0.05; *** significant at P<0.01
Source: own calculations

In Croatia and in the Czech Republic, there is a lack of single effects on innovation performance determinants. Therefore, there is a need for proper combinations of selected determinants that could lead to the creation of more significant results affecting innovation performance. It is clear and it was empirically proved that innovations do not occur in isolation (Stejskal & Hajek, 2015; Stejskal et al., 2016; Prokop & Stejskal, 2016). The University-Industry cooperation within these countries was completely insignificant. On the other hand, Hungarian manufacturing firms, that focused on the determinants of innovation activities, significantly affected innovation performance independently (without further combinations of these determinants), also in the case of University-Industry cooperation, that significantly influenced firms’ innovation performance (0.008***).

In next section, we consequently analyzed combinations of determinants of innovation activities that could lead to the creation of synergies and spillover effects in every country.

Mutual effects of innovation performance determinants within selected countries

Firstly, we analysed firms’ situation in Croatian manufacturing industries and the effects of University-Industry cooperation on firms’ innovation performance. Results in Table 3 show, that firms in manufacturing industries in Croatia were able to significantly influence their innovation performance by using an appropriate cooperation partners (Universities and Public Research Institutes). In Croatia, as is shown in Table 1, the determinants of innovation activities did not influence firms’ innovation performance in isolation. Companies are not able to benefit from these determinants, and they consequently fail to increase their innovation output. On the other hand, companies that choose proper cooperation partners and other determinants of innovation activities (e.g., FUNLOC, FUNGMT, LARMAR, and
ENOOUT) significantly influenced their performance.

Table 3 Influence of University-Industry Cooperation on Innovation Performance in Croatia

<table>
<thead>
<tr>
<th>Universities (or Other Higher Education Institutions)</th>
<th>Public Research Institutes (or the Government)</th>
<th>Clients or Customers</th>
<th>Competitors (or Other Enterprises in the Sector)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FUNLOC 0.001***</td>
<td>0.380</td>
<td>0.006***</td>
<td>0.002***</td>
</tr>
<tr>
<td>FUNGMT 0.000***</td>
<td>0.004***</td>
<td>0.465</td>
<td>0.685</td>
</tr>
<tr>
<td>ENOUT 0.016**</td>
<td>0.020**</td>
<td>0.714</td>
<td>0.756</td>
</tr>
<tr>
<td>ENMRG 0.024**</td>
<td>0.022**</td>
<td>0.331</td>
<td>0.934</td>
</tr>
<tr>
<td>COGOV 0.029**</td>
<td>-</td>
<td>0.018***</td>
<td>0.645</td>
</tr>
<tr>
<td>COUNI -</td>
<td>0.029**</td>
<td>0.001***</td>
<td>0.765</td>
</tr>
<tr>
<td>COCUS 0.001***</td>
<td>0.018**</td>
<td>-</td>
<td>0.941</td>
</tr>
<tr>
<td>COCOMP 0.765</td>
<td>0.645</td>
<td>0.941</td>
<td>-</td>
</tr>
<tr>
<td>LARMAR 0.011**</td>
<td>0.008***</td>
<td>0.797</td>
<td>0.552</td>
</tr>
</tbody>
</table>

Legend: significant at P<0.1; ** significant at P<0.05; *** significant at P<0.01
Source: own calculations

In manufacturing industries in the Czech Republic, the situation was different (in comparison with Croatia) and firms were not able to succeed from the University-Industry cooperation. On the other hand, regression models showed creation of other advanced factors’ combinations and significant links influencing firms’ innovation performance. Largest market in terms of turnover (LARMAR), in combination with proper determinants, was proved as important determinant with influence on dependent variable.

Table 4 Advanced combinations of variables in the Czech Republic

<table>
<thead>
<tr>
<th>FUNEU* LARMAR</th>
<th>FUNEU* FUNGMT</th>
<th>LARMAR* FUNGMT</th>
<th>LARMAR* INN_S</th>
<th>FUNGMT* ENMRG</th>
</tr>
</thead>
<tbody>
<tr>
<td>INN P 0.029**</td>
<td>0.987</td>
<td>0.027**</td>
<td>0.040**</td>
<td>0.837</td>
</tr>
<tr>
<td>INN S 0.004**</td>
<td>0.411</td>
<td>0.025**</td>
<td>-</td>
<td>0.033**</td>
</tr>
<tr>
<td>CO 0.009***</td>
<td>0.282</td>
<td>0.543</td>
<td>0.653</td>
<td>0.110</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FUNEU* INN_S</th>
<th>LARMAR* ENMRG</th>
<th>ENMRG* INN_S</th>
<th>ENMRG* CO_UNI</th>
</tr>
</thead>
<tbody>
<tr>
<td>INN P 0.587</td>
<td>0.152</td>
<td>0.264</td>
<td>0.173</td>
</tr>
<tr>
<td>INN S -</td>
<td>0.076**</td>
<td>-</td>
<td>0.011**</td>
</tr>
<tr>
<td>CO 0.028**</td>
<td>0.003***</td>
<td>0.004***</td>
<td>-</td>
</tr>
</tbody>
</table>

Legend: significant at P<0.1; ** significant at P<0.05; *** significant at P<0.01
Source: own calculations
For example, public financial support from the EU was shown as insignificant in manufacturing industries in the Czech Republic (Table 2 – FUNEU: 0.532). On the other hand, in combination with LARMAR and with introduction of process innovation (INN_P), we found significant impact on innovation performance (Table 4 - FUNEU*LARMAR*INN_P: 0.029***). This is important finding, because, as we can see, there is an emerging inefficiency in provision of public financial support (both from national and European funds). For example, common combinations of national and European funds do not lead to creation of significant effects (Table 4 - FUNEU*FUNGMT*INN_P: 0.987; FUNEU*FUNGMT*CO: 0.282). To reach stronger results, involvement of cooperation is necessary (Table 4 - ENMRG*INN_S*CO: 0.004***; LARMAR*ENMRG*CO: 0.003***).

**Table 5 Advanced combinations of variables in Hungary**

<table>
<thead>
<tr>
<th>Global factors</th>
<th>Market orientation</th>
<th>European subsidies</th>
<th>National subsidies</th>
<th>Cooperation within groups of companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>European subsidies</td>
<td>0.003***</td>
<td>-</td>
<td>0.132</td>
<td>0.007***</td>
</tr>
<tr>
<td>National subsidies</td>
<td>0.005***</td>
<td>0.132</td>
<td>-</td>
<td>0.198</td>
</tr>
<tr>
<td>Services innovation</td>
<td>0.002***</td>
<td>0.002***</td>
<td>0.004***</td>
<td>0.001***</td>
</tr>
<tr>
<td>Goods innovation</td>
<td>0.004***</td>
<td>-</td>
<td>0.004***</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cooperation with suppliers</th>
<th>Innovation of goods</th>
<th>Cooperation with universities</th>
</tr>
</thead>
<tbody>
<tr>
<td>European subsidies</td>
<td>0.005</td>
<td>-</td>
</tr>
<tr>
<td>National subsidies</td>
<td>0.002***</td>
<td>0.004***</td>
</tr>
<tr>
<td>Services innovation</td>
<td>0.002***</td>
<td>0.003***</td>
</tr>
</tbody>
</table>

Legend: significant at P<0.1; ** significant at P<0.05; *** significant at P<0.01

Source: own calculations

In Hungary, proper market orientation, as well as in the Czech Republic, leads to creation of strong links influencing dependent variable (in all cases). It is the same for the innovation of services, most strongly in the case of cooperation within groups of companies. On the other hand, innovation of goods is significant only if it is well targeted on the proper market (0.004***), or supported by national funds (0.004***). University-Industry cooperation was insignificant in most cases.

Moreover, as we can see in Table 5, provision of public subsidies (national and/ or European) could be effective, but there is a need to find proper factors’ combinations. However, combination of national and European funds is not strong and significant (0.132). This seems to be a problem because most of collaborations (industry-industry; university-industry; university-government-industry) are supported from both national and European funds (in most cases, these combinations are required).

**Conclusion and practical implications**

Innovations play an important role in the process of gaining competitive advantage and economic growth of firms.
or countries. In the era of globalised knowledge economy, each economic entity is pushed to find new knowledge sources (collaboration partners) that will help them to share their knowledge, create knowledge spillovers and innovate. Universities play an important role in the process of cooperation because provide cheap source of new knowledge and ideas. On the other hand, universities and firms have different goals and aims and therefore cooperation with universities is not only effective. Therefore, we analysed different influence of University-Industry Cooperation on firms’ innovation performance within Croatia, Czech Republic and Hungary. Results confirmed our claim and showed that this kind of cooperation influence firms’ innovation activities differently within each country and is not always efficient. It is clear because finding of proper determinants of innovative activities (in general) represent a complex process lacking universal formula of which variables positively affect innovation creation and performance. Each country, firm and industry has different initial position at the market and individual innovation potential and ability to absorb foreign knowledge. For these reasons, we provide some practical implications for firms in manufacturing industries in each country (see Table 6) that could help them to innovate more efficiently.

Table 6 Practical implications

<table>
<thead>
<tr>
<th>Country</th>
<th>Practical implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Croatia</td>
<td>strengthening coop. with Universities and Public Research Institutes promote cooperation with clients, customers and competitors (Lead user theory: e.g. Von Hippel, 2005; Co-opetition theory: e.g. Gnyawali and Park, 2011)</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>support innovative activities and proper market orientation properly target public subsidies</td>
</tr>
<tr>
<td>Hungary</td>
<td>proper market orientation and support service innovation do not combine national and European subsidies</td>
</tr>
</tbody>
</table>

For future research, we plan to make consequent analyses within other European countries and also within other industries of national economies.

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The Spatial Structure of Productive Entrepreneurship in the Hungarian Economy

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Abstract
The purpose of this paper is to measure productive entrepreneurship in the Hungarian economy based on financial data of Hungarian firms. According to the recent literature we can distinguish a small proportion of economic actors which has the highest contribution to economic growth, employment and innovation in a given economy. This proportion of economic actors consists of ambitious entrepreneurs and firms with high growth potential. The concept of productive entrepreneurship emphasizes the quality of entrepreneurship instead of the quantity of the entrepreneurial activity. In our research we consider productive entrepreneurship as a result of the activity of an economic community, thus to catch the spatial structure we measure the productivity of the Hungarian firms on the location level. In our research concept the quality of the entrepreneurial activity, which depends on the local entrepreneurial ecosystem, leads to economic value creation. Using spatial econometric tools our results show that the productive entrepreneurship has a disperse spatial structure in the Hungarian economy. The spatially disperse structure strengthens our assumption, that the local entrepreneurial ecosystems do not generate spill-over effects in the economy, thus larger entrepreneurial ecosystems cannot be observed.

Keywords: High growth firms, Entrepreneurial ecosystems, Q-theory, Spatial econometrics

Introduction
In our research we suggest measures of productive entrepreneurship based on financial data of Hungarian firms, by which the quality of entrepreneurial activity can be approximated on the location level. The concept of productive entrepreneurship states that the high growth firms and ambitious entrepreneurs are those economic actors, who drive the economic performance of a given location. Thus productive entrepreneurship often considered identical with high growth potential.

A firm can become high growth via proper financial injections or it can exploit its growth potential via organic growth. The latter case implies that the firm operates in a vibrant environment, which can provide the proper support for the growth. If we use the location level as the basis of aggregation, we can see that the good performance of one high growth firm cannot dominate the performance of the local community. On the location level the productive entrepreneurship can be established only if a high proportion of the local firms have a high growth potential. That assumption implies that there is functioning local entrepreneurial ecosystem behind the high quality of the entrepreneurial activity.

The concept of entrepreneurial ecosystem is a new approach concerning the development of economic communities. This approach states that there are important
actors who can build a community around themselves by exploiting their growth potential. The growth potential allows the actors to continuously expand their activity and to generate spill-over effects, which help the local community to grow. This implies that the concept emphasizes the entrepreneur as an individual, and also the quality of entrepreneurship.

From the policy point of view there are many factors which can contribute to build up an entrepreneur-friendly, vibrant environment, which support those actors, who have high growth potential. So the task of the policy makers is to give incentives to the local community to build up those factors, which encourages entrepreneurship.

According to Stam (2015) the productive entrepreneurship is an output of the entrepreneurial ecosystems. If the quality of the entrepreneurial activity is high at a given location, it creates value for the whole economy. According to this approach we can separate three levels during the investigation of the productive entrepreneurship. The first level is the level of the entrepreneurs. On this level we can see the individual actors of an economic community, who try to establish productive entrepreneurship. These individuals work together to allocate the resources efficiently in the local community, thus they build up local ecosystems. These ecosystems can emerge in a spatial way or they can be borderless ecosystems, when some remote partners work together. In the latter case the local community benefits only from the spill-over effects of the remote partnerships. In our research we assume that the local and the remote partnerships determine the quality of the entrepreneurial activity of a given location. We do not investigate the individual entrepreneurs and the quality of the environment in which they operate.

We are more interested in the second stage, which is the output level. In this level we aggregate the performance of the individual entrepreneurs concerning the economic community. With the help of this approach we can measure the quality of entrepreneurship, allowing us to conclude, whether the economic community managed to establish productive entrepreneurship or not. In our research we compare the quantity and quality based measures of the entrepreneurial activity, and we find that where the quantity of entrepreneurial activity is high based on some measures concerning the number of firms, and employment, it does not mean that the quality of entrepreneurial activity is high. With the help of the quantity based measures some spill-over effects can be identified in the surroundings of bigger cities. We assume that these spill-over effects are based on some local externalities. We think that the entrepreneurs in bigger cities can access bigger markets, and support services, which provide them some economies of scale.

The third level is the outcome level. Regarding this level, we assume that if the quality of entrepreneurship is high then the local community can generate more value. We measure the value creation as the increase of invested capital. If the quality of the entrepreneurial activity is high, the propensity of the individual actors to invest is increasing. If the actors can invest efficiently, they will invest more, which improves the ability of the economic community to generate value.

In our research we use measures based on financial data of the Hungarian firms aggregated on the location level. Thus we define the economic community as the set of members of the local community. The quantity of the entrepreneurial activity is approximated
by the natural logarithm of the number of firms at a given location. We also use the logarithm of the average employment as a proxy measure for quantity. The quality of the activity of the local community is measured by the fundamental Q measure. The fundamental Q is approximated by the net sales per capital ratio of the firms. This ratio shows whether the firms have some profitable investment opportunities or not. This measure is based on the Q-theory of investment, which was introduced in the neoclassical investment theory. With the fundamental Q we try to measure the growth potential of the firms and we think this is a sufficiently good measure of the productive entrepreneurship. Concerning the value creation, we use the investment per capital ratio to measure the increase of the invested capital at a given location. The investment is proxied by the gross increase of the fixed assets of the firms.

To investigate the spillover effects generated by the local entrepreneurial ecosystems we use spatial econometric tools. To map the spatial structure of the productive entrepreneurship in the Hungarian economy we apply global and local Moran tests for the proxy measures. These tests allow us to observe the spatial heterogeneity of the proxy measures, by which we can catch the spillover effects of entrepreneurial activity and we can observe whether larger economic communities can be identified in the Hungarian economy.

Our results show that the productive entrepreneurship has a dispersed structure in Hungary. There are only isolated local communities which can establish productive entrepreneurship. This isolated structure can be a result of the dominance of remote partnerships or can be explained by the path dependency of the Hungarian industry. Further results show that in the case of bigger cities and its agglomeration the quantity of entrepreneurship is high. We assume that cities can attract entrepreneurs, because they can exploit some economies of scale in the cities.

The paper proceeds as follows. Section 2 introduces the theoretical background. Section 3 provides the description of the data and some summary statistics. Section 4 outlines the spatial econometric tests and Section 5 concludes the paper.

Theoretical background

The concept of productive entrepreneurship is based on the work of Baumol (1990) and emphasized by Mason–Brown (2013), who draw some attention for the topic. They observed that there is a small proportion of the firms, who contributes to the economic performance the most. These firms have a crucial role concerning the economic growth and the employment in the local economy (Stam et al. 2012, Brown-Lee (2014). These individual entrepreneurs can boost the local community and also can generate spillover effects concerning the surroundings of a given location (Mason 2009, Feldman 2005, Brown 2011).

In the conceptual model of Stam (2015), Stam–Spigel (2017) the productive entrepreneurship is an output of the activity of an economic community, which performance is driven by systemic and framework conditions of the environment in which the firms operate. On the output level of the conceptual model as a result concerning the activity of an economic community the entrepreneurial activity can be observed. The entrepreneurial activity can be measured by different quantity based measures concerning the entrepreneurial demography, but if we speak about productive entrepreneurship
as the desired output, we have to catch the growth potential of the local firms. According to the neoclassical investment theory firms have to decide to invest an additional capital till the expected marginal benefit equals the marginal cost of installing the additional capital (Gilchrist–Himmelberg 1995, Erickson-Whited 2000). In this model the capital investment depends on the growth potential of the firms, which is measured by the expected marginal benefit of the additional capital investment. Hayashi (1982) shows that the expected marginal benefit can be approximated by the Tobin Q measure in the case of publicly traded firms. Gilchrist–Himmelberg (1995) suggests the fundamental Q as a measure of the growth potential, which tries to estimate the growth opportunities of firms from financial fundamentals of the firm. The paper of LaRocca–LaRocca (2007) expand that concept by stating that the investment decisions depends not only on the growth potential of the firms, but also on the financial status. Some recently published paper also considers this approach as the basis of investigating investment decisions (Ryan et al. 2014, Andrén-Jankensgard 2015, Javakhadze–Ferris–French 2016). According to this approach in the presence of static expectations we can use the net sales per capital ratio as a proxy for the growth potential.

Although we do not investigate the systemic and framework conditions of the local environment, only the output is important for us, we have to see what is lying under the output of the local economic community. The development of the economic communities was investigated by Marshall (1890) and then the concept of innovation clusters was introduced by Porter (1998). The first ecosystem concept can be found in the paper of Moore (1993), in which the authors argued that there has to be a leader, who can build up an economic community via its innovation capacity. The concept of Moore is a lifecycle theory of the economic communities. The main difference between this approach and the innovation cluster approach is that the ecosystem approach is built up from the level of the individual entrepreneurs (Vogel 2013)

There are a lot of policy related work that tries to identify those factors, which play a crucial role in the development process of an economic community. According to this work policy makers have the task to provide incentives to encourage the economic communities to establish those factors to be able build up an entrepreneur-friendly environment (Isenberg 2010, 2011, Acs-Autio-Szerb 2014, Spigel 2015).

The ecosystem approach was summarized in the work of Stam (2015), who defined ecosystems as a set of interdependent actors and factors coordinated in such a way that they enable productive entrepreneurship. In this work we define the set of actors as the members of a local community, who operate in a given environment, which is influenced by different factors. We try to measure the output of these local communities, and their aggregate value creation.

Furthermore, we try to investigate whether these communities can generate spill-over effects in the local economy or not. To be able to accomplish our research objectives we employ spatial econometric tools, which helps us to measure the spatial dependence of the different proxy measures. For measuring spatial dependence the Moran I statistic\(^1\) is mostly applied in economic literature. The test statistic is defined as:

\(^1\) Descriptions are based on Varga (2002) and Tóth-Pajor-Farkas (2016).
\[ I = \frac{N}{S_0} \sum_{i,j} w_{ij} \frac{(x_i - \mu)(x_j - \mu)}{\sum_i (x_i - \mu)^2} \]

where \( N \) denotes the number of observations, \( S_0 \) is a normalization factor, \( w_{ij} \) are elements of the spatial weight matrices, \( x_i \) and \( x_j \) are the variables of interest and \( \mu \) is the expected value of \( x \).

If weight matrices are row standardized, a simpler form of the aforementioned index can be used as the following:

\[ I^* = \sum_{i,j} w_{ij} \frac{(x_i - \mu)(x_j - \mu)}{\sum_i (x_i - \mu)^2} \]

The values of the test statistics are contained by the \([-1; 1]\) interval, thus the results can be interpreted similarly as the correlation coefficient, but mathematically they are not the same. In the case of positive (negative) values we can infer approximately to positive (negative) spatial autocorrelation. If there exist a positive relation that means similar values of the variable of interest are spatially concentrated. From the other side negative values refer to a spatial assemblage of different values of the variable of interest.

In many cases not only an aggregated index as i.e. Moran’s I is the proper trait of spatial heterogeneity, but local indices can be employed (Anselin–Rey 1991, LaSage–Pace 2009). There is a local variant of Moran I as well as the aggregated index which is called Anselin’s Local Moran I, defined as:

\[ I_i = (x_i - \mu) \sum_{j} w_{ij}(x_j - \mu) \]

where \( I_i \) is the computed value of the Anselin’s Local Moran I of the \( i \)th observation. Furthermore, in the case of row standardized spatial weight matrices, the interpretation of Anselin’s Local Moran I is quite similar to Moran I. With the help of these spatial tests we can identify economic clusters based on the quantity and quality based measures of the entrepreneurial activity.

**Sample and descriptive statistics**

To measure productive entrepreneurship in the Hungarian economy we collected the financial data of firms from the Hungarian Spatial Information System (teir.hu). The financial data available in the Hungarian Spatial Information System is provided by National Tax and Customs Administration aggregated on the location level. The aggregated data of the financial reports was collected for the 2013-2014 financial years. The firms are assigned to a location according to their residency. Using the residency for the classification of the firms can cause some bias in the case of the investigations, because the firms can have other sites at other locations and we cannot be sure whether the firms operate at the location where they are resident or we should count their performance at the location of their sites. For example, in the case of quantity based measures of entrepreneurial activity the firms tend to choose residency considering tax optimization goals. If a location offers lower local taxes in Hungary, the number of firms can increase at that location, but it is not sure that those firms generate their value added at that location.

In 2016 the Hungarian Central Statistical Office registered 3155 settlements in Hungary. In the 2013-2014 financial year we found 2709 settlements in the Spatial Information System, where
firms were registered, which is the 86% of the settlements. Some bias can come from the change of settlement structure in Hungary, but we tried to eliminate such kind of biases. So at the end we had aggregated data for 2709 locations concerning the 2013-2014 financial years.

Our suggested measures are mainly originated from the different rows of the financial reports and can be classified into two groups. There are measures of the quantity of entrepreneurial activity, and there are some for the quality of entrepreneurial activity. In the case of the quantity based measures, we use the natural logarithm of the number of firms at a given location, and the natural logarithm of the average employment at a given location. We calculated the natural logarithm of the different quantity based measures to eliminate the problem of the extreme values. For example, concerning the quantity based measures the capital city Budapest has highly extreme values.

Regarding the quality based measures, we suggest two measures, but they can be attributed to the different levels of the ecosystem approach. The first measure is the net sales per capital ratio, which is used as proxy for growth potential of the firms. This ratio catches the notion of productive entrepreneurship. The second ratio is the investment per capital ratio, which catches the aggregate value creation of the given location.

Because of the use of ratios as the quality based measures we also have to handle the problem of the extreme values. We chose to winsorize these two ratios at the 97.5 percentile level (Dixon, 1960).

Table 1. shows the descriptive statistics about the entrepreneurial activity measures in 2014. In the case of the number of firms, there are some bigger cities, where there are many resident firms, but the most of the settlements has just a few of them. In the case of the quantity based measures the right tail of the distribution is longer, a positive skewness can be observed, thus we had to deal with the extreme values. In the case of the net sales per capital ratio we can see, that on average the capital investments are efficient at the locations, so they have some growth potential. The investment per capital ratio shows that most of the locations can attract capital in some extent.

In the next section we investigate whether the locations can generate some spill-over effect in the local economy.

**Empirical results and implications**

To test the spill-over effects of the entrepreneurial activity we use spatial econometric tools. The spatial heterogeneity can be tested with the global

<table>
<thead>
<tr>
<th>Measures</th>
<th>N</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Q1</th>
<th>Median</th>
<th>Q3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of firms</td>
<td>2709</td>
<td>208.7</td>
<td>5918</td>
<td>7</td>
<td>17</td>
<td>45</td>
</tr>
<tr>
<td>Average employment</td>
<td>2709</td>
<td>1165</td>
<td>33440</td>
<td>18</td>
<td>58</td>
<td>190</td>
</tr>
<tr>
<td>Net sales per capital</td>
<td>2709</td>
<td>1.366</td>
<td>0.9505</td>
<td>0.7301</td>
<td>1.159</td>
<td>1.715</td>
</tr>
<tr>
<td>Investment per capital</td>
<td>2709</td>
<td>0.1642</td>
<td>0.2078</td>
<td>0.0642</td>
<td>0.1266</td>
<td>0.2110</td>
</tr>
</tbody>
</table>
Moran I tests of spatial autocorrelation. The results show that if we investigate the entrepreneurial activity with quantity based measures we can find some clusters in the economy where the number of firms or the average employment is greater in the local economy compared to the other parts of the country. On the other hand, if we try to measure the entrepreneurial activity with quality based proxies, we do not find convincing evidence that there are some clusters in the economy where entrepreneurship is more productive compared to the other locations. Thus we can draw the conclusion that the productive entrepreneurship has a dispersed spatial structure in the Hungarian economy.

Table 2: Results of Local Moran I statistic

<table>
<thead>
<tr>
<th>Variable name</th>
<th>Moran I</th>
<th>Expected Value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logarithm of number of firms</td>
<td>0.464025</td>
<td>-0.000369</td>
<td>0.0000</td>
</tr>
<tr>
<td>Logarithm of average employment</td>
<td>0.332714</td>
<td>-0.000369</td>
<td>0.0000</td>
</tr>
<tr>
<td>Net sales per capital</td>
<td>0.038623</td>
<td>-0.000369</td>
<td>0.0008</td>
</tr>
<tr>
<td>Investment per capital</td>
<td>0.004521</td>
<td>-0.000369</td>
<td>0.6748</td>
</tr>
</tbody>
</table>

From the results we can see that the quantity of entrepreneurship has a clustered spatial structure in the economy. To dig deeper in the results we can decompose the global Moran I tests and we can find those clusters in the economy. For that purpose, we can use the local Moran I test, which is the decomposition of the global test. The local Moran I test gives a value to every location. If the value of the test is high, then we can see that the location is surrounded by locations with similar high values.

Figure 1: The local Moran I test results for the logarithm of number of firms in 2014
Figure 1. shows the spatial structure of the logarithm of the number of firms. The black locations denoted with HH (High-high) shows those clusters of the economy where the number of firms is high. Typically, the bigger cities and the central region with the capital city in the middle can build up such kind of clusters. We can identify Budapest, Győr, Székesfehérvár, Sopron, Pécs, Szeged, Nyíregyháza as those cities, which can attract firms. Thus we draw the conclusion that the bigger cities and their agglomeration explain the clustered spatial structure of entrepreneurial activity based on the quantitative measures.

Figure 2: The local Moran I test results for the logarithm of average employment in 2014

Figure 2. shows the same results, but we used the average employment as the quantity based measure. The average employment shows the aggregated number of employees at a given location.

Based on the results of the quantity based measures we assume that the urbanization externalities can play an important role in the process in which the number of firms increasing around the bigger cities. The access to bigger markets, the availability of the support services makes the life of a firm much more easy in the cities.

On the other hand, we found that the high quantity of firms does not mean that productive entrepreneurship was established at the given location. We could not find such location clusters in the economy, which are based on growth potential or value creation. Thus we can state that there are some isolated locations where productive entrepreneurship was established, but we cannot observe larger economic communities based on the quality of the entrepreneurial activity.

Conclusion

In our research we suggested measures of productive entrepreneurship based on the financial data of Hungarian firms. The concept of productive entrepreneurship emphasizes the quality of entrepreneurial
activity, which is often considered identical with the growth potential of firms. The productive entrepreneurship is the desired output of an entrepreneurial ecosystem. In our ecosystem framework, the set of independent actors is defined as the member of a local community, thus we try to measure the quantity and quality of the entrepreneurial activity at a given location. If productive entrepreneurship was established at a given location, it can generate spill-over effects and thus it can build a larger ecosystem in the local economy.

To be able to catch these spill-over effects, we used different tests of spatial dependence concerning the proxy variables of the entrepreneurial activity. The results of the tests show that we can observe spatial dependence in the case of quantity based measures like in the case of the logarithm of the number of firms and average employment. The quantity based spatial dependence is attributed to the bigger cities and their agglomeration, which can provide access to larger markets and support services for the firms.

In the case of the quality based measures the Hungarian economy has a dispersed spatial structure. There are only some isolated locations, where the local community managed to establish productive entrepreneurship. The explanation of this structure can be based on the dominance of the remote partnerships and the borderless entrepreneurial ecosystems. If the local high growth firms do not have dominant position in the local community, then we cannot catch the spill-over effects of the productive entrepreneurship. The growth potential of the high growth firms can also come from financial injections, which means that the high growth firms appears in the local community in an isolated way. The other explanation of the dispersed structure can be based on the path dependency of the Hungarian industry. In that case those locations can establish productive entrepreneurship, where some foreign direct investment was made. Testing these explanations is the part of our future research directions.

To summarize our findings, we can draw the conclusion that the productive entrepreneurship is a desired output of the entrepreneurial activity at a given location. In Hungary the dispersed structure shows that the desired output is missing. Thus the policy makers have the task to establish such an environment for the entrepreneurs, which supports the dominance of productive entrepreneurship in the local communities.

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Is it spinning in Hungary?
The comparative analysis of Hungarian spin-offs in the centre and rural regions

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Abstract
The current study describes the past, present and possible future trajectories of Hungarian spin-offs in a comprehensive way. The main question of the article is whether it is possible to form a strong relationship between market and academic participants. In order to support this relationship the role of universities must undergo a transformation, economic functions and the processes of delivering scientific results to the market must be integrated into it. The creation of a standardized technology transfer process requires the cooperation of the central and peripheral regions, furthermore the quantity and quality of the capital and competence plays a crucial role as well. That is the reason why in this study we examined the spin-offs of Budapest, Debrecen, Szeged and Pécs with regards to the macroeconomic factors affecting these companies.

Keywords: techtransfer, spin-off, Hungary, capital-rural connection, past, present, opportunities

Introduction
This article describes the past, present and possible future trajectories of Hungarian spin-offs in a comprehensive way. The topic has huge relevance and actuality as nowadays it has been emphasized not only by the participants of higher education but also – especially since 2014 - by the government. These efforts provide us a promising picture about the Hungarian R&D and innovation and more particularly about the spin-offs. The shift in the governments’ strategy plays an important role in these positive prospects, the Act LXXVI of 2014 represents the governments’ recognition that building on R&D and innovation leads to a more stable and sustainable social and economic system. This legislations’ objective is to increase the competitiveness of companies, and in the same time to contribute to job creation. The task of the government is embodied in the creation of the related strategy and in the establishment of the connected research centres. This way the government provides incentives and assistance for researchers in the international utilization of their results. The Act LXXVI of 2014 supplemented the Act XXXIV of 2004 that aimed the development of small and medium-sized enterprises (SMEs). The goal of the government is to involve the SMEs in R&D activities and in order to endorse this concept the government provides various tender opportunities. The strategic shift is combined with the promotion of the participation in the tendering environment. For Hungarian spin-offs there are two main forms of receiving financial support; the National Research, Development and Innovation Fund (NRDI Fund) and the funds provided by the European Union. Amongst these agendas we will put emphasis on the 7th framework program as
in this program SMEs and the cooperation of higher educations’ institutions and other research centres plays a major role.

In 2014 the 2007-2013 cycle ended and its effects were examined by NRDI Office. The Office published a few unfavourable results as well where the R&D tender could not reach its original goal, mostly because they had failed to bring any novelty or they could not be utilized on the market. Hungary ranked 16th with its 1500 completed tenders and 278 billion Euro revenues. The current goal is to create a standardized and transparent tender system in the field of research, development and innovation that can be implemented via strict and professional supervision. The current and active spin-offs – with the experiences of the previous 7-year cycle and by learning from its mistakes – can undertake the 2014-2020 tendering program. Spin-offs have an advantage as the framework program puts special emphasis on the universities and on those research centres that are going to utilize their research result on the market. The following 4 tenders under the framework of Economic Development and Innovation Operational Programme (GINOP) could be in the focus of tendering spin-offs:

- **GINOP_2.2.1-15** *(cooperation for R&D competitiveness and excellence)*: Tender invitation for enterprises and research institutions. Its objective is to strengthen the cooperation of domestic enterprises, research centres and higher education institutions in order to facilitate the creation of scientific results with the prospects of business utilization. Depending on the subject of the tender the government provides non-refundable subsidy between 350 million HUF and 2000 million HUF.

- **GINOP_2.1.5-15** *(Building of innovation ecosystem)*: The objective of the tender is to support domestic researchers, the innovation ecosystems’ seed-stage related participants (mainly startups and spin-offs). This way the international recognition of Hungarian researchers can be improved and also the existing knowledge can be supported which prevents researchers to carry on and utilize their researches abroad. The government provides non-refundable subsidy between 300 million HUF and 600 million HUF for those organizations that meet the imposed requirements.

- **GINOP_2.1.3-15** *(„Intellectual property rights”)*: The possible applicants are micro, small and medium-sized enterprises, budgetary organizations, institutions of budgetary organizations with legal entity and non-profit economic organizations with legal entities. The objective is to support Hungarian intellectual properties. The government provides non-refundable subsidy between 1 million HUF and 6 million HUF in order to enhance the contribution of these organizations to the innovation system, hence economic development.

- **GINOP_2.3.2-15** *(Excellence of strategic R&D centres)*: The objective is the convergence to international level. The possible candidates are government backed research centres, institutions of higher education and non-profit organizations with the government as the majority shareholder.
The government provides non-refundable subsidy between 500 million HUF and 1500 million HUF. By strengthening the R&D capacities of domestic knowledge bases, scientific results with international cognisance can be achieved. Spin-off enterprises are able to facilitate the convergence of Hungarian economy to the EU standards alongside the support of scientific progress.

The four tenders above have different evaluation periods and also differ in the amount of subsidy but the primary objective of the government is the same in all cases; the support of research, development and innovation activities in order to increase their intensity. This way innovative enterprises can start their operation, new products can be delivered to the market and they can also spur job creation.

**Literature review**

In order to present a comprehensive analysis of spin-offs it is inevitable to introduce their theoretical background. At first it is important to define what the technology-transfer process is. In the past several definitions were formulated, we consider the definition of Roessner (2000) as a global basis. The core of his definition is the technology and the transfer of technology carried out between the academic and market sector. In this process the technologies, skills, procedures and expertise are transferred from research institutions, universities to government institutions or to private firms. The result of this process is that the participants are able to generate economic value and industry development. He considers the technical competence and know-how as the subject of the process alongside the technology. This transfer process between the sectors can be implemented via formal and informal channels. The formal ways are training and education while the informal channels are publications, conferences or even the friendly conversations of researchers. It is important to point out, that it is a common feature of the various definitions that the subject of the techtransfer is the intangible human knowledge as well as the tangible product itself. This nature of the technology implicates that it is very hard to measure it in a standardized way and this is the biggest hindrance in its market sale. It is impossible to determine its exact market value, even a rough estimation of it could help in the market utilization of a technology. In the context of our research the formal channels play an important role as the cooperation of academic and market participants evolves in this process hence spin-offs are created (Roessner, 2000).

Feldmans’ approach of the topic points out, that the formal and informal transfers do not operate separately and opposed to each other, instead they are in a supplementary relationship. That is the reason why the creation of spin-offs requires knowledge and technology transfer at the same time and they cannot be separated (Novotny, 2010).

It is very hard (if not impossible) to define the spin-offs unambiguously although there are numerous attempts to describe this type of enterprises. There is not a generally accepted definition, but in the different approaches it is common that they position these enterprises between two extremes so there is a broader and a narrower interpretation of spin-offs. The broader interpretation describes spin-offs as enterprises that founders are exclusively or partially university lecturers, researchers or even the students who utilize knowledge
created in the university by founding enterprises regardless of the relationship of the new enterprise and the parent institution. Furthermore this broader interpretation does not require that the founders must leave the parent institution which means that there are no restrictions in this definition with regards to the legal relationship of founders and the parent institution. On the other hand the narrower definition requires the legal relationship between the founders and the university and also between the new enterprise and the parent institution but similarly to the broader interpretation the subject of the transfer is the technology that was created in the university (Makra, 2013).

A generally accepted uniform definition would be the basis of an international comparative analysis so the OECD also attempted to provide a consensual interpretation. In this approach it is an important criterion that the funding is provided by a public financed institution, furthermore, one of the following 4 criteria must stand:

- „Any new enterprise is considered to be a spin-off that was founded by the employee of a university or a public funded research institute.
- Any new enterprise is considered to be a spin-off that obtained technology from a university or other public funded research institute via licencing procedure.
- Any new enterprise is considered to be a spin-off where a university or other public funded research institute is a shareholder.
- Any new enterprise is considered to be a spin-off that was founded by a university or other public funded research institute (Molnár, 2008, 150).”

The Hungarian legislation gives a narrower interpretation for spin-offs in accordance to the OECD definition. Act CXXXIV of 2004 about research and development and technology innovation requires the ownership in the utilizing enterprise. In this sense the utilizing enterprise is a business that exploits research result that derives from budgetary institutions with the aim of gaining business benefits (Antoni, 2011).

The formation of spin-offs is not a recent economic phenomenon; there are examples for these enterprises since the 1920s, such as the Volvo, the car factory of a Swedish ball-bearing company. Following that, the issue of university spin-offs became more and more important all around the world not only for researchers but also for policy makers. As in most countries, scientific researches and developments are funded at least partially by the state it was in the interest of the state to incentives the formation of spin-offs (Gazdig, 2008).

In the United States this new form of enterprises appeared in the 1970s. In the beginning the universities entering the field were highly prestigious substantially supported institutions such as MIT (Massachusetts Institute of Technology) or Stanford.

Although there are famous researchers, prestigious universities with internationally acknowledged inventions and technologies in Europe as well, the segment of spin-offs enterprises is in a less developed stage. Despite the first spin-offs appeared in Europe as well there occurrence was rare and probably as a result of their low acknowledgment they did not have such an effect as the spin-offs created by MIT. Their dispersal on the other hand was enhanced by the increasing role of innovative SMEs, more particularly by the fact that they were able to carry out
new and risky projects with less cost. The real breakthrough in Europe was in the 1990s, when the intention of utilizing the results of state backed research institutes on the market strengthened. The number of spin-offs increased significantly as a result of the growing attention of the governments. The parent institutes in state ownership put more and more efforts into implementing these processes. The reason of the increasing support of governments is probably the recognition of the business potential in these new enterprises (Papanek, & Perényi, 2006).

We already know that the regional environment plays a crucial role in case of spin-offs in their early stages when they deliver their products to the market. A fundamental question is how the limitations imposed by the given regions’ state of development affects the development of universities. On the other hand it is also important that how much is the contribution of these universities to the development of their regions. In this context the innovation strategy of the universities plays a central role (Polónyi, 2005).

Furthermore the available venture capital in the region could be a great advantage in the early stages of the spin-off process. Overall, the formation of spin-off enterprises depends on the regional characteristics with regards to the available social capital, funding prospects, the presence of regional incubators, public funding of R&D and the regional innovation performance.

The effects of spin-offs appear in two ways in the regions’ economy; there are direct and indirect effects. The opinions of 3-3 researchers can be associated with both direct and indirect effects. The direct effects represented by Etzkowitz, Dahrlstrand and Fedman. Based on Etzkowitz spin-offs implicate higher salary and increased entrepreneurial appetite. According to Dahrlstrand spin-offs connect technologies and market sector via funding and marketing networks. Fedman believes that a strong relationship evolves between spin-offs and their parent institutions. Wood, Lawton-Smith and Porter focused on the indirect effects of spin-offs. They emphasised that the competence of spin-offs appear in the other enterprises of the region and could become the basis of technology clusters. In addition to this Porter states that spin-offs require the in-depth and widespread innovation of the infrastructure. These two effects appear different ways in the central and peripheral regions’ economy. These regions differ mainly in terms of the quantity and quality of the competence and capital. The United States can be viewed as the central region where both the direct and indirect effects of spin-offs are considered as the main sources of regional level economic development. Both effects played a substantial role in the enhancement of the growth of successful regions as they contributed greatly to the appearance of new industries and in delivering new and fundamental technologies to the market quickly that led to the growth of job creation that is an important feature of spin-offs. Via their indirect effects spin-offs are able to contribute to the increase of local productivity stimulating the regional economy. The peripheries on the other hand showed different tendencies. The economic development of the less developed regions is influenced by numerous factors and the founded university spin-offs do not result in reverberating successes. Although there are support for these companies, spin-offs in these regions not necessarily lead to successful products and profit. In these cases the support of spin-offs, contrary to its original goals, affects the local economy negatively. Such situations occur when
researchers put efforts into developing wrong technologies and the attempt of delivering these technologies to the market leads imminently to failure hence they are not able to generate revenues for their parent institutions. On the other hand even in the less developed regions there are universities with substantial resources that are able to compensate partially these negative effects. Such example is the University of Newcastle that shows the positive effects of central regions by spurring the regional economic development through the direct and indirect effects of spin-offs (Lengyel, 2012).

There is a network of the given regions and universities in Hungary as well. The geographical location of the university influences significantly the parent institute in the formation of its innovation strategy. Such conspicuous examples are the development of the capital city and the Northern Great Plain. The innovation linkages of the capital city provide a much larger scale of opportunities (Polónyi, 2005).

Based on these evidences we conclude that it is not enough to analyse the different regions according to their categorization on the basis of their development. It is possible that in the central regions there are universities with insufficient resources but on the other hand even in less developed regions there might be universities with substantial resources and with the adequate methods to utilize these resources. This local environment provides the framework of the evolution, persistence and success of the spin-off process. On the foundations of a proper institutional environment the linkage of the market and academic sector could become a complex funding method that in the future can lead to the formation of successful spin-offs.

Methodology

As a first step we state that we are going to use the broader definition of spin-offs, where this term refers to such new enterprises that founders are exclusively or partially university lecturers, researchers or even the students who utilize knowledge created in the university by founding enterprises regardless of the relationship of the new enterprise and the parent institution. Furthermore this broader interpretation does not require that the founders leave the parent institution which means that they do not have to be independent in the new company.

Our goal is to analyse spin-off enterprises concentrated around four focal points based on different aspects. Our hypothesis is that spin-offs founded in the capital city have an advantage compared to their rural counterparts in terms of their creation, survival and development. At the same time we present the strong attempts of rural spin-offs crowned with different successes in the different regions. In addition to this we present the macroeconomic factors that influence the four cities differently.

These are the foundations of the analytical part of the study that is a comparative analyse from new angles. Our methodology builds from two parts; an analytical and a comparative part. We determined seven categories that was the basis of the analyses of the 44 companies which were:

- Geographic location of spin-offs
- Year of foundation and in connection to this their current status
- Main field of activity of the companies
- Number of employees by the cities
- Total revenues of the companies and their change
• Balance sheet earnings of the companies and their change
• The course of the ROE ratio of spin-offs

We have chosen these categories and their order deliberately. As our main purposes was to present the differences of spin-offs in the capital and rural cities and on the other hand to show the effects of macroeconomic factors. At first we put emphasis on their geographic location. With regards to their location we examined their year of foundation and their current status. The main field of activity and the number of employees strengthen that there are differences between the cities. At the end we measured the success of the enterprises on the basis of their revenues, balance sheet earnings and their profitability represented by the return on equity (earnings after taxation/total equity) ratio. The data of questionnaires is available up to 2011 so we supplemented this with our own data gathering to date. Based on these data updated to 2015 we compared the regions and made our conclusions. The data of the spin-offs was gathered from their financial reports. The results of the analysis are presented in the forms of diagrams and tables as well. The distribution of the companies by the different aspects is presented by pie charts, but in the grouping and comparison of the data we decided that the tables will present the result more adequately. Overall, we made our conclusions first by cities, than by synthesising these results on company level based on the seven categories above.

Database

The main question of the article is that how efficiently Hungary is able to formulate the development of technology transfer processes with the resources at its disposal. In other words the question is whether it is possible to form a strong relationship between market and academic participants. In order to support this relationship the role of universities must undergo a transformation and economic functions and the processes of delivering scientific results to the market must be integrated into it.

This question can be examined from two perspectives. First, the relationship of the centre and periphery must be investigated. Obviously in Hungary Budapest functions as centre while the periphery is represented by three rural cities by our choice; Debrecen, Szeged and Pécs. At the same time it is necessary to examine the macroeconomic factors that affect these four cities alike in order to provide an overall economic analysis. Within these factors the two most important events are the economic crisis of 2008 and the Act LXXVI of 2014 that became effective two years ago. We carried out our research on this basis by analysing 44 spin-off enterprises; 14 located in Budapest, 11 in Debrecen, 13 in Szeged and 6 in Pécs, continuing a previous research led by Zsolt Makra (Becsky-Nagy – Erdős 2012, Becsky-Nagy 2013, Becsky-Nagy et al. 2013).

First it is sensible to examine the enterprises separately based on their geographical location, after that we can make general conclusions about all the spin-offs included in the analysis. In the first step we present in separate tables the spin-offs of the four cities that were in the questionnaires and were discovered in our own primer research in the time order of their foundation.

In the context of Budapest we can conclude that 2007 and 2009 were the two outstanding years in the creation of spin-offs. Within the sample the enterprises founded in 2007 represent 27.3% while the
The proportion of the enterprises founded in 2009 is 18.2% besides the other years 9.1%. However, on the basis of current data 2007 loses from its weight as TactoLogic and Agernon Ezeregy Kutatás that were founded in 2007 are in the process of winding up, but their existing data is included in our analysis. Apart from these companies all the other companies in Budapest (Table 1) are still active. Furthermore, 3 more enterprises were registered since this survey. One of them is the Tresorit founded in 2011 by the students of Budapest University of Technology and Economics with approximately 24.5 million HUF subscribed capital that proved to be a huge success. The second is the OptoForce with the Pázmány Péter Catholic University as a parent institute. The company was founded in 2012 with – compared to the previous company a much lesser amount of - 3 million HUF subscribed capital. The third company is VirtDB founded in 2016 that alleviates the data searching in business intelligence systems. Overall the spin-off sample of the questionnaire was expanded with these 3 newly founded enterprises while the TactoLogic and the Agernon Ezeregy Kutatás were excluded.

As indicative information we can mention that from 2013 Immunal continued its operation under the name of Culveit, while since 2016 the name of Icegel is Smart Office Service.

Table 1: The Budapest based spin-offs of the questionnaire and our own research

<table>
<thead>
<tr>
<th>Budapest</th>
<th>Year of foundation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immunal / Culveit</td>
<td>1993</td>
</tr>
<tr>
<td>Pannon Szoftver</td>
<td>2000</td>
</tr>
<tr>
<td>Search-Lab</td>
<td>2002</td>
</tr>
<tr>
<td>ANTE Innovaative Technologies</td>
<td>2005</td>
</tr>
<tr>
<td>Icegel / Smart Office Service</td>
<td>2006</td>
</tr>
<tr>
<td>TactoLogic</td>
<td>2007</td>
</tr>
<tr>
<td>Anxiofit</td>
<td>2007</td>
</tr>
<tr>
<td>Algernon Ezeregy Kutatás</td>
<td>2007</td>
</tr>
<tr>
<td>Surgeonish</td>
<td>2008</td>
</tr>
<tr>
<td>Maven Seven</td>
<td>2009</td>
</tr>
<tr>
<td>Streamnovation</td>
<td>2009</td>
</tr>
<tr>
<td>Tresorit</td>
<td>2011</td>
</tr>
<tr>
<td>OptoForce</td>
<td>2012</td>
</tr>
<tr>
<td>VirtDb</td>
<td>2016</td>
</tr>
</tbody>
</table>

Source: own compilation based on Becsky–Nagy –Erdős (2012) and our own research

Table 2 contains the spin-offs of Debrecen. Similarly to Budapest there were 2 outstanding years in Debrecen as well; 2006 and 2007. The proportion of enterprises founded in 2006 was 57.4%, in 2007 it was 28.6% while in the other years it was 14.3%. Within the above listed companies Ave-Fon and Inno-Tears ceased to operate without successor and Biomer is currently in the process of liquidation but there were available data about them for 2015 that are included in our analysis. In our research we discovered 5 more Debrecen based spin-offs that were not included in the questionnaire but 2 of these enterprises have been removed from the trade register; one is DENEX that pursued its operation in Nyiregyháza with the University of Debrecen as parent institute and was represented amongst the companies founded in 2005, the other one is Microimmun founded in 2007. In
addition to this Biomer and Inno-Tears was presented amongst the companies founded in 2006 up to 2014. Furthermore Cívis FIT founded the latest in 2009 also included with its 10 million HUF subscribed capital. As indicative information we can mention that since 2014 Astrid Research has continued its operation as Larkbio.

Contrary to the previous cities in case of Szeged we can mention 5 years that stand out; from 2004 to 2008 2-2 spin-offs were founded year after year representing 25% of the sample. All 9 companies included in the questionnaire are still active (Table 3). In addition to these companies we found 4 more enterprises in the registration where data was available. Two companies were founded with significantly different subscribed capital in 2005 that are Nanocolltech and Tonosoft. Furthermore we included in our research CE Optics founded in 2007 and Hobré Laser Technology founded in 2013. In case of Szegeds’ spin-off we might also mention as indicative information that since 2014 Traumart has been operating as Smart Dental and the name of KPS Diagnosztika Szolgáltató changed to Oncompass Medicine. So the existing 9 membered list of spin-offs were extended with 4 more enterprises.

Eventually we examined the spin-off activity of Pécs that showed outstanding performance in the Transdanubian region. We can observe one outlier year in Pécs as the 2 companies founded in 2008 represents 40% of the sample. From the registered 3 companies 1 was founded in 2005 while the others were founded much earlier in 1994 and 1998. All of the 5 companies registered in the questionnaire are still currently active (Table 4). Furthermore one year ago the University of Pécs announced a new spin-off; Humeltis was founded with 4 million HUF subscribed capital in

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**Table 2: The Debrecen based spin-offs of the questionnaire and our own research**

<table>
<thead>
<tr>
<th>Company</th>
<th>Year of foundation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neuron Szoftver</td>
<td>1998</td>
</tr>
<tr>
<td>Astrid Research/Larkbio</td>
<td>2004</td>
</tr>
<tr>
<td>DENEX</td>
<td>2005</td>
</tr>
<tr>
<td>Biomer</td>
<td>2006</td>
</tr>
<tr>
<td>Inno-Tears</td>
<td>2006</td>
</tr>
<tr>
<td>Cetox</td>
<td>2006</td>
</tr>
<tr>
<td>Ave-Fon</td>
<td>2006</td>
</tr>
<tr>
<td>Microimmun</td>
<td>2007</td>
</tr>
<tr>
<td>UD-GenoMed Medical Genomic Technologies</td>
<td>2007</td>
</tr>
<tr>
<td>Bionanoferm</td>
<td>2008</td>
</tr>
<tr>
<td>Cívis FIT</td>
<td>2009</td>
</tr>
</tbody>
</table>

Source: own compilation based on Becsky−Nagy–Erdős (2012) and our own research

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**Table 3: The Szeged based spin-offs of the questionnaire and our own research**

<table>
<thead>
<tr>
<th>Company</th>
<th>Year of foundation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optin</td>
<td>1999</td>
</tr>
<tr>
<td>KPS / Oncompass Medicine</td>
<td>2003</td>
</tr>
<tr>
<td>TKM Consult</td>
<td>2004</td>
</tr>
<tr>
<td>Hilase</td>
<td>2004</td>
</tr>
<tr>
<td>Nanocolltech</td>
<td>2005</td>
</tr>
<tr>
<td>Tonosoft</td>
<td>2005</td>
</tr>
<tr>
<td>DFC Biotechnology</td>
<td>2006</td>
</tr>
<tr>
<td>Aivicoor</td>
<td>2006</td>
</tr>
<tr>
<td>CE Optics</td>
<td>2007</td>
</tr>
<tr>
<td>InnoGeo</td>
<td>2007</td>
</tr>
<tr>
<td>Traumart / Smart Dental</td>
<td>2008</td>
</tr>
<tr>
<td>SNW SYSTEMS</td>
<td>2008</td>
</tr>
<tr>
<td>Hobré Laser Technology</td>
<td>2013</td>
</tr>
</tbody>
</table>

Source: own compilation based on Becsky−Nagy–Erdős (2012) and our own research
2014. The importance of 2008 in terms of spin-off activity is confirmed by the fact that in that year in Veszprém (which is approximately 160 km from Pécs) 2 spin-offs were founded that are still currently active. One of them is Ökoret Spin-off with the main activity of engineering, the other is Pannon Bio Innovációs with the main activity of biotechnological R&D.

Table 4: The Pécs based spin-offs of the questionnaire and our own research

<table>
<thead>
<tr>
<th>Company</th>
<th>Year of foundation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hisztopatológia</td>
<td>1994</td>
</tr>
<tr>
<td>Immunochem</td>
<td>1998</td>
</tr>
<tr>
<td>B2AM</td>
<td>2005</td>
</tr>
<tr>
<td>Kistelegdi 2008</td>
<td>2008</td>
</tr>
<tr>
<td>Pharminvivo</td>
<td>2008</td>
</tr>
<tr>
<td>Humeltis</td>
<td>2014</td>
</tr>
</tbody>
</table>

Source: own compilation based on Becsky–Nagy–Erdős (2012) and our own research

Findings and results

Overall, the following conclusions were made based on these 44 enterprises which of 31 were included in the previous questionnaire and 13 were discovered in our research. In the early periods, in the 90s 5 enterprises were already founded but this new phenomenon on the market had also negative effects hence in the 2000-2004 period only 6 enterprises were founded. 2005 was a breakthrough after this period when 5 companies were founded and as a result the spin-off process has started in these cities. The Act CXXXIV of 2004 obviously had a spurring effect on the industry that resulted in the utilization of research results and the connected intellectual properties by alleviating the formation and operation of innovative enterprises. The ‘golden age’ of spin-offs was between 2006 and 2008 when 20 spinning off processes were carried out. The negative effects of the economic crisis in 2008 could be observed in the field of spin-offs as well, the number of newly founded spin-offs decreased and the survival of the already existing enterprises were doubtful. The slow recovery of the economy and the formation of spin-offs moved in parallel ways. This could explain that only 8 out of the total 44 enterprises were founded in the 2009-2016 period dominated by the 5 enterprises founded in Budapest.

By examining the tendency of the formation of rural and capital city based spin-offs we can observe differences. In Budapest after the 2008 crisis 2 companies were founded in 2009 followed by the formation of 1-1 companies in 2011, 2012 and 2016. On the other hand rural spinning off process suffered more thoroughly the effect of the crisis as since 2008 only 1-1 companies were founded in all of the examined rural cities. One explanation of this tendency is that the R&D system in Hungary has been somewhat incoherent for decades but still there are attempts to utilize the available scarce resources in the best possible way and to exploit the opportunities. The business sector is able to gain profit from the created knowledge but at the same time via these processes the Hungarian higher education and the research system could converge to the forefront of the world. All these processes coming to fruition requires time and the consensus of the majority of the society. In Hungary the following factors hinders the processes; decreasing public funding, shortage of capital, high level of risk aversion. Furthermore in Hungary the role and functions of universities are not defined clearly. In the US and in the developed European countries the functions of education and research are both important in the role of the universities and they
appear in a harmonized way. On the other hand in Hungary this categorization is not clear and the research functions’ importance is yet to be recognized (Török, 2006). The first step is the identification of the problems and making recommendations in order to overcome them. To catalyse this process the wider scale awareness of spin-offs is necessary. It could be an important step forward if the government and the private investors would realize the positive economic and cultural effects of these companies. Despite the meagre attempts aiming the catching up of Hungary to the European countries previously, Hungary is still falling behind. Although spin-offs appeared already in the 1990s the spinning off process slowed down mainly because the above mentioned reasons. These drawbacks were strengthened by Act XXXIII of 1992 that forbade for the lecturers of public research institutes to take executive role in other research institutes. This was enhanced by the decree that prohibited research institutes to give their intellectual properties to companies (Papanek, & Perényi, 2006). Many of these drawbacks have been already dissolved but the increased awareness towards spin-offs could improve their prospects significantly. Based on this we can conclude that prior to 2005 there was not an efficient network of academic and market sectors. Act CXXXIV of 2004 brought a change in this relationship as we exemplified it. Besides this legislation the financial support provided by the tendering system proved to be an important step forward. A significant proportion of the examined 44 enterprises were supported via this channel and this way Hungary could increase its competitiveness and most universities established their technology transfer offices. These factors proved to be important steps towards the cooperation of academic and
Overall, in terms of the field of activity the ‘other’ category is dominant with its 66% proportion; the second is the category of ‘health, education and social services’ with only 23%. All the other fields are represented with meagre weights; processing industry with 5% and commerce, construction and property and business services with 2% each (Figure 1).

By examining the activities by cities we see, that commerce and processing industry were represented only in Szeged, enterprises in construction occurred only in Pécs while the property, business services category is connected to Budapest exclusively. On the other hand enterprises in the field of health, education, social services and other are occurred in all of the 4 cities and they play a dominant role. The number of enterprises operating in healthcare, education and social services industry is 6 in Budapest, 2 in Pécs and 1-1 in Szeged and Debrecen. From the other category 3 is in Pécs, 6 in Budapest, 9 in Szeged and 10 in Debrecen. Among the category other the dominant activities are natural sciences and technical R&D followed by biotechnology research and IT and software industry. Although the pivotal role of Budapest is unambiguous and the balance of the enterprises activities is the strongest here, huge efforts could be observed in Szeged as well aiming the extension of the industry focus. In terms of the relationship of the activity and the year of foundation we can conclude that the early period was dominated almost exclusively by info-communication enterprises supplemented by the meagre number of enterprises in the field of natural sciences. Since 2000 the role of natural sciences has increased, as new activities like biotechnology and medicine furthermore the medical and diagnostics appeared. These 3 areas represented the majority of the enterprises supplemented by commerce and processing industry.

The crisis of 2008 decreased the number of newly founded spin-offs and in the same time narrowed the industry spectrum. Since that mainly natural science, medical and diagnostics focused spin-offs have been formulated.

There is a connection between the year of foundation and the number of employees as well that strengthen the conclusions made so far. One positive effect of spin-offs is that they spur the job creation if there are solid enterprises that are able to deliver products and services that attract huge demand on the market. 3 out of the examined 4 cities (Budapest, Debrecen and Pécs) confirm that the outstanding values were associated to spin-offs founded in the early period and nowadays. The economic crisis and its effects are observable in the employment of spin-offs in these 3 cities. The superiority of Budapest is obvious if we investigate the employment by cities as
the average employment was 12 persons here as a result of 5 outstanding years. The same indicator in Debrecen decreased to 8 while in Pécs it was only 6. Among the 4 cities hence within the rural cities there is one exception, the spin-offs of the University of Pécs, where the average number of employees was only 4 with the maximum of 7 employees. Although the indicator was the lowest here it showed the most stable tendency as well.

After the categorization of the 44 enterprises based on their year of foundation, main field of activity and average employment we analysed the course of their revenues. First we present the conclusions made on the basis of the 2011 questionnaire than we introduce the changes that followed it. The data provided by the questionnaire cover the 2007-2011 period. By analysing the performance of this 5-year period in the four cities we see that the highest revenues were generated in 2010. The data reflect the effects of the economic crisis as well. From the enterprises included in the survey in 2007 only 1-1 enterprises had their highest revenues in Debrecen and Budapest. In 2008 – in the first year of the economic crisis – only one enterprise generated the highest revenues. It is a sign of the slow recovery that in 2009 5 companies were able to generate their highest revenues. In 2010, thanks to the Budapest based spin-offs, 12 companies were able to reach their highest revenues while in the coming year 10 enterprises could do the same, but still their outstanding revenues influenced mainly the average. The revenues of Culevit was 684 million HUF while compared to this Pannon Szoftver Szoftver Informatikai with 488 million HUF followed by Culevit with 478 million HUF revenue. The revenues of 2015 show positive sign with a 27 million HUF increase in average. The order of the previously mentioned two enterprises changed, but still their outstanding revenues influenced mainly the average. The revenues of Culevit was 684 million HUF while compared to this Pannon Szoftver slightly fall behind but still it was ranked 2nd far before the other enterprises. On the other hand 3 enterprises caused a negative pull; Surgeonfish and Search Lab produced decreasing revenues while SmartOffice Service revenue remained 0 since 2011. The overall picture of the revenues of Budapest based spin-offs is promising. Besides the companies founded in the 90s there are two newly founded enterprises that generated substantial revenues. Tresorit had 92 million HUF revenues and OptoForce had 113 million HUF.

The analysis of the capital city was followed by the analysis of rural cities starting with Debrecen. Here the calculations were more complicated as two companies - that were included in terms of the year of foundation - has been removed from the trade registry since and that is the reason why the company is not involved in the analysis of revenues, hence we calculated the averages on the basis of the remaining
9 companies. The average was 52 million HUF in 2011 while in 2015 it increased to 83 million HUF. There were 2 companies here as well with outstanding revenues; Neuron Szoftver and Larkbio. The 2 ceased companies showed inactivity in year 2015. Ave-Fon did not have any revenues in the 2011-2015 period while the revenues of Inno-Tears decreased to 0 in 2014. The fact that since 2011 new spin-offs have not been founded represents the relative underdevelopment of the rural regions compared to Budapest. At the same time Civis FIT that was founded at latest in 2009 was not able to generate any revenue in the last 2 years.

In case of the spin-offs related to the University of Szeged the average revenue in 2011 was 32 million HUF which was slightly more than the quarter of the average revenue of Budapest based spin-offs in that year. This could be explained with the fact that in Szeged there weren’t such enterprises like Pannon Szoftver or Culevit that could generate outstanding revenues, the highest value in case of Szeged was the 212 million HUF in 2006 of Avicor. Similarly to Budapest there was an increase from 2011 to 2015 in the 13 enterprises of Szeged, in 2015 the average revenues were 35 million HUF. This value was influenced hugely by the 113 million HUF decrease of Oncompass Medicine that was not compensated by the increased revenues of Avicor and Smart Dental. In addition to this it is important to mention that Hobré Laser Technology that was founded in 2013 was able to generate 64 million HUF already in 2015.

In Pécs all of the examined 6 enterprises are still currently active and they could be included in the analysis of revenues. These enterprises could not generate substantial revenues, they achieved the lowest average among the 4 examined cities with 18 million HUF revenue. What is special compared to the other cities is that in average the revenues decreased to 2015 with little more than 0.4 million HUF. In cases of 2 companies there was a decrease in revenues including Hisztopológia that had the only outstanding result. Immunochem Egészségügyi Szolgáltató Bt was able to grow but in absolute value it was not significant, its revenues increased from 0 to 0.9 million HUF. The sixth company, the Humeltis achieved 13.5 million HUF revenues but this company was founded in 2014.

We can conclude that there are more initiations in the area of the capital city to create spin-offs, furthermore alongside their wider scale of activities they are able to prevail more easily compared to their rural counterparts, although the spin-offs of the University of Szeged have a stable second role amongst the examined cities. In spite of the fact that since 2008 there was not any newly founded spin-off here, the survival of the existing companies is much higher than the survival rate of other rural spin-offs. This ratio is the lowest in the Transdanubian region. Despite the relatively high spin-off activity of Pécs, the enterprises founded in this city showed meagre development and growth although it is possible, that in the future this tendency will change as the lately founded Humeltis looks very promising. The effects of the 2008 economic crisis are reflected in the revenues of spin-offs as the companies solidified in the 90s provided a positive pull while the enterprises founded in 2008 or closely prior that generated negative results.

We believe that the analysis of revenues reflects important information about the growth potential of the enterprises but at the same time the analysis of profitability plays also an important role as well. Based
on the previous analyses we can separate two groups. In Budapest and Szeged the profits moved in a parallel way with the revenues. This strengthens our previous result that amongst the rural cities Szeged is the most advanced in terms of spin-offs. In the second group we find Debrecen and Pécs where the performance of spin-offs shows significant instability. In numerous cases there were no systematic growth in revenues and profits, instead there were decrease in many cases. In the following section we analyse the profitability of spin-offs in the 4 examined cities between 2007 and 2015 by measuring their return on equity (ratio of earnings after taxation and equity) indicator.

The return on equity ratios (ROE) confirm that Culevit and Pannon Szoftver are the two most stable companies. In the given period they produced only 1 negative value. Their stability is the result of their constantly increasing earnings after taxation that moves in a parallel way with their equity. Although Anxiofit showed much more volatility, this company also produced positive values similarly to the previous two companies. On the other hand Algernon Ezeregy Kutatás founded in 2007 was not able to generate profits in the examined period. After the economic crises there were more companies that had to suffer losses. 2011 was the worst year from this perspective as ANTE Innovative Technologies, Surgeonfish and Streamnovation (with its 64 million HUF loss) produced losses only in this year. In terms of profitability OptoForce, founded in 2012 showed also an unfavourable picture with its continuously increasing losses (Table 5).

Table 5: The return on equity in % of Budapest based spin-offs in 2007-2015

<table>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Immunal / Culevit</td>
<td>9%</td>
<td>15%</td>
<td>14%</td>
<td>11%</td>
<td>11%</td>
<td>31%</td>
<td>44%</td>
<td>11%</td>
<td>-24%</td>
</tr>
<tr>
<td>Pannon Szoftver</td>
<td>47%</td>
<td>40%</td>
<td>33%</td>
<td>27%</td>
<td>21%</td>
<td>24%</td>
<td>18%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Search-Lab</td>
<td>31%</td>
<td>15%</td>
<td>11%</td>
<td>-4%</td>
<td>3%</td>
<td>-12%</td>
<td>9%</td>
<td>-64%</td>
<td>7%</td>
</tr>
<tr>
<td>ANTE Innovative Technologies</td>
<td>94%</td>
<td>12%</td>
<td>7%</td>
<td>-420%</td>
<td>7%</td>
<td>74%</td>
<td>2%</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>Icegel</td>
<td>206%</td>
<td>28%</td>
<td>-92%</td>
<td>-1%</td>
<td>7%</td>
<td>561%</td>
<td>-7%</td>
<td>-12%</td>
<td></td>
</tr>
<tr>
<td>TactoLogic</td>
<td>70%</td>
<td>-319%</td>
<td>353%</td>
<td>9%</td>
<td>84%</td>
<td>-19%</td>
<td>44%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxiofit</td>
<td>0%</td>
<td>112%</td>
<td>41%</td>
<td>183%</td>
<td>27%</td>
<td>477%</td>
<td>1%</td>
<td>0%</td>
<td>1%</td>
</tr>
<tr>
<td>Algernon Ezeregy Kutatás</td>
<td>-10%</td>
<td>-2%</td>
<td>-2%</td>
<td>-10%</td>
<td>-1%</td>
<td>-5%</td>
<td>-7%</td>
<td>-63%</td>
<td>-38%</td>
</tr>
<tr>
<td>Surgeonfish</td>
<td>517%</td>
<td>1%</td>
<td>10%</td>
<td>-492%</td>
<td>113%</td>
<td>48%</td>
<td>46%</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>Maven Seven</td>
<td>48%</td>
<td>1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Streamnovation</td>
<td>6%</td>
<td>77%</td>
<td>-6482%</td>
<td>83%</td>
<td>95%</td>
<td>25%</td>
<td>20%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tresorit</td>
<td>-82%</td>
<td>-37%</td>
<td>-49%</td>
<td>-81%</td>
<td>-104%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OptoForce</td>
<td>197%</td>
<td>-2940%</td>
<td>-37805%</td>
<td>-146%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Own compilation
In case of Debrecen the spin-offs founded in 1998 were the most stable in terms of the growth of revenues and profits. Although it is not the Neuron Szoftver that was able to reach the highest ROE but besides Astrid Research this spin-off was the most stable with its constantly positive indicators. In these indicators it is also apparent that the increasing revenues in case of spin-offs do not necessarily implicate profitable operation, like in the cases of UD-GenoMed Medical and Biomer. The lowest value (-530%) was not connected to ceased companies, like Ave-Fon or Inno-Tears but to Civis FIT. In Debrecen in terms of profitability the worst year was 2010 with its lowest values but if we take into consideration the enterprises that ceased to operate, the worst year was 2014. In comparison the best performing spinoff in Budapest was able to achieve twice as high ROE than in Debrecen, while the highest loss expressed in ROE was more than 10 times higher in Budapest than in Debrecen. We believe that the Debrecen based spin-offs could establish a more stable operation by recognizing their inadequacies (Table 6).

Table 6: The return on equity in % of Debrecen based spin-offs in 2007-2015

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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Neuron Szoftver</td>
<td>62%</td>
<td>51%</td>
<td>49%</td>
<td>24%</td>
<td>98%</td>
<td>71%</td>
<td>81%</td>
<td>38%</td>
<td>14%</td>
</tr>
<tr>
<td>Astrid Research</td>
<td>10%</td>
<td>8%</td>
<td>55%</td>
<td>41%</td>
<td>31%</td>
<td>145%</td>
<td>62%</td>
<td>0.278</td>
<td>45%</td>
</tr>
<tr>
<td>Cetox</td>
<td>24%</td>
<td>7%</td>
<td>3%</td>
<td>-2%</td>
<td>-1%</td>
<td>3%</td>
<td>14%</td>
<td>-9%</td>
<td>-22%</td>
</tr>
<tr>
<td>AVE-FON</td>
<td>5%</td>
<td>-1%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
<td>272%</td>
<td>-28%</td>
<td>-77%</td>
<td></td>
</tr>
<tr>
<td>Inno-Tears</td>
<td>15%</td>
<td>13%</td>
<td>-52%</td>
<td>-33%</td>
<td>19%</td>
<td>-48%</td>
<td>-47%</td>
<td>-110%</td>
<td></td>
</tr>
<tr>
<td>Biomer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-209%</td>
<td>74%</td>
<td>-34%</td>
</tr>
<tr>
<td>UD-GenoMed Medical Genomic Technologies</td>
<td></td>
<td></td>
<td></td>
<td>47%</td>
<td>73%</td>
<td>57%</td>
<td>19%</td>
<td>37%</td>
<td>-17%</td>
</tr>
<tr>
<td>Bionanoferm</td>
<td>-12%</td>
<td>-53%</td>
<td>123%</td>
<td>191%</td>
<td>51%</td>
<td>-3%</td>
<td>-13%</td>
<td>36%</td>
<td>1%</td>
</tr>
<tr>
<td>Civis FIT</td>
<td></td>
<td></td>
<td></td>
<td>-530%</td>
<td>10%</td>
<td>45%</td>
<td>9%</td>
<td>-120%</td>
<td>-1%</td>
</tr>
</tbody>
</table>

Source: Own compilation

In Szeged the Optin founded in 1999 could solidify its position. Contrary to Debrecen, amongst the Szeged based spin-offs the negative ROE indicators were mostly connected to enterprises with decreasing revenues, while the companies that were able to grow in terms of sales were mostly able to generate profit as well, except from the Traumart that has shown continuous decrease since 2012. The strengthening of rural spin-offs is shown in the highest ROE indicators; in Szeged it was 1 969% while in Budapest it was 561%. The highest loss expressed in ROE (-992%) was generated by Tonsoft as a result of the lack of revenues, the continuously increasing losses hence decreasing equity. It is also important to mention that Hobré Laser Technology founded in 2013 was able to achieve 64 million HUF revenues and in the same it was able to generate higher profitability indicators as well (Table 7).
### Table 7: The return on equity in % of Szeged based spin-offs in 2007-2015

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Optin</td>
<td>145%</td>
<td>17%</td>
<td>20%</td>
<td>260%</td>
<td>115%</td>
<td>95%</td>
<td>12%</td>
<td>12%</td>
<td>12%</td>
</tr>
<tr>
<td>KPS Diagnosztika Szolgáltató / Oncompass Medicine</td>
<td>-10%</td>
<td>-40%</td>
<td>-18%</td>
<td>-281%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TKM Consult Szaktanácsadó és szolgáltató</td>
<td>25%</td>
<td>-36%</td>
<td>-455%</td>
<td>104%</td>
<td>39%</td>
<td>1969%</td>
<td>594%</td>
<td>33%</td>
<td>146%</td>
</tr>
<tr>
<td>Hilase</td>
<td>39%</td>
<td>7%</td>
<td>3%</td>
<td>1%</td>
<td>-304%</td>
<td>4%</td>
<td>131%</td>
<td>222%</td>
<td>-56%</td>
</tr>
<tr>
<td>Nanocolltech</td>
<td>43%</td>
<td>30%</td>
<td>30%</td>
<td>43%</td>
<td>159%</td>
<td>48%</td>
<td>16%</td>
<td>3%</td>
<td>-30%</td>
</tr>
<tr>
<td>Tonosoft Orvostechnikai Kereskedelmi Szolgáltató</td>
<td>2%</td>
<td>-17%</td>
<td>-43%</td>
<td>-105%</td>
<td>-61%</td>
<td>-40%</td>
<td>-39%</td>
<td>-992%</td>
<td>135%</td>
</tr>
<tr>
<td>DFC Biotechnológia Fejlesztő</td>
<td>-69%</td>
<td>105%</td>
<td>-71%</td>
<td>67%</td>
<td>-8%</td>
<td>-11%</td>
<td>-5%</td>
<td>-5%</td>
<td>n.a</td>
</tr>
<tr>
<td>Avicor</td>
<td>71%</td>
<td>-5%</td>
<td>24%</td>
<td>44%</td>
<td>13%</td>
<td>0%</td>
<td>4%</td>
<td>49%</td>
<td>28%</td>
</tr>
<tr>
<td>InnoGeo</td>
<td>-16%</td>
<td>-53%</td>
<td>195%</td>
<td>128%</td>
<td>6%</td>
<td>-161%</td>
<td>2%</td>
<td>24%</td>
<td></td>
</tr>
<tr>
<td>CE Optics</td>
<td>-2%</td>
<td>33%</td>
<td>15%</td>
<td>62%</td>
<td>35%</td>
<td>72%</td>
<td>20%</td>
<td>-13%</td>
<td>-21%</td>
</tr>
<tr>
<td>Traumart / Smart Dental Fogtechnikai Kerskeskedelmi Szolgáltató</td>
<td>674%</td>
<td>-30%</td>
<td>3%</td>
<td>1%</td>
<td>-3%</td>
<td>-2%</td>
<td>-47%</td>
<td>107%</td>
<td></td>
</tr>
<tr>
<td>SNW SYSTEMS</td>
<td>-7%</td>
<td>-87%</td>
<td>89%</td>
<td>-45%</td>
<td>32%</td>
<td>-29%</td>
<td>1%</td>
<td>-1%</td>
<td></td>
</tr>
<tr>
<td>Hobré Laser Technology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0%  7%  16%</td>
</tr>
</tbody>
</table>

Source: Own compilation

In Pécs there is only one enterprise with outstanding values. Similarly to Debrecen, the profits and revenues were not correlated strongly, like in the cases of Immunochem and B2AM, Kisteledgi 2008 was able to generate profits in the given period, with 2281% it was able the reach the highest ROE indicator in 2009 amongst the 4 examined cities. Although in 2014 Humeltis was still not able to generate profits, if it fulfils its promised potential the Transdanubian region could also emerge in terms of spin-off activity (Table 8).

### Table 8: The return on equity in % of Pécs based spin-offs in 2007-2015

<table>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hisztopatológia</td>
<td>43%</td>
<td>12%</td>
<td>13%</td>
<td>7%</td>
<td>7%</td>
<td>1%</td>
<td>0%</td>
<td>0%</td>
<td>-38%</td>
</tr>
<tr>
<td>Immunochem</td>
<td>24%</td>
<td>8%</td>
<td>18%</td>
<td>32%</td>
<td>-2%</td>
<td>3%</td>
<td>-11%</td>
<td>7%</td>
<td>-15%</td>
</tr>
<tr>
<td>B2AM Innovációs</td>
<td>36%</td>
<td>37%</td>
<td>-25%</td>
<td>19%</td>
<td>-91%</td>
<td>-9%</td>
<td>16%</td>
<td>25%</td>
<td>9%</td>
</tr>
<tr>
<td>Kisteledgi 2008</td>
<td>89%</td>
<td>2281%</td>
<td>1196%</td>
<td>229%</td>
<td>142%</td>
<td>573%</td>
<td>81%</td>
<td>145%</td>
<td></td>
</tr>
<tr>
<td>Pharminvivo</td>
<td>223%</td>
<td>-26%</td>
<td>-74%</td>
<td>216%</td>
<td>-714%</td>
<td>103%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humeltis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-11%</td>
</tr>
</tbody>
</table>

Source: Own compilation
The profitability ratios also confirmed that the spin-offs founded in the 90s were more stable and were able to perform in a more consistent way. The slow recovery form the economic crisis is represented in the profitability of the enterprises as well. It is also apparent that in the segment of spin-offs revenues and profits do not necessarily move in a parallel way. In Budapest and Szeged the increasing revenues of spin-offs resulted in increasing profits, but in the other two cities this relationship was not so unambiguous. Despite the supremacy of Budapest there are strong rural efforts, especially by the University of Szeged to strengthen spin-off activity. The results of 2015 provide us a promising picture as besides Budapest there are rural initiations as well to spur spin-off activity by formulating and implementing stable technology transfer processes.

Conclusions

In our research we examined 44 enterprises located in Budapest, Szeged, Debrecen and Pécs on the basis of 7 aspects. The analysis showed the same results based on all categories. Although spin-offs appeared in Hungary only in the 90s, much later than in the more developed European economies, the first attempts proved to be successful. In spite of the fact that these were the first enterprises representing this form of business in Hungary, they are successful till date, partially because they were able to solidify their operation by the time of the economic crisis. Even before the economic crisis of 2008 the spin-off activity lessened. Despite the changes in the legislation in 2004, as a result of the governments’ support freeze spin-offs and the technology transfer process could not benefit entirely from the positive effects of the changed legal environment. The recovery from the crisis took several years and affected deeply this sector. First, new enterprises could be founded much harder and at the same time the survival of the already existing enterprises were questioned and many of them ceased to operate. This conclusion is confirmed by the analysis of the industry focuses. Based on our results the supremacy of Budapest in terms of spin-off activity is apparent compared to the rural regions. There are more universities that provide more possibilities for the cooperation of market and academic sectors. The successful tender applications were located dominantly in the capital city as well. On the other hand this position of Budapest does not mean that the rural spin-offs are not able to deliver new and successful products to the market, like the spin-off connected to the University of Szeged.

In order to spur the development of spin-offs better communication is crucial. This could be secured by establishing technology transfer offices connected to universities. Furthermore spin-offs should make the best of the opportunities provided by innovation clusters. By sharing the tools and knowledge, clusters could contribute to the transmission of technologies amongst enterprises hence to the spreading of information. On the other hand it is also important to bring balance to SMEs and large corporations. From the mutual support of SMEs and large corporations both parties could benefit. This cooperation could contribute to the delivery of new scientific results to the market. Besides the already existing spin-offs it is also important to pay attention to the newly founded enterprises. In this area business incubators could provide important assistance for them. They provide business and professional support for young enterprises usually below the market price. A very promising initiative is the virtual incubation of the Technology Transfer Centre of the University of Debrecen. For new enterprises the actual presence is not necessary. They are assisted in the activities prior to the foundation of the firm (specifying the idea, formulating a business model, creating a business plan) and after it as well. It is very important that in each area spin-offs should be founded with industry focuses that are consistent with the given areas’ resources, including physical and intellectual resources as well. The physical resources are given but the intellectual conditions could be improved. In this sense we can mention the currently running innovation manager training that provides a specialization with the aim of training professionals who are acquainted with spin-offs and with their management. This way more and more professionals could be trained by the Hungarian education system who possess the necessary knowledge and skills in order to implement the technology transfer process. In order to achieve real successes the necessary amount of capital is also crucial besides the resources and competence. As we already mentioned the 7th framework program could provide great support for spin-offs as in order
to implement a standardized technology transfer process the required quantity and quality of the capital and competence are crucial.

Hungary should make efforts to implement actions based on the above mentioned principles and this way it is possible to make contact with international spin-offs that could be a huge step forward for market and academic sectors as well. Of course there are certain difficulties and limits in this development but with the above mentioned actions these problems could be lessened. After this the prospects of Hungarian spin-offs could be improved gradually. We believe that in order to boost significant development a well-articulated incentive system is necessary. This way using the example of Szeged the other rural spin-offs could improve similarly to the enterprises of Budapest and at the same time a standardized technology transfer process could be developed.

References


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Transfer of R&D Results into Practice – Case Study from Slovakia

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Abstract
Innovation is thought to be one of key factors of regional development, which makes science and research and dissemination and diffusion of their results equally important. The paper examines various channels of knowledge transfer and output of scientific research activities into practice based on a case study of Slovak University of Agriculture in Nitra. Based on findings gathered through administration of semi-structured interviews, we identify key stakeholders - partners from practice, the benefits that cooperation with the practice generates for the academic sphere and especially the identification of barriers to this process. The dominant channels of transfer of innovation into practice are in particular the consulting and educational activities, participation in scientific research projects and student practice and mobility. The possibility of commercialization of outputs of research activities and the creation of academic spin-off companies in the Slovak Republic is very low. The most significant barriers limiting listed processes are underfinancing of research and development, but in particular problems of an institutional nature.

Keywords: innovation, knowledge spill-over, research and development, technology transfer, inter-industry links

Introduction
Technological progress as a determinant of development has undergone many conceptual changes, from exogenous factor of development as was perceived in neoclassical theory of growth, to the endogenous development factor in neoliberal theories (Leigh Blakely, 2013). The new endogenous growth theory is still the basis for the formulation and implementation of not only regional policy but also other macroeconomic policies that have spatial aspect. This theory highlights the technology, innovation and R & D as internal factors, which determine the development potential of the region and as the key factors in the development of regional disparities (Maier, Tödtling, 1998). Further progress in understanding the importance of this factors is connected with transition from the perception of labor as a factor of production, to perception of labor as a human capital that has a certain education, skills and other less quantifiable characteristics. Unequal distribution of high-quality human capital in the regions is the cause of inter-regional disparities, since it is human capital that determine the level of technology and innovation production. (Blažek, Uhlíř, 2002). Universities are both producers of high quality human capital and innovations. During last decades, shortages in public funding and requirements for application of knowledge generated from public funds on universities resulted
in development of activities referred as “commercialization of knowledge” (Bentley, Gulbrandsen, Kyvik, 2015). This activities connected with transfer of university knowledge into industry were intensively investigated in many empirical studies, but there is still lack of literature describing motivation of academics to cooperate with practice and character of linkages between universities and industry in Slovak conditions. From this reason we decided to carry out case study on Slovak University of Agriculture as a first step in research of university – industry interactions in Slovak environment.

Related work

The process of transfer and dissemination of innovations and technology has been discussed and analysed more in detail by theorists of institutional approach in 80s of the 20th century. Between the institutional theories of regional development, the most relevant one, describing impact of knowledge and innovation for growth of regional economy is the theory of „learning regions“. Theory of learning regions by Lundvall and Johnson (1994) highlights the importance of networking, diffusion of knowledge and process of mutual learning of the regional actors. This factors are considered to be essential for the generation of new new ideas and innovations that became to be understood as competitive advantage of the region. Within these theoretical concepts, a major source of innovation is science and research, while the indispensable precondition for research development is institutional environment in the region: the main producers of knowledge are research institutes, universities and corporate research centres. Knowledge produced by this institutions and capability of region to transfer this knowledge into practice determines the innovation potential of the region (Ručinská et al, 2009).

From presently applied theories concerning importance of application of university knowledge, it is suitable to mention „Triple Helix Model“, whose main attribute is, that potential for innovative activities and economic growth in knowledge economy requires more prominent role of universities in institutional system of the region. The necessary precondition of successful region is hybridization of attributes of university environment, private sector and self-government, to reach establishment of new institutional and social forms of organization of the exploitation of knowledge (Ranga, Etzkowitz, 2010). The importance of Triple Helix model was stressed also by Farinha, Ferreira and Gouveia (2016), not only for development of research and innovation activities, but also for commercialisation of generated knowledge.

Still in the present time, scientific literature and also relevant supportive policies deals mainly with institutional factors, that have impact on spill-over effects of knowledge, as patenting activity of academics, or spin-off enterprises (Walter et. al., 2016, Fukugawa, 2016). But on the other hand, we can observe still growing number of empirically founded claims, that important impact on transfer of knowledge from university into practice have also activities of informal and uncommercial character (Abreu, Grinevich, 2013).

Material and methods

The aim of the paper is to identify the forms of cooperation between research
institutions and another spatial actors, focusing in particular on the process of dissemination of research results and identification of channels that are used for transfer of academic knowledge into the practice, on case of Slovak University of Agriculture in Nitra. In addition to examination of specific channels of knowledge transfer, the paper will focus on identification of key partners of university departments from „practical sphere“, benefits that departments can gain from cooperation with partners, but mainly on determination of barriers of knowledge transfer for the purpose of subsequent formulation of recommendations that would contribute to the facilitation of the process of transfer and application of new knowledge generated by public research institution into practice.

In order to fulfil those objectives we carried out case study of Slovak University of Agriculture in Nitra. Information for this case study was acquired by execution of the semi-structured interviews with selected scientific research departments of the faculties on the university. The respondents were heads of departments that were chosen with an emphasis on achieving representativeness from the perspective of research orientation of the university and its faculties. The questioned sample consist of 20 departments, while the size of this sample was determined to reach proposed saturation of gathered information. From 20 questioned departments, fifteen is focused on research in field of life sciences and technology and five execute research within social sciences. Respondents evaluated the importance of channels of spill-over processes for their institution, benefits and barriers of the cooperation with practice within the range of 1 to 5, where 5 represented the highest significance.

Results

Regarding the cooperation in research activities, executed research revealed that university departments create relationships especially with other scientific and research institutions (more than 50% of university’s partners are another research institutions). These are mostly another domestic, but also foreign universities, various scientific departments of Slovak Academy of Science and other specialized research organizations that are mostly established by state authorities, or regional self-government. Close cooperation also exists between responded departments and central government authorities, particularly ministries. With local and regional authorities cooperate mainly departments that focus on research in field of social-sciences, while private sector rather seek to cooperate on research activities with departments oriented on life sciences or technology (from perspective of size of cooperating enterprises, mostly small and medium size enterprises cooperates with university, collaboration of university with large enterprises was observed only occasionally).
The most significant channels of knowledge transfer in case of observed departments of Slovak University of agriculture are free access to publications, consulting, cooperation within project teams of individual research projects and student practices through mobility or trough final thesis of students, while this thesis solve problem of certain actor in economy. These methods of spill over of knowledge from university into practice dominated on both social sciences and life-sciences departments, according to relatively low level of standard deviation. In addition to these spill overs, we can consider as significant also networking. Importance of networking was observed on level of department and also on level of individual scientists (memberships in associations or project teams). As a relatively underused forms of dissemination of the research results were identified: the dual position of employees on the department and in practice, the generation of academic spin-offs and start-ups and commercialization of knowledge through patenting and licensing.

Table 1: Importance of selected channels of knowledge transfer for questioned departments of Slovak University of Agriculture in Nitra

<table>
<thead>
<tr>
<th>Form of cooperation, way how results of R&amp;D are transferred into practice</th>
<th>AVG</th>
<th>STDEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooperation based on contract - department was supplier</td>
<td>3,6</td>
<td>1,231</td>
</tr>
<tr>
<td>Cooperation based on contract - Department was a partner in research project</td>
<td>4,2</td>
<td>0,875</td>
</tr>
<tr>
<td>Commercialization of the results of research and development</td>
<td>2,7</td>
<td>1,565</td>
</tr>
<tr>
<td>Spin-off companies and start-ups</td>
<td>2,2</td>
<td>1,461</td>
</tr>
<tr>
<td>Consulting</td>
<td>4,2</td>
<td>0,988</td>
</tr>
<tr>
<td>Lifelong learning, trainings</td>
<td>3,7</td>
<td>1,031</td>
</tr>
<tr>
<td>Practices of students, student mobility, final thesis</td>
<td>4,2</td>
<td>0,834</td>
</tr>
<tr>
<td>Networking</td>
<td>3,9</td>
<td>1,119</td>
</tr>
<tr>
<td>The double position of employee on the department and in practice</td>
<td>2,5</td>
<td>1,356</td>
</tr>
<tr>
<td>Free access to publications</td>
<td>4,4</td>
<td>0,988</td>
</tr>
</tbody>
</table>
University departments are suppliers mainly for private sector (mostly in case of life-sciences departments), while outputs have mostly character of different expertise’s, new procedural approaches and provision of new technologies. Significant customer that is interested to use the outcomes of social-sciences departments is local and regional government. In this case, research results supplied to self-government are various policy documents (e.g. plans of local/regional economic development), sociological and economic analysis etc. Almost all departments of Slovak University of Agriculture consider “cooperation on joint projects” and “consulting activities” to be the most frequently used knowledge transfer methods. Interesting is also the fact that only in case of student motilities and practices, all spatial actors are interested to cooperate with university. This may be the result of fact that this kind of cooperation is from organizational, administrative and financial point of view relatively low-demanding. Questioned departments are networked mainly with governmental institutions and institutions from third sector (not so frequently with commercial firms) and thus this entities can benefit from less-expensive or free access to results of research of university. The answers of the respondents shows, that practical use of selected channels of transfer of knowledge into practice depends on the way, how difficult is to ensure and manage spill over process from financial, organizational and legislative point of view.
The responded departments see the greatest benefit of cooperation with practice in building the department’s prestige. As a significant benefit are observed also factors “building a long-term strategic partnerships” and “need to enrich the content of the teaching by practical examples”. Almost all heads of departments agreed that cooperation with institutions from private and public sector allows to enrich the learning process trough practical examples or application of knowledge in simulations of practical problems. This kind of cooperation brings many positive effects not only for teaching process, but also for future employment of graduates. The majority of respondents also agreed that the participation of actors from the private and public sector on projects and more frequent cooperation improves the position of department in already competitive environment in research community and such cooperation is also a good platform for creation of longer-term strategic partnerships (existence of such networks also significantly reduce the organizational and financial costs of further research activities of departments).

In addition, respondents are in opinion that cooperation with practice is very important for improvement of the quality and efficiency of research activities of department (e.g. access to technology, data and materials that complement technological equipment of the university). To give a practical example, for a science-oriented department, access to biological material is particularly highly important factor, considering costly system of procurement of these inputs. The most of the questioned departments agree that direct financial aspects - the commercialization of research activity outputs is the least

<table>
<thead>
<tr>
<th>Categories of positive effects of cooperation with practice</th>
<th>AVG</th>
<th>STDEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Getting new skills, techniques and technologies from partners</td>
<td>3,6</td>
<td>0,943</td>
</tr>
<tr>
<td>The availability of data that would otherwise be complicated to obtain</td>
<td>3,8</td>
<td>1,044</td>
</tr>
<tr>
<td>A better understanding how to apply research results in practice</td>
<td>3,9</td>
<td>0,872</td>
</tr>
<tr>
<td>Identification of potential clients/partners for further research</td>
<td>3,7</td>
<td>1,020</td>
</tr>
<tr>
<td>Securing additional financial resources to cover the cost of research</td>
<td>3,6</td>
<td>1,360</td>
</tr>
<tr>
<td>Participation of lecturers from the practice in the process of teaching</td>
<td>4,1</td>
<td>1,300</td>
</tr>
<tr>
<td>Need to enrich the content of the teaching by practical examples</td>
<td>4,4</td>
<td>0,300</td>
</tr>
<tr>
<td>Need to create more options for students to get practical experiences</td>
<td>3,8</td>
<td>0,943</td>
</tr>
<tr>
<td>Learning how to apply the knowledge and skills to solve real-world problems</td>
<td>4,3</td>
<td>0,458</td>
</tr>
<tr>
<td>Building long-term strategic partnerships</td>
<td>4,5</td>
<td>0,500</td>
</tr>
<tr>
<td>Building a good reputation, prestige</td>
<td>4,5</td>
<td>0,500</td>
</tr>
<tr>
<td>Facilitation of the exchange of staff between department and practice</td>
<td>3,4</td>
<td>1,025</td>
</tr>
<tr>
<td>Commercialization of outputs of research activities</td>
<td>2,9</td>
<td>0,748</td>
</tr>
</tbody>
</table>
important effect arising from cooperation with practice.

*Table 3: Barriers of knowledge transfer, identified by chosen departments of Slovak University of Agriculture*

<table>
<thead>
<tr>
<th>N.o.</th>
<th>Barriers of knowledge transfer</th>
<th>AVG</th>
<th>STDEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Insufficient personal</td>
<td>3.6</td>
<td>1.356</td>
</tr>
<tr>
<td>2.</td>
<td>Lack of technical equipment</td>
<td>3.5</td>
<td>1.025</td>
</tr>
<tr>
<td>3.</td>
<td>High level of time costs</td>
<td>3.6</td>
<td>1.114</td>
</tr>
<tr>
<td>4.</td>
<td>Lack of information about the needs of practice</td>
<td>3.1</td>
<td>0.943</td>
</tr>
<tr>
<td>5.</td>
<td>Aversion to take risks</td>
<td>2.5</td>
<td>0.922</td>
</tr>
<tr>
<td>6.</td>
<td>The specificity of the requirements of the market</td>
<td>2.9</td>
<td>1.300</td>
</tr>
<tr>
<td>7.</td>
<td>Inadequate assessment of the collaboration with the practice in evaluation of research outputs</td>
<td>4.3</td>
<td>0.900</td>
</tr>
<tr>
<td>8.</td>
<td>Potential limitations in publication of the outputs</td>
<td>3.1</td>
<td>1.221</td>
</tr>
<tr>
<td>9.</td>
<td>Restrictions given by the regulations of faculties</td>
<td>3.5</td>
<td>1.285</td>
</tr>
<tr>
<td>10.</td>
<td>Inadequate organizational management of knowledge transfer process on university</td>
<td>3.2</td>
<td>1.166</td>
</tr>
<tr>
<td>11.</td>
<td>Lack of interest get new knowledge generated by the practice</td>
<td>3</td>
<td>1.183</td>
</tr>
<tr>
<td>12.</td>
<td>Lack of societal challenges</td>
<td>3.2</td>
<td>0.872</td>
</tr>
<tr>
<td>13.</td>
<td>Lack of qualified staff in institutions engaged in the practice</td>
<td>3.1</td>
<td>1.136</td>
</tr>
<tr>
<td>14.</td>
<td>Unwillingness of institutions from practice to participate on financing of research</td>
<td>3.5</td>
<td>1.360</td>
</tr>
<tr>
<td>15.</td>
<td>Insufficient funding of applied research</td>
<td>4</td>
<td>1.549</td>
</tr>
<tr>
<td>16.</td>
<td>Limitations imposed by the providers of research grants</td>
<td>3.9</td>
<td>1.221</td>
</tr>
<tr>
<td>17.</td>
<td>Problems in the field of the protection of intellectual property rights</td>
<td>2.4</td>
<td>1.200</td>
</tr>
</tbody>
</table>

Presently, in conditions of Slovak republic, there are many barriers that hamper the process of transfer of knowledge generated by universities into practice. Thus analysed barriers can be considered as limiting factors for innovation performance of state economy but also for development of regional economies. In table n.o. 3, barriers 1-6 affect mainly the research institutions, factors 7-10 are based on the present organization of the system of public higher education and factors 11-17 can be described as the wide society problems. From given list of 17 barriers, departments considered as at least average significant 14 of 17 barriers. The most significant barriers encountered by respondents at the departments are: inadequate assessment of the collaboration with the practice in evaluation of research outputs and insufficient funding of applied research. The most significant barriers on level of departments (1-6) are: insufficient personal and technical equipment and increased time demands, while opinions on inadequate staffing differs according to different number of only-pedagogical employees of departments.

Considering barriers that are connected with present organization of the system of public higher education,
majority of respondents agreed that most limiting barrier on the level of universities in Slovak republic is inadequate assessment of the collaboration with the practice in evaluation of research outputs (e.g. evaluation of patents versus evaluation of publication outputs – we can observe insufficient evaluation of commercialization activities in evaluation of research activity of faculty, but also in accreditation criteria for university). Also important are the potential limitations in publication of the outputs, or another limitations that have organisational, financial or legislative character. During execution of directed interviews, we found relatively polarized opinions on the effectiveness of organizational system of support of knowledge transfer into practice, while more negative views in this regards were identified in case of departments with smaller number of employees that are not capable to execute organizational processes of knowledge transfer themselves. On the other hand, departments with sufficient number of employees did not consider this barrier as significant and expressed opinion that it is more effective to let departments to build own system of management of transfer processes.

In terms of wide social problems, affecting the process of knowledge transfer from university to practice, as the most important factor respondents identified „Insufficient funding of applied research“ (in this case, the opinions were also polarized according to focus of certain departments on basic or applied research). As significant problems are also perceived currently applied limitations imposed by providers of funds for research activities that in certain cases can hamper the involvement of the private sector (many providers of grants exclude the possibility of co-financing research by the private sector). In addition, respondents highlight as significant barrier the absorption capacity of entities from private sector to apply innovations, resp. new knowledge generated on university (caused for example by the inability of employees of private enterprises to analyse scientifically-formulated knowledge from university, or lack of technological knowledge of staff).

Conclusion

By realization of this case study, we have identified some of the most common forms of cooperation of scientific research institutions and practical sphere (private and public sector entities). The most important channels of knowledge transfer from university to practice are: free access to publications, provision of consulting, common participation in scientific research projects, student practices and motilities.

The process of knowledge transfer is at the Slovak University of Agriculture based on the use of informal channels of spill-over processes. The questioned departments of university cooperate with another research institutions and public sector rather than with the private sector and provide generated knowledge particularly in the form of consulting, trainings, joint research projects and student practices. Contact of departments with the private sector is mainly represented by preparation of studies and surveys on the basis of a contractual relationship. Classical transfer channels such as selling licenses or establishing spin-off companies are used minimally. This is mainly the result of missing supportive policies and insufficient institutional support of transfer processes at the university, inadequate assessment of the collaboration with the practice in evaluation of research outputs and limitations imposed by the providers of research grants.
However, it should be noted that departments also experienced low interest of private sector to acquire knowledge generated by university. Therefore, we recommend to observed Slovak University of Agriculture, application of “balanced” triple helix model, and thus to create a comprehensive institutional system of support for the commercialization of research at the university, in which key position should have a transfer and licensing office, providing consultancy and support to researchers. Establishment of such office will result into better opportunities for protection and management of intellectual property of the university, building the relationships with the private sector and improvement of opportunities for researchers to get grant for activities of applied research. When we take into consideration current pressure on universities to transfer knowledge created by publicly funded research into practice, it is necessary to remove identified barriers of commercialization of research and support the process of patenting, sale of licenses and establishment of spin-off companies.

References


Science Parks as Seedbeds of Responsible Research and Innovation

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Abstract

Science parks are commercially run innovation areas that promote university-industry collaboration, often with a supporting role for government. For long, they have been considered as important economic development initiatives that play a major role in technology transfer activities and in new venture formation. They collect a region’s main research and innovation results and gather players performing innovative activities. Through the collection of key innovative players and the facilitation of innovation processes, science parks can clearly play a crucial role in the formation of attitudes towards innovation.

As innovation leaders, science parks have a special role in giving shape to Responsible Research and Innovation (RRI). RRI is an emerging notion that emphasizes the importance of including societal desirability, ethical acceptability and environmental sustainability in innovation processes. This paper examines how the concept of RRI in general can be applied in science parks. It presents the organization and aims of science parks and then considers their potential to have a leading role in adopting RRI.

Keywords: science parks, responsible research and innovation, RRI, innovation

Introduction

Innovation is one of the main driving forces of the economy. Several new products have affected the everyday life and opened up brand new market opportunities. Many previously insolvable problems have disappeared thanks to certain technological advancements. Nevertheless, besides the wide scale of benefits a lot of undesired side-effects, which are also inherent parts of the innovation process, are often forgotten. Additionally several new or significantly improved products or processes that supposed to solve one problem frequently bring forth other unforeseeable negative consequences. In light of these considerations, and building upon decades of attempts to take them into account, recent developments in innovation studies have placed responsibility into the focus and introduced the notion of Responsible Research and Innovation (RRI).

RRI tries to exceed the traditional limits of innovation thinking by involving stakeholder engagement or public dialogue as new elements to the process. It broadens the scope of innovation process with other dimensions than economic value such as ethical, societal or environmental ones. It shows a commitment towards the future by taking into consideration these dimensions in the present. The most popular and well-
known environmental dimension reflects to the protection of environment and the sustainable use of natural resources. Commonly the societal aspect deals with the contradictory relationship between technological development and social disadvantages. In a more general sense the societal dimension could be understood as an approach which emphasizes the chance for the future generations to enjoy at least the present level of quality of life. Finally, the ethical dimension covers the conflicts between technological development and the commonly agreed value set of the society.

Despite the growing interest in the concept of Responsible Research and Innovation, studies that seek to put RRI into practice are very rare. Most of them deal with the basic values, elements or framework of RRI but very few try to overcome the limitations and obstacles of practical application. In our view science parks can be places where the practical application of RRI might be successful. They collect the main research and innovation results of a region and gather players performing innovative activities. Thus, science parks may clearly play a crucial role in the formation of attitudes towards innovation. In this way the main aim of our study is to examine how the concept of RRI in general can be applied in science parks.

The paper is organised as follows: at first we introduce briefly the concept of RRI. After it an overview about science parks will be provided since these initiatives might be defined as spaces of innovation where the concept of RRI can put into practice more easily because of the higher concentration of innovative players. Finally, we examine the interrelations between the concept of RRI and science parks.

**Responsible Research and Innovation**

Responsible Research and Innovation has in recent years become an expression to refer to a growing interest from different actors to make research and innovation processes more ethically accountable and more responsive to society. The term is being used by scholars, as well as in policy circles, especially in Europe, where the European Commission uses the term “RRI” to denote part of its research and innovation strategy. A frequently cited definition of RRI is that by philosopher and European Commission policy officer René von Schomberg: “Responsible Research and Innovation is a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in our society).” (von Schomberg 2011, 47).

RRI is described similarly in recent official statements by the European Commission: “RRI is an inclusive approach to research and innovation (R&I), to ensure that societal actors work together during the whole research and innovation process. It aims to better align both the process and outcomes of R&I with the values, needs and expectations of European society.” (EC 2013)

Although RRI has recently been taken up in policy, it has most of its roots in the areas of science, technology and innovation studies and earlier movements for social responsibility in science and democratization of science (Owen, McNaughten and Stilgoe 2012). An important reason that it is currently being
taken up in policy circles is the realization that traditional approaches to research and innovation (R&I) R&I policy do not sufficiently yield the benefits of R&I demanded by society. Specifically, it is now believed that there is a need to move away from technology acceptance by way of marketing, that the diversity of actors in R&I should be increased, and that society must be involved early, continuously and iteratively in R&I processes.

As the two above descriptions show, RRI is concerned with shaping R&I in such a way that it is more in line with demands of society. RRI aims at a transformation of R&I processes and outcomes so as to make them better account for societal interests. The societal interest at stake is specified as ethical acceptability (Von Schomberg) or alignment with societal values (European Commission) and societal desirability (Von Schomberg) or alignment with the needs and expectations of society (European Commission). Von Schomberg also separately mentions sustainability as a goal, whereas the European Commission leaves this goal implicit. It is clear that societal desirability can be cashed out in terms of the kinds of issues that governments and political parties are concerned with, such as improving welfare and living standards, employment, a good educational system, good healthcare, and protection of the environment.

Apart from being characterised by a proactive approach to social benefits in R&I, RRI also has as a distinguishing feature the *involvement of societal stakeholders* in R&I. To help ensure that R&I becomes more driven by demands from society, it is believed, there should be a consistent, ongoing involvement of society, from the beginning to the end of the innovation process, with an effort to create collective agendas and distribute responsibilities. This involvement should include all stakeholders, including civil society and the general public, and should include deliberative processes of mutual dialogue, knowledge sharing and learning. This process of including stakeholders is called *engagement*. However supporting activities from governments for using available information regarding scientific results are often absent (Inzelt – Csonka 2014).

A third characteristic of RRI is inclusion of *anticipation and reflection*. To better include societal values and needs in R&I processes, there must be processes of anticipation and assessment of impacts, benefits and risks of R&I processes and products, so that informed choices and prioritizations can be made at an early stage. There should be iterative processes of learning about impacts and benefits along the entire R&I chain that should include all stakeholders. In this way, social values and needs can effectively be included in R&I processes next to technical and commercial considerations.

A fourth and final characteristic is *multi-stakeholder governance*. RRI calls for new approaches to governance. Classical approaches, in which governments regulate R&I and focus on risk assessment, are no longer valid. New governance models focus on stakeholder engagement in R&I, involving multi-stakeholder governance models that include collective responsibilities for outcomes, voluntary accountability mechanisms, mechanisms for anticipatory governance, and greater reflexivity and responsiveness. In multi-stakeholder governance, different actors, including governmental regulators, industry, universities, NGOs, funders, and others, engage together in collective responsibilities for and governance of R&I.

In the context of science parks, the most important actors are governments,
private companies and universities. Governments, national or local, promote the public interest and general welfare, and in this context they have a responsibility to help ensure that the actions of these actors have social benefits, conform to standards of ethics, include stakeholder engagement, anticipation and reflection, and employs multi-stakeholder governance. They also have an interest to promote the economy, which involves not placing unnecessary burdens or restrictions on private industry. Private companies usually have a profit motive, but many aim to make a positive contribution to society as well, and it is increasingly in the interest of companies to be seen by clients and other stakeholders as responsible corporate citizens that help solve problems in society rather than causing them. To this effect, many companies have developed strategies of corporate social responsibility (CSR), which is corporate self-regulation aimed at adherence by the corporation to ethical standards and social norms and expectations, and often also to create clear benefits for society. Universities are actors that science parks rely on for scientific knowledge and innovative ideas. Most universities are publicly funded, and as such have a responsibility to contribute to the public interest, mostly through the production of new knowledge and ideas.

Our study therefore will focus on current strategies of governments and private companies to give shape to RRI in the operations of science parks. We will focus on the role of government in developing laws, regulations, frameworks, and incentives for RRI in science parks, and on the role of private companies in these parks in developing CSR strategies for R&I. To the extent that the management of science parks is separate from both government and the private companies that participate in them, we will also study their actions and responsibilities.

Science Parks

There is no uniform concept description of “science parks” in professional literature. What initiatives are labelled by science and development policies with this term changes from country to country. Extremely different development policy means are often also put under the “science park” umbrella term, making even more difficult to provide a clear and precise definition (EC 2007). For example the French technopole approach is frequently labelled as science park however it is a far bigger initiative. Mostly it comprises a complete settlement with research institutions, industrial and residential sites (Oh 1995). On the other hand, business parks are sometimes also referred as science parks but mainly these parks just provide high quality infrastructure without having close connection to a research centre or a university (EC 2007).

Due to the large number of definitions and the difficulties around offering an accurate description, this study does not select any particular definition. Instead, we compared the most often used definitions and identified their points of intersection (Gyurkovics and Lukovics 2014). Based on the definitions examined, four elements could be distinguished that are present – explicitly or implicitly – in all of the definitions: the importance of geographical proximity and the (physical) environment; partnerships with knowledge-creating institutions, universities; encouragement of knowledge/technology transfer; encouragement of the creation of new businesses (incubation services). The importance of geographical proximity and partnership with knowledge-creating institutions refer to the necessity for firms to...
be physically close to knowledge creating institutions and other firms in order to exploit the positive effects of knowledge spillovers (Colombo and Delmastro 2002). Proximity to research centres or universities provides firms located in a park easier access to scientific expertise and research results which facilitates their innovative activities. Jaffe (1989) and Acs and his co-authors (1992) find that spillovers from university research supported the innovative activity of local firms (Colombo and Delmastro 2002).

Using these as a starting point and building on the research results of Capello and Morrison (2009), four functions could be defined which a science park can fulfil in its region’s economic system. These functions are the followings: (i) the technology transfer function, i.e. mediating advanced technologies and supporting their dissemination, (ii) the knowledge creating function, i.e. the encouragement of the innovation activity, (iii) the "seedbed" function, which plays a decisive role in the creation of a special environment, and (iv) the incubation function, i.e. the encouragement of the creation of new technology-intensive businesses. Which of these functions is more dominant is strongly determined by the profile of the given science park and the identity and motivations of its owners. The above-mentioned authors highlight the fact that science parks, as understood in the traditional sense (i.e. a real estate development in a given geographical region, where enterprises, research centres and universities are gathered), can fulfil all of these functions at a high level, with the exception of technology transfer (Capello and Morrison 2009).

Through their functions described above, science parks, being spaces of innovation, may do a lot for the translation of the responsible innovation concept into practice. They collect a region’s main research and innovation results, gather players needing similar knowledge elements, stimulate two-way knowledge flows (Link 2009) and enhance university students’ chances for local employment, i.e. the local utilisation of special expertise. And this kind of innovation spirit may play a role in adopting the practice of responsible innovation. It seems from the above that the primary roles of science parks are the collection of players (supporting the creation of knowledge intensive businesses and attracting such organisations to the given region) and the facilitation of innovation processes (stimulating businesses’ innovation activities). However, the creation of new and the channelling of existing knowledge depends first and foremost on the members of science parks and, among them, primarily on universities. In summary, the concept of responsible research and innovation can be carried over to the operation of science parks and, through them, going forward, into the wider region’s attitude, with the assistance of universities.

The results of studies on connections between universities and science parks scatter over a very wide range (Vedovello 1997; Hansson, Husted and Vestergaard 2005). However, none of the studies on this topic states that these connections could be ignored. Moreover, it is exactly the network of relations with universities that to a great extent determines the successfullness of science parks. As their innovation approach gets more sophisticated (“science push” being replaced by “interactive”), the efficient operation of these connections is even more strongly needed. At the same time, the nature of these relations should be clearly understood: in most cases, the main attraction to businesses is highly qualified human resources (Andersson, Grasjö and...
Karlsson 2009) or informal relations, rather than contracted research projects or technology transfer contracts (Vedovello 1997).

Colombo and Delmastro (2002) and Löfsten and Lindelöf (2001) found that firms located in a science park are more likely to have connections to local universities or other firms than firms outside the park. It is also noted that knowledge sharing, which is necessary for the process of innovation, is faster among firms in close geographical proximity (e.g., in a science park). (Chan and Lau 2005). Siegel Westhead and Wright (2003) assessed the impact of university science parks on research productivity in the UK. They found that firms located inside a park have higher research productivity than firms not located on a science park. In their study regarding Spain, Diez-Vial and Fernández-Olmos (2015) also found that firms cooperating with universities and/or research institutions inside a science park would have a higher innovation performance (in case of product innovation). They also emphasize that even though firms that establish research cooperation with universities would have a higher innovation performance, but belonging to a science park would intensify these benefits.

In most cases, the creators and owners of science parks are universities (IASP 2012). Consequently, the profile and level of development of a university can be a decisive factor in the success of a science park. It makes a huge difference what field of science the institution with which the park and its businesses cooperate excels in. Basic and applied research results achieved in engineering, IT, life and natural sciences are more important for the success of a science park than the performance of other fields of science (Perkmann et al. 2013). Thus, through the geographical concentration of the businesses of these fields of science, with a consciously managed RRI policy, science parks can be truly powerful focus points of the efforts made for responsible innovation – in which universities, being opinion leaders, take the key role.

**RRI efforts in science parks**

Science parks, being one institutional form of producing innovation results, can play a crucial role in the dissemination and practical application of the theory of responsible research and innovation. In this way it is very important to identify, who are the leaders of RRI efforts, what kind of motivations of innovators exists and which is the dominant third-mission operating mechanism of the universities involved.

Being one of the most influential actors in science park formation, in most cases the RRI efforts might be led by the university, which also operates as the parks’ scientific base (Gyurkovics and Lukovics 2014). However, science park development always requires a multidimensional approach hence businesses and government might also support the RRI efforts in the park. This might be also supported by the change occurred in the innovation approach. While in the linear innovation process relations between players are practically one-way ones and are usually dominated by one of the two parties, the interactive innovation approach enables the timely detection and management of any negative impacts of innovations, through feedbacks. Owing to the players’ mutual dependence and continuous communication, RRI efforts may be initiated not only by the academic sector but by a wide range of players connected to the science park. Still science parks might encounter the concept of responsible innovation primarily through
the university’s scientific base: universities can have a significant influence on science parks’ members not only in the field of technology innovations but also in the dissemination of novel concepts.

The motivations of a park’s innovators to learn and adapt the concept of RRI might depend on the aims of the science park. Namely, a science park which aims to be well integrated in its region and set the aim of improving the welfare of the local community, which cannot be limited to merely improving the financial standards of life, might facilitate internal motivations at its residents (Gyurkovics and Lukovics 2014). That is, no strict regulations incite residents of a science park to integrate RRI approach to their normal operation but being in a special environment where other actors do business in line with this approach might facilitate this uptake internally. In this case, aspects other than financial matters (e.g. the improvement of efficiency resulting from innovations should not lead to a drastic decrease in employment or, if so, the company should have a predefined plan to handle such a situation) might get taken into account in the course of innovation processes, as the players’ internal motivation.

Since universities are perceived to be crucial actors in science park formation and operation it might be useful to study the dominant type of universities in a science park (Gyurkovics and Lukovics 2014). In the beginning, parks functioned as the point of collection of universities’ research results – as a kind of extension of the university structure – and that required entrepreneurial activities also on behalf of universities. Consequently promoting RRI was also a part of universities’ entrepreneurial activity portfolio (in certain cases, this is integrated into the selection policy of the science park created by the university). However as their aim have been extended by the improvement of the welfare of the local community the engaged university model, in which both the park’s players and the university work for the development of their wider territory, might prevail. And this engaged approach might broaden the set of intervention tools (e.g. policy recommendations for a particular RRI or education about the RRI concept and its carryover to the park through the workforce educated on the matter).

The way in which the inclusion of RRI is handled in the development of general objectives, organizational structure and policies for parks will be partially determined by the general business plan for the park, and will be constrained by local and national regulations. In addition, decisions at the operational and tactical level will determine how RRI topics will be dealt with. The general objectives and organization of a park are important determinants for the way in which attention to issues of RRI are included in the general orientation of the park, and the effectiveness by which they can be approached. The objectives as codified amongst others in a mission statement are important because they reveal whether attention to RRI issues is part of the core orientation of the park. Even if they are not explicitly mentioned there, there may be other instruments present that give shape to such objectives, such as ethics codes or guidelines or a corporate social responsibility strategy, or divisions or officers that are supposed to give shape to these instruments.
One can discern six sets of RRI issues that are specific to science parks. One set of RRI issues includes the interaction between parks and universities: how is integrity and responsibility maintained in this interaction, and how is transparency, objectivity and intellectual property rights guaranteed for publicly funded research? Another set of RRI issues concerns the interaction between parks and the local community: how are the interests and rights of members of the local community taken into consideration in the actions and policies of the park? A third set concerns the interaction with other enterprises, including both clients and businesses who want to become part of the park: is selection of clients and candidate enterprises fair and non-discriminatory, and are any RRI criteria set for prospective clients or businesses in the park? A fourth set concerns the general social and environmental impact of the operations of the park on society: is there a vision on the desired impact, and are there policies to prevent undesirable impacts?

A fifth set concerns the development and maintenance of the material infrastructure of science parks. The very design of the infrastructure for a park involves important choices regarding its location, the materials and energy sources used in the construction of infrastructure, and the processing of waste and pollutants. The choice of location is important in the light of RRI, since some locations will have a more negative effect on the local social and physical environment than others. The use of materials and energy sources is important from an environmental point of view: how much attention is given to sustainability in the design of material and energy infrastructure. Similarly, are pollutants prevented or neutralized, or are they disseminated into the environment? The very architecture of a park will already have major consequences for these kinds of issues. In addition, policies for its operation, and regulations for its businesses, will also determine to what extent negative environmental and social impacts of the park is mitigated. Moreover the construction of a science park is a very significant investment commonly financed by public funds. So a transparent selection procedure is necessary during which certain points of RRI can be included. In this way it is possible to choose a construction company that operates according to certain RRI dimensions.

A sixth and final set of RRI issues concerns support for or regulation of CSR for business in the park. The management of science parks is in a unique position to take on a leading role, both in requiring, stimulating and facilitating CSR efforts of companies in the park. CSR strategies and compliance to relevant laws and regulations require efforts from companies that not all are equally able to undertake, especially small and medium-sized companies. The management of a park could provide guidelines, support, information and advice for companies regarding their CSR strategies. Even more so, parks could enhance their branding by requiring high overall CSR standards from their businesses, thus promoting a positive public image.

It is clear from the preceding section that in science parks RRI topics are often made part of their objectives and general operation. Science parks, by their very nature, include multi-stakeholder models of governance. In addition, many parks have a CSR strategy that requires or stimulates the incorporation of stakeholders, the consideration of ethical issues, and the inclusion of anticipation and reflection. The way extent to which these topics are taken into account varies greatly.
Sometimes stakeholder inclusion is a very selective process that does not include all relevant stakeholders from a societal point of view. And sometimes attention to ethics and anticipation and reflection is quite minimal.

Let us now finally consider the question of responsibility for shaping RRI in science parks: who is responsible for it, and what actions may society expect of them?

In contemporary science parks, which are often co-operated by universities, business and local government together, there is clearly a shared responsibility to address RRI issues by two (usually) publicly funded types of organizations, universities and local governments, who are supposed to represent the public interest, and privately funded businesses who represent private interests, but who can also be expected to behave as responsible corporate citizens. In this alliance, one should expect serious attention to RRI both as something that is stimulated at the science park management, and that is taken up by businesses that operate in the science park.

Conclusion

This paper aimed to apply the concept of Responsible Research and Innovation (RRI) to science parks. After an introduction of the notion of RRI, an analysis was provided of science parks, their aims, organization, management, and approach to innovation. Next, it was studied how science parks currently incorporate RRI in their operations.

Having analysed strengths and limitations in current approaches, an analysis was then made of the main RRI issues facing parks, and it was studied how such issues could be faced by them in corporate social responsibility (CSR) strategies. A distinction was made between classes of RRI issues, those of a general nature, those pertaining to the construction and operation of the material infrastructure of the park, and those pertaining to the regulation and operation of individual businesses in the parks. For each, RRI issues were identified, and responsibilities were proposed, both depending on the particular type of park that is at issue. It was concluded that science parks have responsibilities for RRI that derive from the public sector role of universities and governments, and from the corporate responsibility of the business sector.

These responsibilities entail that RRI issues are addressed in the mission of science parks, that overall strategies for CSR are developed, that local stakeholder interests and environmental consequences are taken into account in the construction and operation of science parks, that the special role of universities as providing publicly funded knowledge and ideas is expected, and that for individual businesses in the parks attention is paid to guidelines, support, information and advice regarding their CSR strategies.

References


Investigating the intention to create spin-offs in higher education

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Abstract

In the recent decades academic entrepreneurship has gained an increasing attention in the literature since universities had been engaging in the commercialization of the scientific results. But there is still a lack of studies investigating the role of individual scientists in the transition of universities to become entrepreneurial universities and even studies focusing on Central European countries.

We use Theory of Planned Behavior for determining the influencing factors of entrepreneurial intention. In 2015, we conducted a survey (N=660) among researchers at Hungarian Higher Education Institutions. We found that those scientists who have positive attitudes, are encouraged by the social environment and feel control over entrepreneurial activity, are tend to establish spin-off company for commercializing their research results, and vice versa. Furthermore, previous entrepreneurial experiences, industrial embeddedness and the ability of covering the expenditures of spin-off creation also foster entrepreneurship. While two-third of the respondents would commercialize their research results if they got possession of commercializable invention, there is only a small proportion of academics (9%) who are actually planning it. Thus, the lack of commercializable research results and/or the ability to evaluate commercial potential of scientific results could be also relevant barriers of spin-off creation.

Keywords: spin-off company, intention, higher education, theory of planned behavior, researcher

Introduction

In recent decades university entrepreneurship has gained an increasing attention in the literature [1], [2], [3] due to their role in the regional development [4], in technology development [5], [6] and in spin-off creation [7]. However, academic spin-offs are rare entities, they can contribute to the economic development and to the additional income generation for universities [8].

In 1980, the United States legislation passed the Bayh-Dole act which facilitated the transition of traditional universities to entrepreneurial ones. The act allowed universities to commercialize their intellectual properties arising from federal government-funded research [8]. Although the Bayh-Dole Act was a fundamental milestone of the transition, there had been other factors as well fostering universities’ patenting and licensing activity [9]. As a result, universities were engaging in entrepreneurship not only in the United States, but also in Europe [10] in order to bring university technologies to the market [11]. The transition to the entrepreneurial university poses challenges [12], which make difficulties for universities corresponding to the new role [13]. Furthermore, the participation of academics in the commercialization of university knowledge is crucial.
due to the tacit knowledge possessed by the inventors [14]. As the previous authors highlighted – we also believe that scientists play important role in the development of entrepreneurial university. Therefore we put our research focus on the individuals and investigate their entrepreneurial attitudes and intentions in the Hungarian context. Although entrepreneurial intention may reflect a wide range of entrepreneurial pursuit [15], we put it into the academic context and perceive it as intention to commercialize scientific results in spin-off company as other scholars did [16].

Foreign studies have revealed various motivations that can influence academics’ entrepreneurial activity. Personal income is one of the well discussed motivation factor, there are evidences of expected financial gain can motivate researchers [17], but other result [16] suggest only indirect effect between financial gains and entrepreneurial intentions. This supposes that the expected personal earnings exert direct effect only on the attitudes towards entrepreneurial activity that has direct impact on entrepreneurial intention [16] while many scientists are motivated in enhancing their academic standing instead of profits [18]. In addition, expected reputational gain usually does not motivate scientists in their entrepreneurial activity [16]. The latter can be explained by that entrepreneurial activity does not always yield additional reputational gain to the researchers in the scientific community. Another motivational factor is the desire to bring discoveries to the market which has been proven important in researchers’ motivation [19] while some young scientists create spin-offs in order to escape the bottlenecks of the academic system and work on the field of their expertise [20]. Hungarian studies also investigated motivational factors among scientists that emphasize the importance of financial incentives due to the low salaries in the academia [21] which was also remarkable among young researchers [22]. These studies could not prove the significance of career-related motivations in general.

Some authors emphasize that the commercialization of university knowledge may divert scientists from fundamental research activity [23] and can restrict information flow among scientists [24], which is contrary to the norms of open science. Significant obstacles of entrepreneurial intentions can be scientists’ workload (teaching and research) and personal circumstances [16]. Although most of the scientists have positive attitude towards knowledge and technology transfer in general, they do not prefer entrepreneurial activity as a form of knowledge transfer [25]. However those researchers, who are motivated mainly by the commercial potentials of entrepreneurial activity, are more likely to take part in spin-off creation [26]. In addition, other authors argue for the possible positive effects of commercialization which may yield additional benefits for the academics, like increased publication performance, defining new research agendas with industrial partners or increased cooperation between research groups [27], [28] [29], [30].

Despite of the increasing amount of studies investigating university entrepreneurship in the United States and in Western Europe, there is still lack of studies in Central Europe. A Hungarian [31] study concluded that there is a lack of motivation (motivation gap) towards entrepreneurship, which pulls back researchers from spin-off formation. If some researchers are enthusiastic, they still have to face with the lack of competence (competence gap) in commercialization and lack of confidence (confidence gap) from industrial partners. Another study in Hungary emphasizes the role of department in engaging in the technology transfer, while the spin-off creation is mainly influenced by the entrepreneurial attitude and previous working experience [32].
According to the literature review, in this study we investigate the influence of previous experiences (entrepreneurial experiences and industrial embeddedness), scientists’ abilities (independence) and commercial potential of spin-off creation (commercial prospects) that will be demonstrated in the research method and research results.

Research method

The present study was carried out among academics in order to better understand the influencing factors of spin-off creation intention. In order to investigate our presumptions, a questionnaire has been developed based on literature review [33] and on a previous qualitative study conducted with 21 scientists in 2014 [34]. In the following sections we introduce the research method and the hypothetized model of intention to commercialize research results in spin-off company.

Interpreting the TPB model

Our investigation aims to determine the potential factors that can have impact on academics intention towards spin-off creation. In order to gain more insight about the Hungarian case, we use Theory of Planned Behavior (hereinafter TPB model) for investigating the potential influencing factors of spin-off creation. The TPB model is widely used [33], [35], [36] as a theoretical framework for predicting behavior in psychology and other scientific fields. In recent decades the researches on entrepreneurship also adopted this conceptual model for investigating entrepreneurial activity [16], [15], [37]. The theory supposes that the intention towards certain behavior (intention) is affected by the attitudes, subjective norms and perceived behavioral control related to the given behavior. The model also measures the linkage between the intention and the behavior as well. The predicting factors (attitudes, subjective norms, perceived behavioral control) are usually constructed from at least 2-3 variables.

The concept of the TPB model allows us to investigate the predefined psychological factors of TPB model and other entrepreneurship-related factors at the same time that is the extension of the model. Figure 1 summarizes the conceptual model built on the Theory of Planned Behavior and the potential influencing factors of spin-off creation.

Figure 1: Conceptual model of entrepreneurial intention
Data collection

The data collection has been done at 20 higher education institutions which represent all institutions that meet the following criteria. Two principles were taken into consideration during the collection of contact information that was carried out at the departments’ websites. Firstly, the scientific field represented at the department had to be relevant to life sciences, natural sciences, engineering or agriculture, while departments relating to arts (e.g. literature, history, etc.) were excluded in our survey. Secondly, the personnel listed on the websites had to have relevant research activity like full professors, associate professors, assistant professors, assistant lecturers, PhD students; or who held research-related positions (e.g. research fellow or head of research) according to the websites. Others were excluded, like assistants, technical staff and administrators. Finally, 7,967 relevant e-mail addresses were collected. We used EVASYS web-based survey system for collecting responses and in 2015, we have received 660 responses from the approached scientists (response rate: 8.3%).

Hypotheses

In our study we test two hypotheses relating to the spin-off creation. Taking the psychological assumptions of Ajzen (1991), we suppose that the basic factors of the TPB model, namely the attitudes, subjective norms, and perceived behavioral control all have significant influence on the spin-off creation intention (Hypothesis 1).

Hypothesis 1: Attitudes, subjective norms and perceived behavioral control towards patenting have significant influence on the spin-off creation intention.

Testing the results of previous studies and our qualitative research we investigate the impact of the following factors on spin-off creation intention. Therefore we suppose these presumptions in our study:

Hypothesis 2: The entrepreneurial experiences and industrial embeddedness play important role in scientists’ spin-off creation intention.

Hypothesis 3: The scientists’ independence plays important role in scientists’ spin-off creation intention.

Hypothesis 4: The perceived commercial prospects influence scientists’ spin-off creation intention.

This model allows us to test the Theory of Planned Behavior in the Hungarian context and investigate what other factors have impact on spin-off creation intention.

Measurement

In the Theory of Planned Behavior we measured attitudes, subjective norms, perceived behavioral control and intention with 5-point Likert scales ranged from 1 (not agree at all) to 5 (fully agree), where respondents had to mark whether they agree or not with the statements. The statements were constructed based on guidelines of the TPB model [33], [38], [39]. Entrepreneurial intention was measured with the following statement on a 5-point Likert scale: I plan to create spin-off company within 1 year for the commercialization of my scientific results. Regarding the potential influencing factors, in some cases we used the previous 5-point Likert scales and in other cases we let researchers to decide whether the given statement has positive or negative content. The statements were
collected through the qualitative study in 2014 where 21 researchers have been interviewed and provided basis for the potential influencing factors [34].

Research results

In this section we demonstrate the research results including the descriptive statistics, the method of creating the factors and the impact of the investigated constructs on the entrepreneurial intention.

Descriptive statistics of our survey

According to the respondents, most of the scientists expressed rather negative attitude towards entrepreneurship (see Appendix 1 and Figure 2). Regarding the attitudes towards entrepreneurship, the importance of commercializing research results in spin-off company is balanced among scientists ($m_{(A1)}$: 2.8; $m_{(A2)}$: 3.0, see Figure 2), while they express higher willingness (64% expressed positive opinion) to do so if they got possession of commercializable research result ($m_{(A3)}$: 3.7). Unfortunately, academics perceive few encouragement from social environment, like family, friends ($m_{(SN1)}$: 2.6) and peers ($m_{(SN2)}$: 2.6), and just a few are encouraged by the university management which should promote the transition to entrepreneurial university ($m_{(SN3)}$: 2.2). About every fourth of the respondents stated that they receive encouragement from family members (25%) and peers (27%), while university management seems to be less promoter (15%). In case of behavioral control, academics do not feel high control over the spin-off creation ($m_{(PBC1)}$: 2.4; $m_{(PBC2)}$: 2.7). Only a small proportion of scientists (9%) plan to commercialize their research results through spin-off creation/operation within 1 year ($m_{(INT)}$: 1.7).

Figure 2 Means of variables of Theory of Planned Behavior
More than half of the researchers stated that (see Appendix 1 and Figure 3), they do not possess appropriate industrial relations and are not familiar with support organizations. Only a small proportion of scientists have any experience in spin-off creation/operation (16%) or possess entrepreneurial competences (15%). Moreover only 5% of researchers believe that the commercialization of university research results is easy contrary to 64% of them who find it difficult. We can conclude that these results depict an unfavorable environment for entrepreneurial activity.

According to the results, academics do not have huge experiences in spin-off creation/operation (m: 2.0; only 17% of respondents have huge experiences) and neither possess appropriate entrepreneurial competences (m: 2.3). The respondents rated their industrial network stronger (m: 2.8) while they are not really familiar with technology transfer organizations (m: 2.4). We were interested in how much support they need from the university, regarding business expertise and financial resources. As the results show, academics expect more support of business expertise (m: 2.3) than financial sources (m: 2.8). More or less, scientists believe that commercialization can contribute to become rich (m: 3.3, 51% of respondents believe that), while they find commercialization at university really difficult (m: 2.2; only 12% of them perceive commercialization easy).

Figure 3: Means of variables of potential influencing factors
Impact of the investigated factors on intention

The three main factors of the TPB model are attitude, subjective norms and perceived behavioral control. Each category was measured with 2-3 statements (Table 1).

We measure the Attitude factor with statements relating to the importance of spin-offs in the scientific field represented by the researchers, to the importance of spin-off creation for the individual and to the willingness of creating spin-off if the scientific results can be commercialized. Regarding the Subjective norms factor, the impact of family and friends, other scientists whose opinion matters for the respondent and the university encouragement were investigated. We assume that these three groups of stakeholders can have impact on spin-off creation intention. Finally we wanted to better understand how much the academics feel control over the freedom of spin-off creation at the university and control over the competitiveness of the spin-off company led by the scientist (Perceived behavioral control factor).

According to the principles of the TPB model we test the internal consistency among the variables. We use Cronbach’s Alpha for the estimation of reliability among the variables by each factor. In our predefined constructs we expect the internal consistency among the given items. As Table 1 demonstrates, the items of the Attitude factor (Cronbach’s Alpha: 0.811), the Subjective norms factor (Cronbach’s Alpha: 0.787) and the Perceived behavioral control factor (Cronbach’s Alpha: 0.706) pertain to the corresponding constructs and each factor can be applied for further investigation (we applied the following acceptance criterion: 0.7<α<0.9: good internal consistency). These results confirm the validity of the constructs developed.

Table 1: Reliability statistics of the variables within the TPB model

<table>
<thead>
<tr>
<th>Factors</th>
<th>Variables</th>
<th>Mean (5-point likert scale)</th>
<th>Reliability statistics (Cronbach’s Alpha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitudes</td>
<td>Commercialization of research results through spin-off creation plays key role in my scientific field.</td>
<td>2.8</td>
<td>0.811</td>
</tr>
<tr>
<td></td>
<td>The commercialization of research results through spin-off creation is important for me.</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>If I got possession of commercializable research results, I would commercialize it through spin-off creation.</td>
<td>3.7</td>
<td></td>
</tr>
<tr>
<td>Subjective norms</td>
<td>My family and friends encourage me to commercialize my research results through spin-off creation.</td>
<td>2.6</td>
<td>0.787</td>
</tr>
<tr>
<td></td>
<td>Those researchers, whose opinion matters for me, encourage me to commercialize my research results through spin-off creation.</td>
<td>2.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The university management encourage me to commercialize my research results through spin-off creation.</td>
<td>2.2</td>
<td></td>
</tr>
<tr>
<td>Perceived Behavioral control</td>
<td>If I wanted to commercialize my research results through spin-off creation, I can freely commercialize it at the university.</td>
<td>2.4</td>
<td>0.706</td>
</tr>
<tr>
<td></td>
<td>Whether I commercialize my research results through spin-off creation or not is entirely up to me.</td>
<td>2.7</td>
<td></td>
</tr>
<tr>
<td>Entrepreneurial intention</td>
<td>I plan to create spin-off company within 1 year for the commercialization of my scientific results.</td>
<td>1.7</td>
<td>1.0</td>
</tr>
</tbody>
</table>
According to the literature review and our previous qualitative study we investigated different variables, which may have impact on scientists’ spin-off creation intention at Hungarian universities. In this study 8 variables and their relationship with entrepreneurial intention were analyzed (Table 2).

In order to create factors from the variables that can have impact on entrepreneurial intention we conduct Principal Component Analysis (Table 2). The analysis suggests that, three factors can be constructed from the 8 statements in our model. Firstly, *Entrepreneurial experiences and industrial embeddedness* consists of the scientists’ previous entrepreneurial experiences and the appropriate competences possessed by the individual while appropriate industrial relations and the awareness of support organizations also play important role in this factor. The second factor is the *Independence* which reflects on whether scientists would need expertise or financial support from the university or not. *Commercial prospects* of entrepreneurship means that those scientists who see lower rate of commercial prospects of entrepreneurial activity, find it difficult to commercialize university research results and do not believe in getting rich from entrepreneurship. The opposite is also true, in case of high commercial prospects scientists believe that commercialization of research results and getting rich from entrepreneurial activity is easy.

**Table 2 Rotated Component Matrix**

<table>
<thead>
<tr>
<th>Factors</th>
<th>Entrepreneurial experiences and industrial embeddedness</th>
<th>Independence</th>
<th>Commercial prospects</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have EXPERIENCE of creating/operating spin-off company.</td>
<td>.764</td>
<td>0.445</td>
<td></td>
</tr>
<tr>
<td>I possess appropriate entrepreneurial COMPETENCES.</td>
<td>.767</td>
<td>0.453</td>
<td></td>
</tr>
<tr>
<td>I possess appropriate INDUSTRIAL RELATIONS.</td>
<td>.729</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am familiar with those organizations that can provide assistance in patenting and spin-off creation.</td>
<td>.732</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I... (would need/ would not need) ...support of business expertise from the university in order to operate the spin-off company successfully.</td>
<td>.807</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I... (could/could not) ...afford the costs related to spin-off creation without the financial support of the university.</td>
<td>.699</td>
<td></td>
<td></td>
</tr>
<tr>
<td>University scientists... (cannot get/can get) ...rich from the entrepreneurial activities.</td>
<td>.647</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The commercialization of research results at universities through spin-off companies is... (difficult/ easy).</td>
<td>.811</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 4 iterations.
In this section we investigate the relationships between the determined factors and entrepreneurial intention in order to unfold significant linkages within the model. Firstly, the TPB model will be tested, then the potential influencing factors.

In the TPB model we assumed that the attitude, subjective norms and perceived behavioral control have impact on the entrepreneurial intentions. In previous sections we provided evidence of the internal consistency of the TPB model’s factors (Table 1). Considering the relationships between the TPB factors and entrepreneurial intention we can conclude that each factors (\( r_A: 0.452**; r_{SN}: 0.372**; r_{PBC}: 0.199** \)) have significant relationship with entrepreneurial intention as expected by the theory (Figure 3). In one hand these results contribute to the presumptions that these factors exert influence on intention, on the other hand the model is seem to be applicable in the Hungarian context. Based on the results Hypotesis 1 is accepted.

We assumed that the determined potential influencing factors also have impact on entrepreneurial intention (Hypothesis 2-4). According to the results, only Entrepreneurial experiences and industrial embeddedness (\( r: 0.304** \)) exert remarkable influence on intention, while Independence (\( r: 0.167* \)) and Commercial prospects (\( r: 0.161* \)) have been proven significant, but express weak influence in this context. According to these results these hypotheses (H2, H3, H4) are also accepted – these influencing factors play important role in entrepreneurial intention –, but the weight of their influence differ (Figure 4).

**Figure 4: Spearman correlations**
Conclusions

In our study we investigated the determining factors of entrepreneurial intention in a Central European country at four scientifically respected universities. As we have seen, scientists express rather negative attitude towards academic entrepreneurship views. Only a small proportion of researchers (9%) plans to engage in commercialization of research results through spin-off creation. This result is in line with recent studies [16], [32], [31] which suggest that there are a small group of scientists (12%) calling them „repeat commercializers” who take part in technology transfer and who invent 80% of the university technologies [38]. But this rate is still quite low. Remarkably, almost two-third (64%) of the respondents in our study would commercialize their research results through spin-off creation if they got possession of usable invention. This result gives rise to hope.

According to the results we can suggest that, those scientists, who have positive attitude towards entrepreneurship, who receive encouragement from social environment and feel control over spin-off creation are tend to create spin-off companies for commercializing his research results. We extended the TPB model with potential influencing factors and found previous entrepreneurial experiences and industrial embeddedness significant in connection with entrepreneurial intention that reflects on experiences, appropriate competences in entrepreneurship, furthermore possessing industrial relationships and being familiar with support organizations that can provide assistance during patenting and spin-off creation. The other two constructs have been proven also significant in entrepreneurial intention, but exert less influence. Those researchers who can afford the expenditures of spin-off creation are rather tend to establish spin-off company than who does not possess enough financial resources to do it. In one hand these factors can trigger entrepreneurial intention in case of positive opinions, but on the other hand those scientists who do not feel competent or do not possess industrial relations will not commercialize research results through entrepreneurial activity. These results contributed to the literature and extended our knowledge in entrepreneurship from a Central European perspective.

Our study gains significant insights since the data collection was carried out at all of the relevant Hungarian Higher Education Institutions. Due to time constraints we could not test whether the entrepreneurial intention trigger entrepreneurial activity (behavior) or not, therefore the results should be interpreted carefully.

Acknowledgement

This work was partially supported by the European Union and the European Social Fund through project (grant no.: TÁMOP-4.1.1.C-12/1/KONV-2012-0004).

References


[34] Huszár S., Prónay Sz., Buzás N.


**Brief biographies of the authors**

**Sándor Huszár**

Sándor Huszár is an assistant lecturer of Faculty of Economics and Business Administration and research fellow of the Knowledge Management Research Center at the University of Szeged. Sándor Huszár has also gained practical experiences in the field of technology transfer as marketing manager at the Directorate for Research, Development and Innovation. His research interest focuses on possible business utilization of R&D activities and researchers’ motivation and expectations in connection with technology transfer from the individual’s perspective.

**Szabolcs Prónay, Ph.D.**

Szabolcs Prónay Ph.D., is an assistant professor at the Institute of Business Studies of the Faculty of Economics and Business Administration at University of Szeged. Dr. Prónay also worked as marketing manager for the Directorate for Research, Development and Innovation. He works as a marketing consultant for several business and management consulting firms. He is a founding member of Innovation Club at the University. His research interests include consumer behaviour, knowledge management and Science to Business (S2B) marketing.

**Norbert Buzás Ph.D., MBA**

Norbert Buzás Ph.D., MBA is former director of Directorate for Research, Development and Innovation at Universi-
ty of Szeged. Now, he is the head of the Knowledge Management Research Center and the head of Institute of Health Economics. Dr. Buzás started his career as research fellow working at the University of Szeged, Technical University of Vienna, VUB University of Brussels and the University of Palermo. He has served as intellectual property director of a biotech company for six years and director of professional operation at largest private Hungarian business acceleration company. Dr. Buzás has 90 publications including 20 books and book chapters.
Appendix 1: Descriptive statistics of the variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Valid</th>
<th>Missing*</th>
<th>Total</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Frequencies by responses (on a 5-point likert scale)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercialization of research results through spin-off creation plays key role in my scientific field.</td>
<td>404</td>
<td>256</td>
<td>660</td>
<td>2,8193</td>
<td>1,33646</td>
<td>96 66 106 87 49</td>
</tr>
<tr>
<td>The commercialization of research results through spin-off creation is important for me.</td>
<td>427</td>
<td>233</td>
<td>660</td>
<td>2,9766</td>
<td>1,31956</td>
<td>88 57 114 113 55</td>
</tr>
<tr>
<td>If I got possession of commercializable research results, I would commercialize it through spin-off creation.</td>
<td>420</td>
<td>240</td>
<td>660</td>
<td>3,6762</td>
<td>1,25882</td>
<td>42 30 80 138 130</td>
</tr>
<tr>
<td>My family and friends encourage me to commercialize my research results through spin-off creation.</td>
<td>412</td>
<td>248</td>
<td>660</td>
<td>2,5558</td>
<td>1,30479</td>
<td>135 45 132 68 32</td>
</tr>
<tr>
<td>Those researchers, whose opinion matters for me, encourage me to commercialize my research results through spin-off creation.</td>
<td>406</td>
<td>254</td>
<td>660</td>
<td>2,6305</td>
<td>1,28676</td>
<td>118 54 124 80 30</td>
</tr>
<tr>
<td>The university management encourage me to commercialize my research results through spin-off creation.</td>
<td>404</td>
<td>256</td>
<td>660</td>
<td>2,2030</td>
<td>1,20314</td>
<td>165 70 107 46 16</td>
</tr>
<tr>
<td>If I wanted to commercialize my research results through spin-off creation, I can freely commercialize it at the university.</td>
<td>315</td>
<td>345</td>
<td>660</td>
<td>2,4222</td>
<td>1,32449</td>
<td>108 66 70 42 29</td>
</tr>
<tr>
<td>Whether I commercialize my research results through spin-off creation or not is entirely up to me.</td>
<td>356</td>
<td>304</td>
<td>660</td>
<td>2,7191</td>
<td>1,40011</td>
<td>94 75 79 53 55</td>
</tr>
<tr>
<td>I plan to create spin-off company within 1 year for the commercialization of my scientific results.</td>
<td>411</td>
<td>249</td>
<td>660</td>
<td>1,7056</td>
<td>1,13629</td>
<td>274 37 63 21 16</td>
</tr>
<tr>
<td>I have EXPERIENCE of creating/operating spin-off company.</td>
<td>642</td>
<td>18</td>
<td>660</td>
<td>1,9829</td>
<td>1,29731</td>
<td>359 84 87 75 37</td>
</tr>
<tr>
<td>I possess appropriate entrepreneurial COMPETENCES.</td>
<td>613</td>
<td>47</td>
<td>660</td>
<td>2,2610</td>
<td>1,34446</td>
<td>266 105 102 96 44</td>
</tr>
<tr>
<td>I possess appropriate INDUSTRIAL RELATIONS.</td>
<td>645</td>
<td>15</td>
<td>660</td>
<td>2,7519</td>
<td>1,47984</td>
<td>200 97 119 121 108</td>
</tr>
<tr>
<td>I am familiar with those organisations that can provide assistance in patenting and spin-off creation.</td>
<td>638</td>
<td>22</td>
<td>660</td>
<td>2,3934</td>
<td>1,34844</td>
<td>244 110 121 115 48</td>
</tr>
<tr>
<td>I... (would need/ would not need) ...support of business expertise from the university in order to operate the spin-off company successfully.</td>
<td>431</td>
<td>229</td>
<td>660</td>
<td>2,8121</td>
<td>1,48776</td>
<td>113</td>
</tr>
<tr>
<td>I... (could/could not) ...afford the costs related to spin-off creation without the financial support of the university.</td>
<td>414</td>
<td>246</td>
<td>660</td>
<td>2,4614</td>
<td>1,47693</td>
<td>164</td>
</tr>
<tr>
<td>University scientists... (cannot get/ can get) ...rich from the entrepreneurial activities.</td>
<td>412</td>
<td>248</td>
<td>660</td>
<td>3,2694</td>
<td>1,27210</td>
<td>54</td>
</tr>
<tr>
<td>The commercialization of research results at universities through spin-off companies is... (difficult/ easy).</td>
<td>337</td>
<td>323</td>
<td>660</td>
<td>2,1958</td>
<td>1,10609</td>
<td>118</td>
</tr>
</tbody>
</table>

*or cannot decide
### Appendix 2: Correlations

<table>
<thead>
<tr>
<th></th>
<th>Attitude</th>
<th>Subjective norms</th>
<th>Perceived behavioral control</th>
<th>Entrepreneurial experiences and industrial embeddedness</th>
<th>Independence</th>
<th>Commercial prospects</th>
<th>Entrepreneurial intention</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attitude</strong></td>
<td>Correlation Coefficient Sig. (2-tailed)</td>
<td>1,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>364</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Subjective norms</strong></td>
<td>Correlation Coefficient Sig. (2-tailed)</td>
<td>.538**</td>
<td>.000</td>
<td>.106</td>
<td>1,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>248</td>
<td>278</td>
<td>264</td>
<td>269</td>
<td>299</td>
<td></td>
</tr>
<tr>
<td><strong>Perceived behavioral control</strong></td>
<td>Correlation Coefficient Sig. (2-tailed)</td>
<td>.106</td>
<td>.533**</td>
<td></td>
<td>.054</td>
<td>1,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>264</td>
<td>269</td>
<td>231</td>
<td>208</td>
<td>218</td>
<td>271</td>
</tr>
<tr>
<td><strong>Entrepreneurial experiences and industrial embeddedness</strong></td>
<td>Correlation Coefficient Sig. (2-tailed)</td>
<td>.273**</td>
<td>.154*</td>
<td>.027</td>
<td>.430</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>231</td>
<td>208</td>
<td>218</td>
<td>271</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Independence</strong></td>
<td>Correlation Coefficient Sig. (2-tailed)</td>
<td>.032</td>
<td>-.017</td>
<td>.156*</td>
<td>.029</td>
<td>1,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>231</td>
<td>208</td>
<td>218</td>
<td>271</td>
<td>271</td>
<td></td>
</tr>
<tr>
<td><strong>Commercial prospects</strong></td>
<td>Correlation Coefficient Sig. (2-tailed)</td>
<td>.193**</td>
<td>.312**</td>
<td>.261**</td>
<td>.014</td>
<td>.028</td>
<td>1,000</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>231</td>
<td>208</td>
<td>218</td>
<td>271</td>
<td>271</td>
<td>271</td>
</tr>
<tr>
<td><strong>Entrepreneurial intention</strong></td>
<td>Correlation Coefficient Sig. (2-tailed)</td>
<td>.452**</td>
<td>.372**</td>
<td>.199**</td>
<td>.304**</td>
<td>.167*</td>
<td>.161*</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>326</td>
<td>259</td>
<td>272</td>
<td>236</td>
<td>236</td>
<td>236</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).
Increasing Regional Embeddedness of the ELI-ALPS Laser Research Centre in the Szeged Region: Opportunities of the University-based Enterprise Development

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Abstract

The ELI is one of the largest R&D&I investment projects of the EU, which is a highlighted flagship project of the European Union, which is established in Szeged. This promises outstanding chances to be really attractive for companies from all over the World, so the local embeddedness of the ELI and related companies is a relevant problem and a grandiose challenge for the whole local economy. Embedding the ELI into local economy is a crucial premise of exploiting the local economic development potential of the research centre.

In our study we investigated the opportunities of the regional embeddedness of the ELI in the Szeged region. We carried out a primary research investigating the existing information of SMEs about the ELI and their needs on enterprise development activities in order to cooperate with the ELI in the future.

As a result of our survey, we can state that the awareness of SMEs in the examined topic is currently low in the Szeged region: they are slightly informed about the ELI itself and about their opportunities concerning the ELI. We also stated their concrete needs on enterprise development tools, which could increase their “ELI-readiness”.

Keywords: knowledge-intensive enterprises, science park, local economic development, geographical and technological proximity

Introduction

The ELI-ALPS Laser Research Centre will soon start operating in Szeged. Its economic development potential provides opportunities which may positively influence the economic and social processes of the region directly and indirectly through multiplier effects (Lukovics & Dusek, 2014; Lengyel, Lukovics, & Imreh, 2015). It also allows local enterprises to build economic interdependences with the ELI and to make use of its potential.

However, exploiting economic development potential of the ELI requires the concerted actions of local actors and the implementation of conscious strategies, in which universities can have a major role according to the best practices concerning
less developed regions (Lengyel, Lukovics, & Imreh, 2015).

In our study, we review the enterprise development aspects of the ELI-ALPS Laser Research Centre operating from 2018 in Szeged, in the centre a less developed region of Hungary, financed by the European Union with EUR 200 million. Our research aimed to find out the extent of information local enterprises currently have about the activities of the ELI and the possibilities for connection, as well as their attitude to and first impression of the ELI, whether they would like to or could establish a connection with the ELI based on the current competences. In addition, we aimed to find out what enterprise development tools local enterprises have the highest need for, and what role the university can play in facilitating economic relations between the ELI and local enterprises.

The Laser Research Centre and its geographical environment

The Extreme Light Infrastructure (ELI) project is an integrated part of the European major research equipment generation under construction or scheduled to be built, coordinated by the European Strategy Forum on Research Infrastructures (ESFRI). The EU laser project with a total budget of EUR 850 million is carried out in three countries, in distinct thematic areas and instruments: research centres are under construction in the Czech Republic (beamline), in Hungary (attosecond) and in Romania (photonuclear).

The ELI Attosecond Light Pulse Source (ELI-ALPS) is being built in Szeged with a total budget of EUR 200 million (approximately HUF 60 billion). The Laser Research Centre’s “primary mission is to make a wide range of ultrashort light sources accessible to the various user groups of the national and international scientific community. The equipment installed in the research centre is expected to enable the achievement of outstanding research results not only in the field of ultrafast physical basic processes, but also in biological, medical and materials sciences”\(^1\). Its main research areas: valence electron studies, core electron studies, 4D imaging, relativistic interactions, and biological, medical and industrial applications. Potential application areas are expected in biomedical sciences, chemistry, climate research, energy and materials sciences, medical imaging, etc. The Research Centre is partly established from the EU structural funds allocated for Hungary. Approximately 220-250 employees will work here, about half of them are researchers, who will be hired based on an international application and their remuneration will also be at a Western European level. The research conducted here will be implemented partly from EU funds, and partly the equipment will be rentable for business research.

The building of the Research Centre is of nearly 3,500 square metres\(^2\), where, besides the spaces containing the laser equipment, there will be laboratories (biological, chemical, medical, etc.), workshops, computer rooms, a 200-seat conference room, 8 seminar rooms, administration spaces, a library, etc. The Research Centre can provide space not only for research projects, but also for conferences, workshops and trainings.

The broader geographical environment of the Laser Centre is constituted by the Southern Great Plain and Csongrád County as the NUTS2 and NUTS3 territorial unit levels of the ELI investment.  

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1. Source: http://www.eli-alps.hu/
2. Source: http://www.eli-alps.hu/
The GDP per capita in purchasing power parities is far below the EU average in both the region and the county, it is between 45% and 50%, the economic growth has been at a low level since 2004, the EU accession of the country (HCSO, 2016).

However, the position of the Southern Great Plain is strong in the majority of the indicators related to R&D, it is immediately behind Central Hungary in the order of regions. Csongrád County is even in a more favourable position, as it is the first among the counties in the majority of R&D input and output indicators. Moreover, the specific number of PhD holders (35 persons) is higher in Csongrád County than in Central Hungary included among the developed regions (29 persons), and the rate of university graduates also near the EU average.

In Hungary, several units of the provincial research institute network are located in Szeged. Alongside the University of Szeged, the Biological Research Centre of the Hungarian Academy of Sciences in Szeged (with 260 researchers) represents a substantial scientific capacity; it gained the Centre of Excellence award of the European Union in 2000. The Institute for Biotechnology in Szeged (BAY-BIO) owned by the Bay Zoltán Nonprofit Ltd. for Applied Research and the Grain Research Nonprofit Ltd. also operate here.

The data indicate that the economy of the Southern Great Plain and Csongrád County qualify as less developed and knowledge-intensive industries and clusters are hardly present in the private sector klaszterek. But the knowledge-base concentrated in the county, particularly in the Szeged region, is significant not only domestically, but also internationally. The University of Szeged is a permanent source of prepared graduates, a part of whom continue their studies in the local PhD programmes. This knowledge-base and the masses of talented youth emerging every year provide a chance to a knowledge-intensive economic structural change in the region. The ELI-ALPS investment creates an opportunity not only for strengthening the local scientific capacities, but also for substantive knowledge-based local economic and enterprise development.

Basic ideas on the possible economic development role of universities

The local economic development effects of universities can be categorised in two groups: effects emerging on the supply (input) and the demand (output) side (Armstrong, & Taylor 2000; Lengyel I., 2006; 2010, Lengyel B., 2012). The effects emerging on the side of the input are, for example, university expenses (maintaining and operating buildings), spending of university students, professors and researchers. These effects are independent of the specificities of the university (type and quality of courses, extent of R&D activities, etc.), they are present in every university town. On the other hand, the effects of the output side, such as qualified workforce, R&D activities of university professors, researchers and their economic exploitation do not occur automatically, but they are the results of conscious university strategy and local economic developments (Lengyel, 2010). Here the enhanced involvement of the university in enterprise development and entrepreneurship education can have a major role in the support of the spin-off enterprises originating from the university and student enterprises, in the development of university-enterprise cooperations, and in the commercialisation of the results of R&D activities. This is confirmed by Buzás’s (2004) research, showing that managerial skills represent
one of greatest obstacles in starting spin-off enterprises, as researchers do not have adequate knowledge about business operations, running and starting an enterprise. Universities and research institutes can significantly influence the development and competitiveness of a region both directly and indirectly, and it is often pointed out that the educational and research function of a university can be effectively fulfilled and result in economic impact only together with the economic exploitation of results. The university, and higher education itself, faces new challenges, since the internal and external environments of universities are changing. While in the case of first-generation universities, the most important task of the institutions was education (transmission of knowledge), research activities (creation of knowledge) already occur in the case of the second-generation (Humboldt-type) universities. Universities are currently in the process of the second great transformation, as a result of which second-generation universities are becoming third-generation universities, where knowledge application also occurs alongside education and research (Youtie, & Shapira, 2008; Wissema, 2009). Related to this, the third mission of universities is knowledge transfer, i.e. the industrial application of the knowledge created in the course of research.

Based on this logic, third-generation universities are the ones that make efforts in the economic and enterprise development of their region. We can establish that third-generation universities are primarily expected to improve the competitiveness of a region, as this is the stage where universities not only educate and research, but knowledge utilisation is also a crucial aspect. This means that the industry and the university establish a close connection, which enables the local application of the knowledge created in the university, which also improves the competitiveness of the region through the improvement of the enterprises’ competitiveness. Knowledge spillover from the university facilitates regional development through commercialising research and providing new firms, human resources and new ideas. It is sufficient to think of the relations established here, or the increasing number of knowledge-intensive spin-offs swarming out from the university.

In terms of our topic in a narrow sense, i.e. in terms of studying the ways universities can affect the local economic and enterprise development in a specifically underdeveloped region, we need to discuss the issue of the so-called “fourth-generation universities. This topic is not yet considered a scientifically proven thesis, but its logic can considerably advance our thinking about university-based enterprise development in less developed regions. Krzysztof Pawlowski (2009) studies the effect of “fourth-generation” universities on local development. The main distinctive characteristic of “fourth-generation” universities is proactivity, which is a means of the higher educational institution’s

3 Spin-off enterprises are usually started by professors, young researchers, occasionally PhD students, and they are created in an academic environment, or in private or state-owned research laboratories (Chiesa-Piccaluga 2000).

4 When we discuss the role of universities in the economic and enterprise development of less developed regions, the attribute of “fourth-generation” may be slightly misleading if we expect it as a sort of further development of third-generation universities. In this case, it is rather a more emphasised role of the university helix in the Triple Helix model university.
basic objective to decisively influence the economic and social change of its local region, corresponding with the needs of the knowledge-based economy. The logic of “fourth-generation” universities thus goes beyond the logic of third-generation universities in the sense that the university has a greater role in terms of its effect on the local economy and society; in the “fourth generation”, instead of trying to meet the needs created by the local economy and society to the most possible extent, the university itself develops its social and economic environment.

The essence of the “fourth-generation” university can also be defined by that we have reached an era of society, economy, globalisation processes and information technologies where the presence of a strategic vision is crucial. Universities today need to be able to position themselves even more at local, national and global level. It is important to create an excellent workforce, to be able to commercialise innovations, to adapt them on different scales, and to have a complex system of networks.

This idea is particularly interesting because Pawlowski describes a Polish “fourth-generation” university in his paper, the WSB-NLU based in Nowy Sacz, which is located in the NUTS2-level region of Malopolskie, whose GDP per capita in PPS is about 55% of the EU28 average, i.e. in terms of the regional policy of the EU, it qualifies as a less developed region, similarly to the Southern Great Plain Region (where the same value is about 45%). Following the logic of Wissema’s categorisation, we can illustrate the characteristics of “fourth-generation” universities (Table 1). In “fourth-generation” universities, apart from the education-research-knowledge application trio, the objective of a conscious, planned and future-oriented development of local economy is also present. In this model, the university is the catalyst and the engine of the economy at the same time; it has a major role in determining strategic directions. It is involved not only in training professionals, scientists and entrepreneurs, but also in shaping their environment. In the case of a “fourth-generation” university, it may be necessary to operate in multiple languages due to the presence of complex, cross-

<table>
<thead>
<tr>
<th>Name</th>
<th>First-generation universities</th>
<th>Second-generation universities</th>
<th>Third-generation universities</th>
<th>“Fourth-generation” universities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective</td>
<td>Education</td>
<td>Education and research</td>
<td>Education, research and knowledge application</td>
<td>Education, research, knowledge application, proactive economic development</td>
</tr>
<tr>
<td>Role</td>
<td>The protection of truth</td>
<td>Discovering nature</td>
<td>Value creation</td>
<td>Role of local economic engine, defining strategic direction</td>
</tr>
<tr>
<td>Creates</td>
<td>Professionals</td>
<td>Professionals and scientists</td>
<td>Professionals, scientists and entrepreneurs</td>
<td>Professionals, scientists, entrepreneurs, and competitive local economy</td>
</tr>
<tr>
<td>Language</td>
<td>Latin</td>
<td>National</td>
<td>English</td>
<td>Multilingual (National and English)</td>
</tr>
<tr>
<td>Management</td>
<td>Chancellor</td>
<td>Part-time scientists</td>
<td>Professional management</td>
<td>Professional management and local professionals</td>
</tr>
</tbody>
</table>

Table 1: Some characteristics of the first, second, third and “fourth generations” of universities

Lukovics – Zuti (2014)
border cooperations and network relations. A professional management is responsible for the main strategic and operational tasks, however, local professionals who are aware of local economic relationships and experts in economic development also have an important role in this job.

The Laser Research Centre – from the perspective of local enterprises

In order to promote the establishment of economic relations between the ELI and the enterprises with enterprise development tools, it is important to know the starting position, namely how the local enterprises currently assess their possibilities to join the ELI. We surveyed the present awareness and opinion about the ELI among the local SMEs with a quantitative method, with online and personal questionnaires.

We analysed the received data primarily with descriptive statistical methods, but in certain cases we also applied inductive statistical tests. The questionnaire was suitable not only for data acquisition, but it also provided an opportunity to indirectly give information for the enterprises about the ELI through the questions. Thus we managed to realise both an awareness-raising and a teaching process, in which the respondents could have better knowledge about the ELI and their own possibilities to join the investment.

Our aim with the questionnaire was to survey the existing information of the enterprises regarding the ELI, as well as the deficiencies the establishment should focus on in future communication. 202 responses arrived to our questionnaire.

Figure 1: Distribution of enterprises according to the number of employees.
out of which 197 proved to be suitable for analysis after data cleaning. We categorised the enterprises based on the number of employees (Figure 1) (the amounts of net turnover and balance sheet earnings were unknown).

Thus 68% of the responding enterprises are categorised as micro-enterprise (0-10 persons), 23% as small enterprise (11-50 persons), 6% as medium-sized enterprise (50-249 persons), and 3% as large enterprise (from 250 persons). Most of the firms provide a kind of service (27%), while 17% are active in food industry, 11% in tourism and 10% in infocommunications.

86% of the respondents, 170 enterprises in total, had already heard about the ELI prior to the questionnaire, which can be considered a relatively high proportion. The majority of them (37%) had information about the ELI from the internet or the radio, while 28% learnt about it from acquaintances and 25% from newspapers (Figure 2). This indicates that online and offline communications are both significant and gathering information from acquaintances or word of mouth also has an important role regarding the information collection of enterprises.

We also studied the first impression the firms have in connection with joining the ELI (Figure 3). We found that more than half of the respondents assess establishing connection in a negative way, i.e. they believe they will not be able to join (24%) or they do not know how they could establish connections (30%). 19% of them have a positive attitude to the ELI but think they do not have the required competences, while only a slightly more that a quarter of the respondents see a huge opportunity in joining the ELI.
Based on this question and the findings of preliminary research, we can assume that local SMEs do not have information of adequate quantity and quality about the ELI. Many of them think that only firms engaged in scientific, R&D activities, or only laser research companies can cooperate with the ELI. The questionnaire supported this assumption, as only 45% of the enterprises responded with “yes” to the question “Did you know that not only the enterprises engaged in laser research activities will be able to join the scientific centre?” We also aimed to resolve the stereotype formed about the ELI with this question in the questionnaire. In order to examine if we succeeded in that, we later asked a control question about whether they could see any possibilities of connection between their enterprise and the ELI. This time already 77% of them considered the possibilities of connection in a positive way and responded with “yes” (Figure 4). This well indicates that even little positive information may have a great influence on the attitude of enterprises, since we could observe that based on the first impression only 27% saw a huge potential in the ELI, while this proportion increased to 77% after they learnt that not only research companies could establish connections.

Figure 3: Distribution of enterprises based on the first impression related to joining the ELI.

Figure 4: Distribution of enterprises based on whether they see a point of connection to the ELI.
Following this, we intended to find out whether preliminary information influences, and if yes, in what direction the opinion about the ELI. First, we studied the first impression of the ELI among those who had already heard about it prior to the questionnaire, and those who had not. The distribution of the responses related to first impression within the two groups is found in Figure 5. Here we can see that among those who have previously heard about the ELI, the proportion of those who consider it as a great opportunity for their enterprise is higher by 19 percentage points. However, it should be emphasised that among those who have known absolutely nothing about the ELI – only the questionnaire provided them with some information – already 10% regard it as a great opportunity. Half of the respondents who have not heard about the ELI do not know how to establish a connection with it. This rate is much lower (28%) among those having information about the ELI. This result supports how important in terms of assessment that the news of the investment get through to the most possible enterprises.

We also studied whether there is a difference in terms of first impression between those who were and were not aware that not only firms engaged in laser research activities could join the ELI. The contingency table analysis indicates that there is a significant correlation between the variables (sig.=0.001), which is weak (Cramer coefficient = 0.307). If we analyse the distributions in the case of the two groups (Table 2) related to first impression, we can observe that most of those (41%) who were aware that not only firms engaged in laser research activities could join the ELI see a great opportunity in it. On the other hand, the majority of those (66%) who were not aware think that they will not be able to join it or do not know how to establish business connections with it. It also supports that relevant information needs to be passed to local SMEs, since it can largely influence their attitude to the ELI, as well as their future activity and attempts to connect.

Figure 5: Distribution of responses based on first impression among those who have already heard about the ELI and who have not.
Table 2: Distribution of enterprises based on the first impression of the ELI among those aware that not only firms engaged in laser research activities can join and those unaware, %

<table>
<thead>
<tr>
<th>Possible responses</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>I did not know and I still do not how we could establish business connections with them.</td>
<td>22</td>
<td>36</td>
</tr>
<tr>
<td>I can see the potential in it, but we lack the necessary conditions.</td>
<td>20</td>
<td>18</td>
</tr>
<tr>
<td>I considered it a great opportunity for my enterprise.</td>
<td>41</td>
<td>15</td>
</tr>
<tr>
<td>I thought that we would not be able to join the ELI.</td>
<td>17</td>
<td>30</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Furthermore, among those who had already heard about the ELI, the proportion of those who knew that not only firms engaged in laser research activities could join it was 50-50%. It shows that even of they had preliminary information, they were not aware of whether they could join it, if yes, how they could do so. Consequently, it is not sufficient to familiarise the firms with the investment, it is also important to provide them with as much and accurate information as possible.

We can overall conclude that there is not enough common knowledge about the ELI, therefore not everyone has already heard about it despite the fact that it is considered a large investment. As a result, much incorrect information has also occurred. One of such stereotypes, which we tried to resolve in the questionnaire, is that it is believed that only firms engaged in laser research or scientific research activities could join the ELI. The other such stereotype, which could be resolved with good communication, is that “One day, the ELI will be set up.” It means that there are people who know that it is under construction, but are not aware of when it will be finished, they consider it as something due at some time in the future, even though it will soon open its doors. In our opinion, the biggest problem is that SME-specific information I limited and thus enterprises do not know how they could join. In the articles and publications we have found, the ELI is discussed in general terms, there are no details about the opportunities local SMEs may have or what capacities they must possess to even have a chance to join.

**Enterprise development tools**

We also asked the enterprises about the enterprise development tools they would need to become more competitive and more efficient. The necessity of each tool was scored on a Likert scale ranging from 1 to 6. *Figure 6* shows the average of the points given to the necessity of each enterprise development tool, where a higher average signifies higher necessity. On this basis, we can establish that local enterprises mostly need financial assistance, sources and support for equipment purchase. In addition, they would want enterprise development tools which could help to make the work of employees more efficient and increase their competences. Such tools are foreign language courses, professional trainings, marketing services and business consultancy. Intellectual property rights consultancy, transport development and obtaining certificates proved to be the least necessary.

The questionnaire also revealed that 91% of the enterprises would use a kind of enterprise development tool in order to cooperate with the ELI. Furthermore, a similarly high proportion, 85% claimed that they would collaborate with the ELI in order to develop their enterprise. *Table 3* illustrates that those who would cooperate
with the ELI to develop their firm would also use enterprise development tools for joining, while those who would not cooperate are not likely to use an enterprise development tool either. It indicates that if there is no help, the enterprises do not want to deal with this issue, they do not intend to implement developments. If they get information and assistance, the rate of those who seek to join increases.

Table 3: Distribution based on the attitude to enterprise development tools, %

| Would you cooperate with the ELI in order to develop your own enterprise? | Would you use an enterprise development tool in order to join the ELI? |
|---|---|---|
| Responses | Yes | No | Total |
| Yes | 91 | 9 | 100 |
| No | 24 | 76 | 100 |
| Total | 85 | 15 | 100 |

Figure 6: Average scores to the necessity of each enterprise development tool

University-based integrated entrepreneurship education programme

The development of infrastructure – of the science park in the present case – is necessary but not sufficient for successful local economic development, and, therefore, it is also important to seek to strengthen the existing and emerging enterprises. An enterprise development strategy is based on a defined target system and three related specific enterprise development interventions, which have special characteristics in a less developed country (Kállay & Lengyel, 2009).

Business environment, start-ups

It is necessary to have a wide range of services promoting entrepreneurship and the operation of inspiring new firms:

– Education, a conscious development of entrepreneurship and business competences: it is important to provide high-level entrepreneurship education for
the researchers and experts of the ELI-ALPS scientific park and the educators and student of the University of Szeged in order to establish spin-off enterprises with great growth potential. For this, it is needed to organise the practical education of entrepreneurship and business knowledge for the actors not having economic qualifications (researchers).

- **Creating special business development services for spin-off and start-up enterprises**: special business development services are of major importance (consultancy, mentor programmes, managing early growth), which all contribute to long-term success both in setting up and operating a business. Alongside such focus, it is practical to create a consultative background specialised in knowledge-intensive enterprises in the long term.

- **Managing knowledge transfer and technology transfer**: the settlement of technologies considered as key industries within the European Union (e.g. photonics, manufacture of medical equipment) can substantially facilitate the success of the economic district forming around the scientific park. A conscious management of the knowledge and technology transfer based on these industries, e.g. with technology transfer offices, can accelerate the development of knowledge-intensive enterprises.

### Financing background

Starting and rapidly growing knowledge-intensive firms have particular financial needs, which can be efficiently supported only with special financing facilities.

- **Supporting seed capital and business angel financing**: larger and successful investments are usually hindered not only by an insufficient amount of venture capital, but by actors finding each other. It is a priority to join business angel networks and organise investment forums and brokerage events. It also includes preparing knowledge-intensive enterprises (receiving party) to receive venture capital.

- **Supporting donor financing**: national and EU application alert, management and preparation of application documents are a great help for both the enterprises in the scientific park and the related knowledge-intensive firms in the town region. It is necessary to build a professional background in accordance with prevailing regulations, markedly separating the tasks to be carried out by community funded (nonprofit) and by for-profit sectors.

### Accessing knowledge networks

Knowledge-intensive firms have local (based on geographical proximity) and global relationships, which are both necessary to be successful in international competition.

- **Supporting expansion on external markets, encouraging exports**: the international relations of the firms growing in the park are crucial for entering export markets, it is therefore an important task to consciously manage efficient external market relations and networks. To establish relations, it is also necessary to arrange
personal meetings, which need to be facilitated by organising businessman meetings, conferences and workshops, appearing in exhibitions, inviting guest researchers and professors, etc.

- **Promoting business and scientific networks**: joining interpersonal and business networks makes it easier for researchers and enterprises to access existing knowledge and experience, as well as to create new knowledge, thereby reducing the risks of their decisions. Professional relations can be strengthened with organising regular forums (clubs, professional organisations, etc.) and occasional gatherings.

### The strategic role of the university

Owing to its size and position, the University of Szeged is involved in forming and implementing the sub-activities of both system-oriented and business-oriented policies: it is the organiser of trainings tailored to the workforce claims of knowledge-intensive firms, one of the preparers of regional economic development decisions, active developer of university-industry relations, and a participant of local enterprise development programmes. Consequently, it has a major role in facilitating knowledge spillover, forming the science park, introducing the concept of responsible innovation in practice, promoting the access to financial sources and knowledge networks, and developing a business environment (*Table 4*).

In the University of Szeged, it would be practical to establish a “**Strategic Council**” of the representatives of involved departments and scientific workshops, which requires the particular university divisions to elaborate their involvement in the above described programmes and constantly monitors their activities. Its important task is to detect and indicate in time if a discrepancy or negative phenomena can be found in the programmes involving the university. It is also important that in the University of Szeged an “**Economic and Enterprise Development Centre**” should be operated, which creates and maintains a connection between scientific workshops and knowledge-intensive firms, and coordinates the services of related university divisions (trainings, events, consultancy, etc.).

### Table 4: The potential tasks of the university in the particular programmes

<table>
<thead>
<tr>
<th>Name</th>
<th>Potential roles of the university</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELI Science park</td>
<td>- conducting the economic impact assessments of the settlers</td>
</tr>
<tr>
<td></td>
<td>- promoting the local embedding of the settlers</td>
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<tr>
<td></td>
<td>- contributing in the exploitation of the real economic development potential of the ELI and the science park</td>
</tr>
<tr>
<td></td>
<td>- arranging collaborations between settling firms and university workshops</td>
</tr>
<tr>
<td></td>
<td>- training the employees of settling firms</td>
</tr>
<tr>
<td>Regional knowledge spillover</td>
<td>- developing the local innovation system</td>
</tr>
<tr>
<td></td>
<td>- establishing an economic and enterprise development centre</td>
</tr>
<tr>
<td></td>
<td>- preparing economic situation analysis</td>
</tr>
<tr>
<td></td>
<td>- operating a technology transfer office</td>
</tr>
<tr>
<td></td>
<td>- organising informal meetings, professional forums and business clubs</td>
</tr>
<tr>
<td></td>
<td>- organising trainings for the related activities generated by the ELI-ALPS</td>
</tr>
</tbody>
</table>
### Cultural change: responsible innovation
- spreading the approach of responsible innovation
- promoting the practical introduction of responsible innovation
- teaching the possible applications of laser
- strengthening engineering trainings
- organising related PhD programmes, announcing research topics
- inviting guest researchers and lecturers

### Business environment, start-ups
- teaching entrepreneurship in a wide scale
- establishing legal, business, information technology, etc. consultants’ network
- arranging patent administration
- organising brainstorming sessions
- screening project ideas
- organising a mentor network
- consulting in strategic planning
- monitoring and preparation of applications, consultancy

### Financing background
- assistance in accessing investors
- organising investor meetings
- assistance in preparing business plans

### Knowledge networks
- organising international conferences
- arranging businessman meetings
- strengthening international professional partner university relations
- supporting international research cooperations

## Conclusions

In Szeged, a university town of a less developed region of Hungary, a high-tech research institute, the ELI-ALPS is being established. This international research centre, running from 2016, operates globally unique laser equipment, which can be used by both scientific researchers and industrial users. The ELI-ALPS has been located in Szeged primarily for two purposes: first, to exploit the local, internationally acknowledged scientific capacity; secondly, to enhance the local knowledge-based economic and enterprise development. In Szeged, the research centre is an opportunity which both the town and the university would like to make use of in order to promote the economic development of the region.

Based on international experience, in a small university town of a less developed region, strengthening the knowledge-intensive economy requires an efficient local collaboration of the municipality and institutions of the town with the university and its research workshops.

The logical framework and management of knowledge-based local economic development concepts should be financed in the framework of bottom-up smart specialisation strategies, also supported by the EU.

Based on the literature and the evaluation of local specificities, we consider that in the case of the expected development effects generated by the ELI-ALPS, it is practical to differentiate two consecutive stages. In the first stage, two elements of micro-economical bases need to be strengthened: economic development strengthening the quality of business environment and the refinement of business operations and strategy. The research conducted in the framework of the ELI-ALPS enables various business applications, therefore it is not yet possible to tell what activities will be clustered in the future. Owing to this, the promotion of knowledge-intensive clusters takes place in the second stage, when the number of firms related to the activities of the ELI-ALPS has already acquired a critical mass in an
industry.

In the first step of the development, an effective measure would be the creation of a science park, including an incubator, set up in the immediate vicinity of the ELI-ALPS, housing knowledge-intensive enterprises, settling firms and start-ups. It is also very important to support enterprise development so that knowledge-intensive firms related to the university can be established and local enterprises can be the business partners of the firms located in the science park.

**References**


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Innovation performance increasing with the cooperation: case study of Estonia and Romania

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Abstract

Innovation processes belong among the most complex business processes. Their complexity, time and cost force the businesses to use new approaches. SMEs support their innovative processes with connecting to the networks (corporate or business or knowledge-based or cooperative). Many international studies show that participation in the cooperative network can be help to improve innovation performance of small or medium sized enterprises. It has been proved that various types of cooperative linkages (e. g. inter-firm cooperation and cooperation with the intermediaries, cooperation with research organizations or cooperation in the holding group) has a positive impact on the firm’s ability to innovate. An interesting question is the involvement of government or public institution in these cooperative networks. Mostly the worldwide studies show that their involvement does not significantly positive benefits. But the new forms of cooperation, such as vertical or horizontal cooperation with customers and suppliers or competing companies also play a significant role in the innovation processes. Even some studies show that the cooperation among the industrial enterprises and customers is more important than cooperation in knowledge-based network. The question remains whether the results of various international studies are also valid in the CEE regions. Therefore, to fill the gap, we analyse the influence of cooperation with different partners (e. g. customers, competitors, universities) on the growth of firms’ turnover from innovated products in manufacturing industries (in total, 4,903 firms) in Estonia and Romania between the years 2010-2012 by using own multiple linear regression models. For data collection, we use Community Innovation Survey, which is harmonised questionnaire (part of the EU’s science and technology statistics). Results show, that proper selection of cooperation partners (especially in Estonia) in combination with other determinants of innovative activities (e. g. participation in the group of companies, public financing) lead to creation of synergies and spillover effects, that significantly influence innovative activities. In conclusion, we provide a comparison of determinants of innovation activities between countries and propose some practical implications for policy makers (not only from these countries).

Keywords: innovation, performance, cooperation, spill-over effects, Estonia, Romania

Introduction

Even today, traditional production factors – considered to be work, land, and various forms of capital – can still be perceived as one of the basic determinants of economic development (M. E. Porter & C. Van der Linde, 1995). Nonetheless, other kinds of production resources, which help strengthen or maintain a company’s position
on international and domestic markets or help increase company competitiveness, began to increase in importance during the second half of the 20th century (Carney, 1998).

In the last few decades of the 20th century, there was a reduction of industrial production in many countries, which has tended to be replaced in modern Western economies more frequently by the production of services. It is possible to explain this using technological and demographic changes, people’s changing preferences, or a change in the maturity of individual economies, for example. These factors gradually and noticeably change the ways of looking at the role of production factors and logically result in a changeover from material production to production based primarily on the use of information, i.e., knowledge. On the basis of scientific research, it was already possible to state in the 1990s that economies based on knowledge achieve a higher gross domestic product (e.g., Abramovitz & David, 1996).

Many studies have proved that the use of various types of knowledge is a driver for company growth in the 21st century. Knowledge is a source of innovation; moreover, in contemporary economies, the competitive advantage of both companies and regions as well as countries is dependent on it. Alois Schumpeter, who considered innovation originating with entrepreneurs to be the source of technological change for nations, came up with these conclusions (Peters, Marginson, & Murphy, 2009).

Nonetheless, thanks to globalization, market competition is increasing – even in relation to the use of the aforementioned information and knowledge and the subsequent creation of innovation. It is possible to discover the fundamental differences that distinguish one company from the rest within the innovation process itself. Primarily groups of small and medium-sized companies are more frequently engaging in networks that operate on the basis of cooperation and knowledge in the attempt to hasten the overall innovation process and make it less expensive. Representatives of institutions from the public sector (of regional or national governments) also tend to be included in the cooperative chains or forms of cooperation. Another interesting fact from recent years is the finding that a direct relationship between industrial companies and customers is also fundamental for the development of the innovation process. Many studies even point to the fact that this relationship is more important than cooperation in networks based on pure knowledge.

The goal of this paper is thus to analyze how individual partners influence companies’ innovation performance. For example, this is understood to be the possible increase in innovation outputs resulting from cooperation with local, regional, government, or European public financing; from cooperation with suppliers of equipment, materials, components, or software; and from cooperation with clients and customers as well as universities or other government or public research institutions. The overall 26 variables that were selected were analyzed in addition to their individual combinations. Regarding a gap stemming from research on existing studies in this area, attention has been focused on Estonia and Romania.

Theoretical Background

It was first possible to observe massive cooperation between companies for the purpose of increasing productivity in the 1980s (Negassi, 2004). In the studies...
of this period, it was initially proved that knowledge spillover (as one of the unintentional outputs of cooperation) is able to reinforce a company’s innovation capacity and increase its competitiveness. Miotti and Sachwald (2003) observed the influence of cooperation and spillover effects in the area of research and development (as well as the creation of global research and development networks) over the course of the 1990s in various European countries.

Germany is one important European economy where it is possible to observe how cooperation’s positive influence on competitiveness and the capacity to innovate evolves. As Stejskal and Prokop (2016) have stated, this country has one of the most productive economies in the world; additionally, it is also primarily one of the countries that are most competitive internationally (for 2015–2016, Germany came in fourth place in the Global Competitiveness Index composed by the World Economic Forum). However, the situation was the reverse even into the 1990’s. As Audretsch (1995) states, this country struggled with both high unemployment as well as a loss of international competitiveness at the beginning of the 1990s. The scope of this problem can be seen in the fact that a solution for the innovation crisis was eventually adopted as one of the German government’s three main objectives for the 1990s.

In general, however, the importance of innovation, competitiveness, and cooperation can also be explained using economic theory. For example, from the microeconomic perspective, it is possible to start with the knowledge spillover theory, which explains the positive recognition and use of companies’ opportunities. This fact was confirmed by Acs, Braunerhjelm, and Audretsch (2009), among others. In their research, Alfaro and Chen (2013) explained that cooperation also contributes to the growth of productivity. They demonstrated that it is also possible to observe this positive effect on a sample of 60 of the world’s countries for knowledge that has spilled over from transnational companies to domestic companies. The significance of cooperation and knowledge spillovers was also documented by Prokop and Stejskal (2016) – on data originating in the Czech Republic confirming that innovation does not emerge in isolation, but rather is created and disseminated effectively via cooperation. For example, Fritsch and Franke (2004) have actually already confirmed a similar fact for a number of German regions for the beginning of the 21st century itself.

As can be seen from the above, primarily in recent years, knowledge has played an important role in theoretical concepts of innovation – not only for companies but also for national economies. Nonetheless, the general discovery of the positive benefits of spillover effects and cooperation can be considered merely a first step on the road to prosperity. In order to be able to cooperate and derive benefits, it is necessary to find an appropriate partner for cooperation. From a closer analytical perspective, this fact naturally appears to be a distinctly complicated process. It is necessary to start with the fact that potential partners are significantly different depending on industrial focus or affiliation to an industrial sector. Different rules apply to each case, and ties emerge that vary in strength and effectiveness.

At the start of the 21st century, this problem was also analyzed for Germany; Fritsch and Lukas (2001), for example, analyzed the tendency to maintain various forms of cooperation in the area of research and development
with customers, suppliers, competitors, and public research institutes on a sample of 1800 manufacturing companies from the processing industry. On the basis of this research, it was demonstrated that a propensity for maintaining ties tended to be shown by larger companies with a higher participation in research and development. Moreover, using data for Belgium, Veugelers and Cassiman (2005) determined that it is primarily large firms engaging in the chemical and pharmaceutical industry (a so-called vertical network) that have distinct interest in maintaining mutual ties, i.e., actively engaging in cooperation in the area of industry and science. This fact was also verified in research by Tomlinson (2010), who confirmed a hypothesis using data from Great Britain that ties in vertical networks are able to explain the innovation level of individual companies. This study also drew attention to the fact that it is not only the existence of these mutual ties that is fundamental, but also, particularly, their strength. Nonetheless, the results also concede that horizontal network ties are also important in certain sectors (even though this is to a lesser degree). On the basis of the study results listed here, it is possible to postulate the conclusion that companies cooperate on R&D in order to supplement internal resources for their private innovation process (Becker & Dietz, 2004).

Even despite the above, it is also necessary to accept the fact that mutual cooperation by companies from the private sector is not the only driver of innovative development. Today, positive participation on behalf of the public sector in creating innovation is overall a common phenomenon, which has been demonstrated by David, Hall, and Toole (2000), among others. German experience can be utilized for this as well, because Germany has been pursuing extensive expansionary fiscal policy in the area of industry, primarily using the system of providing grants. This fact has been confirmed by Beise and Stahl (1999), among others. Using a sample of 2300 German companies, they determined that less than one tenth of new innovative products (or innovative production methods) were developed without the participation of research derived from public resources. It is thus a logical connection that universities began to be perceived by companies as an important source of findings for their innovation activities. Nonetheless, it is necessary to point out that massive private investment is the primary reason behind the German companies’ success (V. Prokop & Stejskal, 2016). McMillan, Narin, and Deeds (2000) also came to the same conclusions concerning the significance of government grants. They investigated the effects of supporting research and development in the USA. They determined that American companies’ industrial base relies on public research to a large degree; this implies that knowledge is derived from universities, research institutions, and government laboratories (the results confirmed the fluctuating dependency of various sectors of industry).

However, individual companies’ capacity for innovation is also dependent on other variables – primarily, on the quality of the innovation environment, the condition of the global economy, and the public policies that have been adopted (mainly industrial and tax policies). Cooke (2001) points to the gap in the innovation capabilities of European and American companies. European companies loose their ability to be successful in competitive markets precisely because they rely too much on public “pro-innovation” government intervention. Naturally, this
can cause market failure and a crowding out effect on private investment (as can all government interventions). Almus and Czarnitzki (2003) have dealt with this subject on the European continent. They analyzed the effect government expenditure programs supporting R&D had on the innovation activity of German enterprises (whether they stimulate research activities or whether they crowd out private investment in research and development). The results show that if companies use both private and public funding to finance their research, this increased their innovation activity by 4% (this did not lead to the crowding out effect in the given empirical sample). Czarnitzki and Fier (2002) also came to the same conclusion.

The studies presented here primarily deal with the influence of cooperation and public support for research and development in the most advanced countries. However, the question remains as to whether these two factors of a pro-innovation environment also have a positive effect on economies that are not as advanced, whose public and private business sectors suffer various deficiencies. The goal of this paper is thus to analyze whether the analyzed companies’ ability to innovate their production increases with the influence of cooperation in the selected sectors. Two countries that appear to be undergoing development in the area of innovation, Estonia and Romania, were chosen for analysis.

Data and methodology

For our analyses, we obtained data from the Community Innovation Survey 2010–2012. The Community Innovation Survey is a harmonized questionnaire, which is part of the EU’s science and technology statistics and it is carried out every two years by the EU member states and a number of ESS member countries. Continuously, we created original multiple linear regression models to investigate the relationship between one dependent variable – innovation performance - represented by the % of turnover in new or improved products introduced during 2010–2012 (new to the market), and a number of selected independent variables (innovation activities determinants). In total, we analysed 4 903 enterprises from the manufacturing industries (NACE Categories 10-33) in Estonia and Romania. Data from Eurostat we don’t consider as censored or truncated (as in study of Doran & Ryan, 2016). All independent variables are shown in Table 1. Regression models are commonly used for this kind of analysis (e.g., Nieto & Quevedo, 2005; Chen & Huang, 2009; Schneider & Spieth, 2013) and take the general form as follows (Chatterjee & Hadi, 2013):

\[ y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_n x_n + \varepsilon \]

(1)

where

- \( y \) is a dependent variable;
- \( x_1, x_2 \ldots x_n \) are independent variables;
- \( \varepsilon \) is an error term that accounts for the variability in \( y \) that cannot be explained by the linear effect of the \( n \) independent variables;
- \( \beta_1, \beta_2 \ldots \beta_n \), called the regression parameters or coefficients, are unknown constants to be determined (estimated) from the data.

To verify whether the data from
the Community Innovation Survey were correlated, Spearman’s test were used. Spearman’s coefficient ($r_s$) measures the strength of the linear relationship between each two variables when the values of each variable are rank-ordered from 1 to N, where N represents the number of pairs of values (the N cases of each variable are assigned integer values from 1 to N inclusive, and no two cases share the same value). The difference between ranks for each case is represented by $d_i$. The general formula for Spearman’s rank correlation coefficient takes the general form as follows (Weinberg & Abramowitz, 2002; Borradaile, 2013):

$$r_s = 1 - \frac{6 \sum d_i^2}{N(N^2 - 1)}$$

(2)

All calculations were made using the statistical software STATISTICA (StatSoft Inc., 2011). The values of Spearman’s test rejected the hypothesis that the data are correlated with a level of significance at $p<0.05$. After fulfilling the first prerequisite (uncorrelated data) and the rejection of multicollinearity in the model, the analysis itself was conducted.
### Table 1: Independent variables

<table>
<thead>
<tr>
<th>Financing</th>
<th>Cooperation</th>
<th>Innovation</th>
<th>Expenditures</th>
<th>Firm Activities</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public funding from local or regional authorities (FUNLOC)</td>
<td>Cooperation arrangements on innovation activities (CO)</td>
<td>Introduced a new or significantly improved product into the market (INN_G)</td>
<td>Intramural R&amp;D (RRDIN)</td>
<td>Merge with or take over another enterprise (ENMRG)</td>
<td>The largest market in terms of turnover between 2010-2012 (LARMAR)</td>
</tr>
<tr>
<td>Public funding from the central government (FUNGMT)</td>
<td>Other enterprises within an enterprise group (COGP)</td>
<td>Introduced a new or significantly improved service into the market (INN_S)</td>
<td>Extramural R&amp;D (RRDEX)</td>
<td>Sell, close, or outsource some of the company’s tasks or functions (ENOUT)</td>
<td>Participation in a group of enterprises (GP)</td>
</tr>
<tr>
<td>Public financial support from the EU (FUNEU)</td>
<td>Suppliers of equipment, materials, components, or software (COSUP)</td>
<td>Introduced a new or significantly improved process into the market: method of production; logistic, delivery, or distribution system; supporting activities (INN_P)</td>
<td>Acquisition of machinery (RMAC)</td>
<td>Establish new subsidiaries in [home country] or in other European countries (ENNWEUR)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clients or customers (COCUS)</td>
<td>Acquisition of external knowledge (ROEK)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Consultants and commercial labs (COCONS)</td>
<td>All other activities (ROTR)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Competitors or other enterprises in the sector (COCOMP)</td>
<td>Total expenditures on innovation activities (RALL)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Universities or other higher education institutions (COUNI)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Government or public research institutes (COGOV)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
Results of regression analyses in Estonia and Romania

Firstly, we analyzed the relationship between each of the independent variables (the determinants of innovative activities) and the target variable – innovation performance - by using original multiple regression models. Table 2 shows the results of the individual models for the manufacturing industries of each country.

Table 2 Comparison of determinants of innovation activities between the countries

<table>
<thead>
<tr>
<th>Determinants</th>
<th>Romania</th>
<th>Estonia</th>
</tr>
</thead>
<tbody>
<tr>
<td>FUNGMT</td>
<td>0.059*</td>
<td>0.014**</td>
</tr>
<tr>
<td>FUNEU</td>
<td>0.065*</td>
<td>0.000***</td>
</tr>
<tr>
<td>COGP</td>
<td>0.065*</td>
<td>0.402</td>
</tr>
<tr>
<td>COSUP</td>
<td>0.070*</td>
<td>0.047***</td>
</tr>
<tr>
<td>COUNI</td>
<td>0.076*</td>
<td>0.047***</td>
</tr>
<tr>
<td>INN_G</td>
<td>0.104</td>
<td>0.037**</td>
</tr>
<tr>
<td>INN_S</td>
<td>0.104</td>
<td>0.037**</td>
</tr>
<tr>
<td>RRDIN</td>
<td>0.034*</td>
<td>0.630</td>
</tr>
<tr>
<td>RRDEX</td>
<td>0.054*</td>
<td>0.007***</td>
</tr>
<tr>
<td>ENOUT</td>
<td>0.082*</td>
<td>0.052**</td>
</tr>
<tr>
<td>ENNWOTH</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>GP</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Legend: significant at P<0.1; ** significant at P<0.05; *** significant at P<0.01

Source: Authors’ own research.

Determinants of innovation performance are different in each country because of number of different internal and external factors (e.g. initial conditions, background for innovation activities, infrastructure, and absorptive capacity). In Romania, a background in innovation is missing and therefore determinants of innovative activities are not able to influence firms’ innovation performance. This is one of the signs of innovation paradox, which countries like Romania may suffer. Innovation paradox refers to the apparent contradiction between the comparatively greater need to spend on innovation in lagging regions and their relatively lower capacity to both absorb public funds earmarked for the promotion of innovation and invest in innovation related activities (as we can see in Table 2 – FUNGMT, FUNEU do not effectively influence innovation performance) as compared to more advanced regions or countries (Oughton et al. 2002). Therefore, innovation performance cannot increase with the cooperation as well as it could.

The situation in Estonia is different than in Romania and number of factors (determinants of innovation activities) influence firms’ innovation performance independently. Financial sources are the most important determinants (businesses intramural expenditures in R&D, establishment of new subsidiaries outside Europe and self-financing from their national resources). The new product – innovated process or service (INN_P and INN_S) – is not a significant determinant of innovative activities in Estonia (their role increases, combined with other changes - see below). Estonian firms, in comparison with firms from Romania, can use the cooperation as the source of cost-cuts and new knowledge. We show that cooperation with other enterprises within the enterprise group (COGP: 0.000***), participation in the group of firms (GP: 0.037**) and cooperation with clients and customers (COCUS: 0.047**) significantly influence firms’ innovation performance in Estonia.

Because of weak effects, especially in Romania, we consequently analysed the effects of mutual combinations between determinants that allow the creation of synergies and spillover effects and can significantly influence firms’ innovation
performance. It is clear because innovation is not created in isolation (Hajek & Stejskal, 2015; Mikušová Meričková et al., 2016; Prokop & Stejskal, 2016).

Romania is a typical example of a country where there is an innovation paradox. In this country, a background for innovation is missing, and the country faces obstacles in elements of its environment. Therefore, determinants of innovative activities are not able to influence firms’ innovation performance even if they were provided with sufficient public funds. The country struggles with a lack of absorption capacity but may also be hampered by a lack of demand for innovation outputs (from both enterprises and research organizations). On the other hand, results in Table 3 show that finding of proper collaboration partners (universities and public research institutes) has impact on firms’ innovation performance. For example, if a company simultaneously introduced process innovations and cooperated with universities, this causes effects influencing the growth of turnover from innovations (0.046**). Also, the provision of EU funds led to the creation of significant effects in some cases – in cooperation with universities (0.045**) and in cooperation with public research institutes (0.042**).

The results in Table 4 confirmed that cooperation (with various subjects) brings positive effects on firms’ innovation performance (the rate of signification was increased). We can see the improved results in INN_S (improved service onto the market). INN_S in combination with all types of cooperation increase the level of determination (compare result: Tab.4: INN_S*COCUS: 0.006*** in opposite itself Tab.2: INN_S: 0.402 - without influence). Cooperation with competitors or other enterprises in sector (COCOMP) has no significant influence 0.249 (see table 2); now if we analyse the combination with INN_S we obtain significant value 0.009***. In our analyses, we also confirmed the negative role of national financial sources in combination with other variables. If we analyse these combinations, the results are lower (for example FUNGMT*COCUS*INN_S: 0.087**) or the level of significance is lower. We can conclude that public support does not always bring positive effects, especially if subsidies are not carefully targeted to the appropriate industry and to the target activity (totally clear type of innovation). It was confirmed also with results from INN_P analysis. If we analyse the combinations concerned INN_P, we obtain higher significance levels and better results also in combination with public funds (example: FUNGMT*COSUP*INN_P: 0.009*** means that public sector brings positive effects if support the process innovation in firm who cooperate with its suppliers).

<table>
<thead>
<tr>
<th>Universities (or Other Higher Education Institutions)</th>
<th>Public Research Institutes (or the Government)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FUNEU</td>
<td>0.045**</td>
</tr>
<tr>
<td>INN_S</td>
<td>-</td>
</tr>
<tr>
<td>INN_P</td>
<td>0.046**</td>
</tr>
<tr>
<td>COGP</td>
<td>0.055*</td>
</tr>
</tbody>
</table>

Legend: significant at P<0.1; ** significant at P<0.05; *** significant at P<0.01
Source: Authors’ own research.
Table 4 Combinations of Variables in Estonia - Importance of Innovation and Cooperation

<table>
<thead>
<tr>
<th>Combination</th>
<th>INN_S</th>
<th>INN_P</th>
</tr>
</thead>
<tbody>
<tr>
<td>GP</td>
<td>0.004***</td>
<td>0.662</td>
</tr>
<tr>
<td>COGP</td>
<td>0.004***</td>
<td>0.430</td>
</tr>
<tr>
<td>COCUS</td>
<td>0.006***</td>
<td>0.210</td>
</tr>
<tr>
<td>COCOMP</td>
<td>0.009***</td>
<td>0.099*</td>
</tr>
<tr>
<td>COSUP</td>
<td>0.461</td>
<td></td>
</tr>
<tr>
<td>COCOMP*FUNGMT</td>
<td>0.046**</td>
<td></td>
</tr>
<tr>
<td>GP*COCUS</td>
<td>0.007***</td>
<td>0.018**</td>
</tr>
<tr>
<td>COGP*COCUS</td>
<td>0.006***</td>
<td>0.019**</td>
</tr>
<tr>
<td>FUNGMT*COCUS</td>
<td>0.087***</td>
<td>0.306</td>
</tr>
<tr>
<td>FUNGMT*COSUP</td>
<td>0.289</td>
<td>0.009***</td>
</tr>
</tbody>
</table>

Legend: significant at P<0.1; ** significant at P<0.05; *** significant at P<0.01
Source: Authors’ own research.

Conclusion and practical implications

As we mentioned above, the innovation and ability to collaborate can be ranked among the fundamentals of competitive advantage in every developed economy. According to the results from the analysis, the innovation environment differs in every country.

Based on the results of this research we can state that complete innovation ecosystem lacks in Romania. The Romanian environment is not able to absorb the incoming innovation impulses – all innovation are crowded out. The Romanian public authorities try to block the crowding out effect with the public investments, but the innovation paradox is observed. Also, the other public funds from EU budget are used. The results show that variables FUNGMT or FUNEU are not able to change the situation and influence the output of the innovation processes (innovation performance of the firms).

In contrast, the same models were used also in Estonian CIS data. The results showed that the innovation paradox is not observed in this country. Public support (from EU budget – FUNEU 0.014**) affects the innovation activities in Estonian firms.

Not only this result confirms that EU subsidy policy affect differently the innovation activities in various countries. Therefore, it is necessary to more thoroughly define the goals of public innovation policies and planed tools and system of support analyse before their wide application (ex ante). Only then the greater efficiency can be achieved.

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References


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Generational transfer among family businesses, European trends

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Abstract
In my thesis I will focus on change of generations among Hungarian family businesses.

I am going to deal with changes of leadership, organizational culture and core values, related to the management/owner succession. I will also examine reputation and web of relationships. I will observe the planning of generation change by the Hungarian family businesses.

International experience shows that 2/3 of family companies do not survive the generation change. A significant part of Hungarian family businesses is facing a generation change. Therefore, successful succession is an especially important issue. Since most of the Hungarian family businesses are by first generation, there is no previous experience in generation change.

Keywords: family business, strategic generation change, models, influence of soft facts

Introduction
I would like to choose a topic which had a determining role in the past, is dominating in the present and will be important in the future.

I thought about leading change as a main topic of an essay when I wrote my master’s essay about the management succession within the Erasmus Student Network. The ESN deals with foreign scholarship students.

Currently the framework of the topic will a little bit modified because as a PhD student I would like to deal with generation change among Hungarian family businesses.

The relevance of the research comes from the fact that most of the founders of the Hungarian family businesses are around retirement. (Konczosné Szombathelyi, 2014)

The planned research needs to apply knowledge from four disciplines, so it is multidisciplinary in nature: PR, organizational culture, economic (family businesses) and leadership.

One of the greatest results is expected to raise awareness of importance of strategic planning of succession, within the families and outside. The next result could be the awareness of importance of soft factors, such as values’ and reputations’ transfer.
Objective, methodology

The aim of my research is to get an answer to the question how generation change happens in family businesses. I would like to deal with leadership, reputation, organizational culture, generation change and change management.

First, I am going to read the professional literature about management succession, leadership, generation, family business, organizational culture, reputation and generation change. After that, I would make interviews with those family businesses in the region where generation change is an actual task. I also plan to make questionnaires with those possible heirs who study at the main universities of Hungary.

Modelling the process

The process of my research was applied in six steps. The first step is a literature review. As second step semi-structured qualitative interviews will be conducted with predecessors and successors from 50 family businesses. After making interviews with them, qualitative focus groups from stake holders of 5 chosen organisations will be organized. The aim is to explore the potential change in the reputation, relationship, leadership style, communication of the investigated companies. The fourth step of the research will be making questionnaires with the heirs of family businesses who have been attending the main Hungarian universities. I would like to ask them about their attitudes, plans, visions related to their family businesses. According to these interviews and questionnaires I would be able to make the modelling of reputation and values transfer among Hungarian family businesses. Continuously I would write my thesis.

1. Figure: Modelling the process

Step 1
- Literature review
  - Collecting info about the Hungarian family businesses

Step 2
- Interview with the 50 chosen family businesses
  - Analysis

Step 3
- Focus groups for stakeholders of 5 chosen companies
  - Analysis

Step 4
- Questionnaire among the possible heirs of family businesses who study at the main universities of Hungary

Step 5
- Modelling of reputation and values transfer

Step 6
- Writing the thesis
Theoretical background

Family businesses

Anderson’ Bull’s Eye model (Figure 1) can provide a conceptual basis for formulate different definitions of family business and for modelling family-firm interactions in a wider sense. The role of the family in the entrepreneurial business is, as already mentioned, an ever more important research topic.

2. Figure: A Continuum of Family – Enterprise Interactions. Extending Astrachan and Shanker’s Bully’s Eye Model


Three types of family-business cluster were identified. One group, “Family Rules” saw the family and business as a single unit, whilst for the “Family Out” cluster the two should be kept as far apart as possible. The third group, “Family-Business Jugglers” were concerned to balance the interests of both parties, and maximum formal family involvement was restricted to the employment of a few kin in the firm. Nonetheless they were comfortable with, and accepting of, some degree of overlap between the two domains. The “Family Rules” group encompasses the first (narrow definition), second (medium definition), and third (broad definition) circles of the model. The “Family-Business Jugglers” group are clearly beyond the scope of the three circles, since their enterprises cannot be classified as family firms, even under the terms of the broadest definition. Nonetheless, the role of kin for these entrepreneurs may be substantial. Finally, the “Family Out” group reject all links between family and business, and, again cannot be mapped onto the Bull’s Eye model (Anderson, 6-7.).

Reputation

Corporate reputation is concerned with the overall estimation in which the organization is held by its constituents. Reputation is not separate from employee or customer satisfaction, financial performance or other indicators. It is a sum of all things (Griffin, 2008). Broomley (2000) defines reputation as an index of a company’s worth or value. Chernatony and Harris (2000) agree that the opinion of all stakeholders must be considered. Schweizer and
Wijnberg (1999) state, that reputation has been classified as an intangible component of a firm’s pool of resources.

Reputation matters – it can explain why customers choose the particular product or service in preference to somebody else’s and can make the difference between success and failure.

Added to such challenges is the fact that the internet, blogs and mobile technology have made it possible for anybody to broadcast information to large audiences in a very short space of time. The media play a powerful role in the making and breaking of reputations. Furthermore, the ever-increasing shift towards greater corporate accountability and transparency through enhanced narrative reporting means that organizations need to understand and report on all those issues that have a significant bearing on their future prospects and their risk profiles.

Organizational culture

Within a company the coordination of several factors is important to help the company’s ability to operate effectively. One of these factors is the organizational culture. The 3rd figure shows the definition of organizational culture. The 4th figure represents the most important points of organizational culture. (Robbins, Judge, 2009)

3. Figure: Organizational culture

![Organizational Culture Image](Source: Robbins S. P., Judge T. A. (2009), Organizational Behavior, Pearson)

4. Figure: The most important points of organizational culture

![Organizational Culture Points Image](Source: Robbins S. P., Judge T. A. (2009), Organizational Behavior, Pearson)

European Family Businesses Barometer

European Family Businesses (EFB) and KPMG have joined forces to create a unique Barometer to measure the confidence levels of the members of EFB, and the opportunities and challenges impacting on their operations in the short, medium and long term. (www.kpmg.com)
Confidence

In December 2013 family businesses seemed confident about the future with 54% of respondents because they had a positive outlook for their business for the next 6-12 months. In June 2014 71% of the respondents had positive outlook for the next 6 months and it shows approximately 20% growth compared with 2013. In December 2014 70% of the respondents had positive outlook for the next 6 months and it shows a small 1% decrease. In 2015 family businesses seemed confident about the future with 75% of respondents because they had a positive outlook for their business for the next 12 months. This percentage increased with 4% compared with December 2014. In 2016 family businesses seemed confident about the future with 72% of respondents because they have a positive outlook for their business for the next 12 months. This percentage decreased with 3% compared with 2015.

It is strange to see that in 2013 34% of the respondents were neutral and do not have any opinion in this case. In June 2014 21% of them were still neutral in this case but this percentage is less than before. In December 2014 4% more respondents were neutral in this case than before. In 2015 17% of them were still neutral in this case but this percentage is less than before. In 2016 21% of them were still neutral in this case but this percentage is unfortunately 4% more than before.

Fortunately, in 2013 only 12% of them had a negative outlook for their business for the next 6-12 months. In June 2014 8% of the respondents still had a negative attitude to the next 6 months but this percentage was 4% less than in 2013. In December 2014 5% of the respondents still had a negative attitude to the next 6 months but this percentage was 3% less than in June 2014. In 2015 8% of the respondents still had a negative attitude to the next 12 months but unfortunately this percentage was 3% more than in December 2014. In 2016 7% of the respondents still had a negative attitude to the next 12 months but this percentage is 1% better than in 2015.

Investment in the future

In 2013 63% of the respondents were planning overseas investment opportunities in other European countries (20%), in Asia (16%), in North America (8%), in South America (8%), in Africa (7%), in Oceania (1%) and all over the world (3%). In June 2014 59% of the respondents were planning overseas investment opportunities investing in other European countries (19%), in Asia (11%), in Africa (11%), in North America (8%), in South America (3%), in Oceania (3%) and all over the world (4%). In December 2014 53% of the respondents were planning overseas investment opportunities investing in other European countries (20%), in Asia (13%), in North America (9%), in Africa (6%),
in South America (3%), in Oceania (2%). According to these data the willingness of the European family of foreign expansion decreased during from 2013 to the end of 2014.

Summary

Now I am by the first step in my PhD thesis (5th figure). Within the confines of this paper I intended to give a draft summary about my research plan and the core concepts.

5. Figure: The present stage in the research process

As a next station in the nearest future I would like to examine family businesses, international and national organizations. In addition, I will read journals in connection with Hungarian family businesses and generation change.

For the next two month I have a plan to make interviews with three metallurgical family businesses in connection with this issue.

References


European Family Business Barometer:


- [https://home.kpmg.com/content/dam/kpmg/at/pdf/presse/Global_EuropeanFamilyBusinessBarometer_SCREEN.pdf](https://home.kpmg.com/content/dam/kpmg/at/pdf/presse/Global_EuropeanFamilyBusinessBarometer_SCREEN.pdf)
Economic Development
Through Local Television in
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Abstract

In 2002, the system of Indonesia
Television broadcast was changed to
decentralization. The fundamental changes of
the broadcast have marked since Indonesia
announced the Act of broadcasting form-
TV station). Research analyses model was used by interactive model (Sutopo, 2002). The result of research found that ADi TV has already generated the local economic through their on air broadcasting and off air as well. Further research would be necessary to figure out contribution of ADi TV in economic compere with “existing television/national TV” and network local television as well.

**Introduction**

Since the present of television in 1962, Indonesia was applied monopolistic and centralistic broadcasting television system. Government applied censorship and revocation on the media. Form 1962 until 1989, there was one TV station only owned by government, namely TVRI (Republic Indonesia Television Broadcasting Station). Although in 1964 Indonesia was built local TV broadcasting stations in several regions but all of them were owned by government.

Monopoly of television was ended in 1989. Government gives licenses to private TV broadcasting station, namely RCTI (Rajawali Citra Televisi) and followed by 4 other TV stations, namely; SCTV/Surya Citra Televisi (1990), TPI/Televi Pendidikan Indonesia (1991), Andalas Televisi/AN TV (1993), and Indosiar/Indonesia Visual Mandiri (1995). But all the private TV stations were owned by family of Soeharto (the 2nd President of Indonesia) and his cronies. RCTI, TPI, and Indosiar were located in Jakarta, but SCTV was in Surabaya, and ANTV was in Lampung. In 1993, SCTV was moved to Jakarta (Surya Citra Media Annual Report, 2014). ANTV established in Lampung city but on March 1993 was moved to Jakarta (ANTV, 2016). All TV stations were nationally broadcast and free to air gradually; and they tend to Jakarta centrist of broadcasting as well.

In 1998, Indonesia faced world economic crises. The exchange rate of rupiah against the dollar was falling rapidly. Indonesia’s debt burden swell, especially the need dollars to repay debt occurred almost at the same time. Economic profile of Indonesia under the New Order was not supported by a strong economic foundation (Yazid, 2014: 1-14). Further, the New Order fell and replaced by Order of the Reform.
TV broadcasting companies was increase rapidly from 10 private TV stations to 532 TV stations around Indonesia in 2015 (Dewan Pers, 2015). The success of national TV stations become inspire among local broadcaster to make new TV channels.

Almost all of regions in Indonesia have local television, as well as Yogyakarta Special District (DIY). In this region, there were 5 local TV stations namely Republic Indonesia TV Station of Yogyakarta (TVRI Yogyakarta, established in 1965), RB TV (established in 2004), Jogia TV (established in 2004), ADi TV (established in 2009), and R-TV (established in 2014). All the local televisions were owned by private, but TVRI was owned by government as a public television. (Figure1). All TV broadcasters claimed that they have local culture character. For instance, ADi TV focuses on education and information around of Yogyakarta; Jogia TV on entertainment with Yogyakarta style; RB TV on local Yogyakarta and national news; R-TV on local culture and national entertain; and TVRI Yogyakarta on Yogyakarta traditional culture.

Although the all TV stations were not permitted to broadcast nationally based on Act of 32 of Broadcasting, but national TV stations was asking an exceptions. They proposed several reasons and makes powerful lobbies with many parties, elites, and important persons for the exceptions. Finally government gives licenses to all National private TV stations for broadcast nationally, with special licenses, named IPP (Ijin Penyelenggaraan Penyiaran/ Broadcast Provider License) sign by Ministry of Information and Communications of Republic of Indonesia (Kominfo 2016). Based on IPP, national TV broadcast can use local spectrum of TV frequencies bands. In IPP procedure, the national TV stations obtained to use local channels on the name of headquarters’ network.

The IPP makes all national TV stations can broadcast nationally and becoming weighty competitor for local TV stations. With all their sources, national TV stations were tends to control the competition and gaining more advertisers than local TV. They received big revenue from advertisements. The competition among TV broadcast in Yogyakarta become tight. Instead 5 local televisions, Yogyakarta people can find 10 national private TV broadcast and 1 public TV freely.

Further, most of local TV stations were not vigorous to face the competition. The huge of investment in TV stations from local investor needs to be return immediately. Except ADi TV, all the local private TV stations in Yogyakarta make several actions to save their business, hoping their investment returned as soon as possible. One of the business decisions was joining TV networking.

The oldest local TV stations in Yogyakarta (founded on 17 August 1965) as public television was joint network with national TV public, TVRI Center of Jakarta. TVRI Center of Jakarta was full fill 16 hours duration of broadcast per day, and 3 hours left by TVRI Yogyakarta. Meanwhile RB TV was founded in 2004 by PT. Redjo Buntung and STIMIK AMIKOM Yogyakarta. Since 2012, RB TV was joint cooperation with Kompas TV as TV networking. The 70% programs per day of RB TVs programs was support by Kompas TV.

Further, Jogja TV was joining TV network as well. This local television was owned by PT Yogyakarta Tugu Televisi. Since 2014 Jogja TV was joint cooperation with Bali TV as TV networking. Besides joining Bali TV network, Jogja TV was shared with local elite politician of Yogyakarta. In this shared, Jogja TV often received government expenditure for
Networking is giving financial benefit for local TV stations. According to the regulation of Kominfo, local private TV network was allowed to produce 10% duration TV programs only per day. They were not necessary to make many TV programs. They rely on their main network. Even though local televisions need large number of programs, but they can fill from their networking stations easily. In other side, local TV will receive a lot of money, profit sharing with their network.

Among the local TV stations in Yogyakarta, ADI TV was not joining with any TV network although national television offering many times. Even though this TV stations have big losses, but this local TV stations keep forwards and not tempted to be part of networks with other TV stations. Until nowadays, ADI TV still survive in the competition and reduce losses constantly. They can build big new building for studio as well. The economic business in surrounding of ADi TV studio was developed smoothly. Several of ADi TVs program, become popular, such as Mocopat Safaat, Wedang Ronde; Tips Tiga Menit; Cahaya Robani; and Lensa 44. Some of them had been competed with national broadcast, especially in Ramadhan. One of the TV programs, Mocopat Syafaat, had been succeed on air and off air as well. The program is succeeding to attracting viewers and advertiser as well.

This appealing phenomenon brings out an important question; how contribution of local television of ADi TV as no networking TV station to the local economic development and how they encourage local community maintained local culture?

**Literature review**

**Television and Business**

Television is the most popular mass media in Indonesia and Yogyakarta as well. Currently, media has become almost as necessary as food and clothing. The amount of viewers in Indonesia was huge number. In 2012, television is the dominant form of mass media in Indonesia; almost all Indonesian adults (95.9%) watch TV, which means a TV audience of almost 240 million people. (Gallup, 2012). As a result, a large proportion of advertising spend goes to television – around 60% in 2011. But national channels dominate the market, with local channels only holding a 3% share of viewers (Redwing, 2012).

The spending of TV advertisement in Indonesia is very huge. Redwing (2016) was report that television ad spending trends always goes up from year to year (Figure 2). The amount of the advertising pie is very interesting in television business. They hope to join obtaining revenue from the advertising expenditure. The ad revenue made television stations can manage to accumulate capital and develop themselves entered in to other businesses (Sudibyo, & Patria, 2103: 257-275).

Television is a big industry in Indonesia. Business motive always remain in local TV, beside ideal motive as giving positive content of message of television to the viewer’s (Adi TV profile, 2016).

Television stations serve two distinct groups of clients: on the one hand is the content of consumers (i.e., TV viewers) who demand information and/or entertainment and on the other hand is the advertisers who seek the attention of potential customers. The two groups affect each other’s wellbeing in that TV viewers dislike advertising, whereas advertisers like viewers’
attention (Nilssen, 2010: 115-123). In economic, it called two-sided markets (Evans and Schmalensee, 2007: 150-179; Rochet, and Tirole: 2006: 645-678). All the markets should be maintained harmonically.

Local Economic Development

Local economic development has various definitions. A related discipline, economic development, is also defined in different ways. In this study, I defined that local economic development is an ongoing process by which key stakeholders and institutions from all spheres of society, the public and private sector as well as civil society, work jointly to create a unique advantage for the locality and its firms, tackle market failures, remove bureaucratic obstacles for local businesses and strengthen the competitiveness of local firms (Ruecker & Trah, 2007).

Local economic development can be done by many parties. Government is not a single actor in local economic development. There were in diverse array of agencies and organizations across all levels of governance and represent a range of functional interests who playing important role (Morgan, 2009: 5) such as non-government organization (NGO), small-medium enterprises (SME), finance institutions, and private company as well (Swinburn, Goga, & Murphy, 2006: 3). The legal standing of local television is a firm or company. According to Indonesia government, television broadcasts must be a legal entity (PP of 50, 2005).

The role of the local television institution in economic field examine in several activities such as in administration of the business, producing the TV programs and commercials, and the effect of the TV commercials as well. The contributions of local television were divided into 2 parts, namely indirect distributions and induced contributions.

Indirect contributions, which relate to the output and jobs supported in Indonesian-based supply chains, due to purchases by Indonesian TV companies of goods and services from other firms located in the country, purchases by those suppliers in turn, and so on throughout the chains. Meanwhile, Induced contributions, i.e. the Indonesian output and jobs supported by workers in the TV industries – and other employees throughout the supply chains – spending the earnings ultimately derived from TV activities. (Oxford Economics, 2010: 6-7).

Estimation of the direct GDP of the television sector was worth 5,246 billion Rupiah in 2010, directly supporting 162,500 jobs and generating 537 billion Rupiah in tax revenue. Taking into account indirect and induced effects these figures rise to 17,001 billion Rupiah in GDP, sufficient to account for 344,300 jobs and yield 1,769 billion Rupiah in tax receipts. The television sector therefore accounts for 68% of the direct GDP of the combined ‘film and television’ industry, and for 85% of direct employment. Therefore, its productivity is lower than that of the film industry. At 32.3 million Rupiah per employee in 2010, that is now below the average for the non-financial services sector as a whole, of 43.3 million, having been broadly on a par with that broader sector’s performance as recently as 2008 (Oxford Economics, 2010: 6-7).

The purpose of local economic development is to create an enabling environment in which local people and institutions can make realistic and practical decisions to strengthen the local economy, create more jobs, promote new enterprises, including self-employment, and to improve the quality and prospects of life for all (Bhisho, 2006).
Local TV and Network TV

The decentralization of TV broadcasting had been implemented by many countries, such as Canada, Australia, Europe, and United State of America (Comer and Wikle, 2015). Most of the countries have common purpose in implementing decentralization of broadcasting system these are to promote localism, diversity of ownership, competition and immersing potential local economic (Rennhoff and Wilbur, 2012: 231-242; Indonesian Broadcasting Act 32, 2002; ).

The definition of localism had been disputed. Ayock (1999) and Stavinsky (1994) wrote that locally can be considered geographically such as cities, counties and regions while Comer and Wikle, (2015) refer to news content and adapt to the needs and interests of the local community where the media is managed. According to Communication and Informatics Minister of Republic Indonesia, local TV is a broadcast station that was established in certain place with certain scope of broadcasting in the presence and should provide their own studio and transmitter (Kominfo, 2009).

Further local televisions consist of networking local television and no network television. Networking local television is described as working procedures governing the relay broadcast regularly between local television institutions (Kominfo, 2009). Further Kominfo ruled several regulations, such as: 1). Private local television can involve as main of network and member. 2). Main of network must be located in province and member was in districts. 3). Member of network have obligation to produce minimum 10% of content local program and gradually increase to 50%. 4). Main network have right to spread his content through the member of network, based arrangement among network television. Local program describe as broadcast material with local content, factual and non-factual, include events, issue, news background, and profile, in perspective to developing culture and local potential (Komisi Penyiarian Indonesia, 2009).

Conceptualization

Due to the implementation of the act of 32 of broadcasting, Indonesia television broadcast system was changed from centralized to decentralization. TV station was not allowed anymore to broadcast their contents to all of Indonesia, except through TV networking. Since the Act of 32 applied, there a lot of local television stations have founded in all region of Indonesia. The spirit of shifting system of decentralization was to promote diversity of content, ownership, and immersing of local economic as well.

As mass media, local TV is institution of business as well. As an institution business, local TV was playing important role in local economic and culture development. Steven M Chaffee (2002) wrote the existence of media has several effects to society, such as economics, social; people scheduling in daily lives; disappearing of surfeited feeling, and affected of various social sentiment. In economic and social fields, the local TV has widely effect.

The local TV was agencies as one of the actor who playing important role in local development (Swinburn, 2006: 3). Local TV immerge create more jobs, salaries, broadcasting taxes (Bhisho, 2006). Local TV stations represent areas suitable for sales messages, “stealth advertising”, and product placement (Upshaw et al., 2007: 67), and increasing consumption among the viewers (Asadollahi & Tanha, 2011: 01-06).
Methodology

This research was a qualitative method. The research has two main purposes to explore the contribution of the ADi TV as a non-networking and private local television stations of broadcast to economic development in Yogyakarta Special District.

Data was collected through observation and deep interview. Interviewed was done among the managers, producers, and marketing officers of ADi TV, as well as Yogyakarta community business who advertise their business at ADi TV and who was not advertise at ADi TV as well. Observatory was used in data collected. The validity of the research was method validity. All data collected was analyses with interactive analysis (Sutopo, 2002).

Results

The viewers of TV broadcast are not only people who lived in Yogyakarta but in bordered around of Yogyakarta as well. Dukcapil (2016) reported that population of Yogyakarta is 3,499,316 (Figure 3). In effort to increase of the viewers, ADi TV placed their 12 KWh antenna in Patuk of south of Yogyakarta. From this place, ADi TV can broadcast its content to wider places, such as Klaten, Surakarta, Sukoharjo, Boyolali, Karanganyar and Magelang. The populations of 8 regions are 9,100,729.

The average Indonesian people watching TV was 2.9 hours per day. Even the averages of housewife watching TV is 3.2 hours per day (Neilson 2008). But the local viewers tend to choose national TV stations than local TV. The national TV is offering more entertaining and interesting news. Facing this reality, ADi TV is creating several TV programs collaboration with some local famous peoples.

Meanwhile, Yogyakarta was known as student city. In this region have 128 higher education institutions (Kopertis V DIY, 2016). Based on this fact, ADi TV was creating large number of news focuses on campus and making TV program joint collaboration with higher education institutions as well.

The TV market based on religions, ADi TV was focusing on Muslims as main viewers. Most ethnic Yogyakarta’s are Muslim (92.20%); then 4.76% Kato-lík; 2.78% Christian, Hindu 0.13% Budha 0.10% (Dukcapil, 2015). In all most all the content, ADi TV was colored with Islamic culture and values.

In attracting advertiser’s enthusiasm, ADi TV was offering several flexibilities such as number of choices in categories of TV advertisement and promotions. Further, ADi TV gives disclosure of information in the bid proposals, such as budgeting component of productions, negotiable opportunities of concept of productions, etc. Averages per month, ADi TV have 160 Advertiser consist of local and national advertisers. (Figure 4).

Local Television in Yogyakarta

In Yogyakarta, there were 5 local television stations, namely Republic of Indonesia Television Station of Yogyakarta (TVRI Yogyakarta), Reksa Birama/RB TV, Jogja TV, ADi TV (Arah Dunia Televisi), and R TV.

TVRI Yogyakarta was founded on 17 August 1965 and owned by government of Indonesia as public television. Meanwhile RB TV was founded in 2004 by PT. Redjo Buntung and STIMIK AMIKOM, one of famous college in Yogyakarta. Since 2012, RB TV was joint cooperation with Kompas TV as television networking. At the same year with RB TV, Jogja TV was...
founded. This local television was owned by PT Yogyakarta Tugu Televisi. Since 2014 Jogja TV was joint cooperation with Bali TV as television networking. Further, in 18 July 2009 ADi TV was formally founded by University of Ahmad Dahlan and Muhammadiyah.

All private and public TV in Yogyakarta was support by main network, except ADi TV. ADi TV is a local television with un-networking TV station formally. Most of the ADi TV program was produced by them self, but less programs was produce by other.

TVRI Station of Yogyakarta was supported by TVRI center of Jakarta. TVRI Center of Jakarta was full fill 16 hours duration of broadcast per day, and 3 hours left by TVRI Yogyakarta. The 70% program per day of RB TV was supported by Kompas TV. Other local television, Jogja TV has the same system, supported by their main network. Meanwhile Jogja TV, besides joining Bali TV network, shareholders was local elite politician of Yogyakarta.

Arah Dunia Televisi (ADI TV)

Initially, ADi TV was formed as community television owned by University of Ahmad Dahlan. Further, on July 18 2009 ADi TV was formally established with 2 counterparts, namely University of Ahmad Dahlan (64%) and Muhammadiyah (36%). Further, in 2011 relate to the overtake of the costs should be borne, UAD decrease its share to 12% and Amin Rais former head of People’s Representative Assembly republic of Indonesia was took 60% of ownership. Composition of share of ADi TV was change, UAD 12%, PWM 28, and Amin Rais 60%. The total investment on ADi TV was approximately 1.500.000 USD.

The format program of ADi TV was information, education, entertain, kids program, live and interactive, and local culture. The target market was all Jogjakarta viewers were ages 3-60 and mostly middle-up social economic background. ADi TV was officially located at Jl Raya Tajem Km 3 Sleman. The coverage of ADi TV broadcast was Yogyakarta, Temanggung, Sragen, Wonogiri, Solo, Purbalingga, Purworejo, Boyolali, and Gunungkidul.

ADi TV have produce several TV program (Figure 5), and in 2015 take cost averages all of production at least 5.000 USD per month. The total overhead of ADi TV was 19.167-20.833USD per month (1 USD = Rp.12.000), meanwhile the revenue approximately 15.667-16.666 USD. ADi TV still has losses in every month approximately 4.167 USD. Based on idealistic reason, the owner still give subsidy to ADi TV. In effort to minimize the losses, ADi TV was creating another effort using their related potential business such as short training, charge a ticket fee for company visit and student trainee, off air event, e.t.c. These efforts bring approximately income for ADi TV 416.7 USD per month. Since in the middle of 2013, ADi TV succeed decreasing 50% losses.

Local Television Contributions in Economic of Yogyakarta

Local television had have contribution in local economic. The contribution was not from the presence its self, but as well from their broadcasting activity. The descriptions of contribution of local television in local economic of Yogyakarta Special District were:

a) Workplace of the employer.

As a formal institutions TV local need several employees for run their business regularly, but amount of
worker were different each other. ADi TV has 89 employees, divided into 6 divisions, namely human resources affair, finance, marketing, news division, technical affair, and TV production business (Figure 6).

Among the 89 employers, 78 employees were full time workers and the rest were part time officers. According to management in the future, the amount of employee will be added more to run the business. Further, the division of marketing, technical affair, news, and TV productions division are the priority to be added. At least for ideal business will be added approximately to 150 persons of worker.

Officers were regularly paid following the standard of “Upah Minimum Regional Yogyakarta/UMR Yogyakarta” (Regional of Yogyakarta minimum payment standard). UMR Yogyakarta is regulated by Governor of Yogyakarta, based on normally living cost in Yogyakarta regions. Every year the standard of UMR of Yogyakarta were reviewed by Yogyakarta Labor and Employee Department. In 2015 UMR of Yogyakarta was 100 USD (SK Gubernur DIY, 2014).

b) Workplace of the performer and supporting team

For full filling the program, Local television has contribution to local economic of Yogyakarta in several variations, namely host/news anchor, invited guest speaker and its audience in talk show programs, singer and musician, dancer, comedian and drama, magician, and other program participants. They were not ADi TV employees but involved in certain ADi TV program of television, both of in studio and out of studio production.

ADi TV has 34 programs of broadcast, 19 programs produce by them self, 8 programs was joint production, and the rest was outsourced production. There 18 program of production was live and the rest was taped. All programs were involved variance of amount of performer and supporting team. Performer is person(s) who fulfilling the program as the actress or actor. Supporting team are the persons who involved and accompanied the performer.

The small supporting team of a television program was 15 persons, for talk show program. The large number of crew of production in a program was “Macapat Safaat” a joint production with Kyai Kanjeng.

Macapat Safaat was a religious speech, a combination of music and dialog. Sometimes, dance was involved as well. Actually Macapat Safaat was collaboration between Kyai Kanjeng and ADi TV, whereas Kyi Kanjeng was event organizer of out studio production and ADi TV as exclusive television to broadcast.

Kyai Kanjeng was consists of Cak Nun, 30 musician, 3-4 guest, and 4 singer. The Macapat Safaat was produce at out of studio such as basketball courts, mosque, meeting hall, etc. Usually, the event was attended by approximately 3,500-5,000 people. ADi TV was mobilized 10-12 personal of employee. In every performance street vendors usually comes, sell traditional food, drink, moslem accessories, and toy for kid, etc. There were around 40-50 street vendors with turnover 16.6-25 USD in each of them per event.

Except Macapat Safaat, most of the performer was paid by ADi TV and
some other by sponsor. The payment was variety depend on some variables, such as level of popularity, educations, ages, and level of position in organization or community. The person who determines the amount of wages was financial officers. The lowest of wages were 3.85 USD and the high were 291.67 USD.

c) ADi TV Commercial Contribution in Local Economic

The next contribution of ADi TV in local economic was produced from its role as promotion and commercial television. ADi TV has offering seven categories of commercial program to local business, namely commercial spot, running text, credit title, backdrop logo, blocking time, and sponsor program. But down to date, business people of Yogyakarta have not better response. ADi TV had not got a large number and variance of advertiser or sponsor.

The less of local business people who used ADi TV as promotional media was understandable, because local business people prefer to use print media especially newspaper. There were 5 main rations according to ADi TV’s fact finding, namely:

1. Advertised in print media was documented and easy way to read in many times than television.
2. Commercial print was cheaper than television.
3. Yogyakarta local business was expected direct selling form their commercials and promotions effort
4. The quality of ADi TV broadcast was poor than existing television. Transmitter power of ADi TV was 6 watt and mostly of existing television power of transmitter was 4-5 watt,
5. Large number of Yogyakarta community was chose existing TV than local TV such as ADi TV.

d) Emerging New Business in Surround of studio

Initially ADi TV studio was located in ITC Building, Kapas street. The building was owned by UAD. Most of ADi TV worker was UAD employees. They have house and family nearby campus of UAD. Since 2013, ADi TV was moved their studio to Tajem area, a countryside 18km of north of Yogyakarta. Initially the location of studio complex was empty land and rarely of resident.

Further the increasing of ADi TV production was encouraged the resident at surrounding studio to open the new business. Nowadays, complex of Tajem was developed into more crowded area and much of business by the local resident. Two hundred meters of surround of ADi TV studio, there were approximately 150 new small-medium businesses such as food and drink shop, room for lease, cellphone shop, motor spare part and reparation, motor leasing, barbershop, laundry, and saloon.

e) Increase the popularity of product, performers, and event

The uncountable of effect of ADi TV was increasing of the popularity of the products, performer, and event. Further, the popularity helps
the brand name of the product, events, persons, goods, and service among the community become more familiar among community. Most of the advertiser continuing their commercial is ADi TV. The popularity is followed by the product sale.

ADi TV develops through the sale of goods and services of the local culture, tourism on the internal and external market, and help in creating the positive image of the region.

Advertiser state that commercial through ADi TV was helps them better. Even though they were not has certain data on correlations between commercial activity in ADi TV and product selling. The TV commercial was not the only one of their promotions activities. But generally advertiser and the performer as well recognize the popularity was increased.

“Hijab Tutorial” was one of the most popular ADi TV program. The program was contain on know how to wearing creative hijab for women. This program was successful to persuade women for wearing hijab with art and creative ways.

f) Increasing local budget revenue

ADi TV give contribution to local government, increasing local budget revenues, through taxes, personal income taxes and company income taxes, and through profits generated in complementary industries.

Conclusion

As a local TV station, ADi TV had already in line with the purpose of the Act of television broadcasting in Indonesia, to actualize on diversity of ownership and diversity of content. ADi TV had been contribute to local business and economics of Yogyakarta as several ways, namely as workplace, workplace of the indirect business; side business of ADi TV; off air activity of local broadcasting business. Further, ADi TV has to assist the advertiser in the marketing.

The effort of ADi TV in contribution of local business and economics of Yogyakarta was respectful and be able replicate by other local TV broadcast in Indonesia. Unfortunately, the ADi TV has not enough capital for strengthen their self, especially to increase quality of its broadcast. Further ADi TV has not able to significant attract of viewers trough quality of content and signal of broadcast. Meanwhile, government was not take side bravely to encourage a strong system for create conducive environment for local TV station.

Discussion

Local television with no networking has contribution to local economic and culture development. But all the description above was relate direct contribution with local television no networking. There was other local television with networking. Further research would be necessary to figure out contribution of ADi TV in economics of Yogyakarta society compere with “existing television” and network local television.

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### Apendix

Figure 1: Local TV Stations in Yogyakarta (2015)

<table>
<thead>
<tr>
<th>No</th>
<th>Name of Station</th>
<th>Establish</th>
<th>Status</th>
<th>Owner</th>
<th>Chanel</th>
<th>Networking with</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TVRI Yogyakarta</td>
<td>1965</td>
<td>Public</td>
<td>Indonesian Government</td>
<td>22 UHF</td>
<td>TVRI Jakarta</td>
</tr>
<tr>
<td>2</td>
<td>Jogja TV</td>
<td>2004</td>
<td>Private</td>
<td>PT Yogyakarta Tugu Televisi</td>
<td>43 UHF</td>
<td>Bali TV</td>
</tr>
<tr>
<td>3</td>
<td>RB TV</td>
<td>2004</td>
<td>Private</td>
<td>PT. Redjo Bunting &amp; STIMIK AMIKOM</td>
<td>40 UHF</td>
<td>Kompas TV</td>
</tr>
<tr>
<td>4</td>
<td>ADi TV</td>
<td>2009</td>
<td>Private</td>
<td>UAD, Muhammadiyah, Amin Rais</td>
<td>44 UHF</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>R-TV</td>
<td>2014</td>
<td>Private</td>
<td>PT. Rajawali Corpora</td>
<td>55 UHF</td>
<td>R-TV Jakarta</td>
</tr>
</tbody>
</table>

Figure 2: Advertising Spending in Television Media (2010-2016)

![Total Ad Spend (US$ bn)](chart.png)

Figure 3: Population of Yogyakarta Special District (2016)

![Population Chart]


Figure 4: Client of ADi TV Yogyakarta (October 2015)

<table>
<thead>
<tr>
<th>No</th>
<th>Category of Clients</th>
<th>Number of client from</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Out of Yogya-karta</td>
</tr>
<tr>
<td>1</td>
<td>Education institution (institusi pendidikan)</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>Government institution (lembaga pemerintah)</td>
<td>40</td>
</tr>
<tr>
<td>3</td>
<td>Health and medicine (kesehatan &amp; pengobatan)</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>Hotel and tourism (hotel dan turisme)</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>Food and beverage industries (industry mak &amp; min)</td>
<td>30</td>
</tr>
<tr>
<td>6</td>
<td>Handicraft and souvenir (keraj tangan &amp; souvenir)</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Sum</td>
<td>130</td>
</tr>
</tbody>
</table>
Table 1: TV Programs of ADi TV Yogyakarta

<table>
<thead>
<tr>
<th>No</th>
<th>Name of Program</th>
<th>Category Program</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>In house</td>
</tr>
<tr>
<td>1</td>
<td>Religion</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>News / information</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>Talk show</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Entertainment</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Documenter</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Sum</td>
<td>19</td>
</tr>
</tbody>
</table>

Table 2: Employee of ADi TV in Yogyakarta in 2015

<table>
<thead>
<tr>
<th>No</th>
<th>Division</th>
<th>Number of employee</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Human resources affair</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>Finance affair</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>Marketing division</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>Technical affair</td>
<td>14</td>
</tr>
<tr>
<td>5</td>
<td>News division</td>
<td>21</td>
</tr>
<tr>
<td>6</td>
<td>TV production</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>Total Employee</td>
<td>89</td>
</tr>
</tbody>
</table>
Challenges of venture capital financing in Bosnia and Herzegovina

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Abstract

VC funds have positive effects on capital market development, investment growth, establishment and growth of SME sector. While they are considered a higher-risk investments, VC funds also bring higher returns to investors and support the overall economic development through contributions to employment and technical developments.

This paper reports on the research that focused on the demand for VC funds intermediation services in Bosnia and Herzegovina (BiH). The primary goal of this research is to determine the level of demand and associated obstacles for VC in BiH and provide recommendations for the establishment of a supportive environment for VC funds in BiH. The dataset used in this research covers the companies which are located in the innovation centers in BiH.

The research indicates that BiH companies with a capital structure that corresponds to VC financing have a significant growth potential and are aware of the main positive effects associated that VC financing. On the other side, there is a great aversion to the financial assets collection component of VC funding, which is probably related to insufficient knowledge about VC funds among the owners and management as well as the obstacles on macroeconomic level for VC financing in BiH.

Keywords: SME financing, VC funds, demand, obstacles, BiH.

Introduction

VC funds, as a special type of financial intermediaries, are convenient source of financial assets as well as non-financial support for money-deficient companies which, considering the high risk, are not able to provide financial resources under favorable conditions at conventional means. Venture funds first appeared after the World War II, with the aim of reviving destructed regions, which speaks enough about the importance and value of this type of financing. According to latest data published by Invest Europe - the association representing Europe’s private equity, venture capital, and infrastructure sectors as well as their investors, in 2015, VC funds invested over 3.8 billion EUR in more than 2,800 companies all over Europe. In recent years, official institutions in the field of VC as well as investors saw the potential of Central and Eastern Europe (CEE) in terms of VC financing. Statistical data related to the level of VC funds investments in CEE countries indicate that currently the most interesting countries for these investors are: Hungary, Poland, Baltics, Czech Republic and Romania, while Bulgaria and the Western Balkans, including the BiH, are less interesting. However, these data should not be discouraging, but rather
motivating. Considering agricultural, energy, touristic, and other potentials of BiH, it is necessary to try to stimulate the development of VC market in order to achieve benefits of this form of financing in the future, both for investors and companies as well as the country. For investors, the biggest benefit is manifested through the achievement of high returns on investment, and for the company through productivity growth, favorable sources of financing, professional help in management, etc. In addition, employment opportunities, GDP, and public revenues would increase, financial markets would develop more, which represents a significant effect on the overall economy, especially that of a developing country.

In this context, it is interesting to examine how potential users of VC funds in BiH are familiar with this form of financing, the extent to which they need these funds, and for which activities, and weather they are willing to give up part of the ownership in their venture in exchange for the initial essential financial resources. If entrepreneurs appear unprepared for this form of financing, they need to be educated, to become aware of all the benefits that it offers.

**Literature review and conceptualization**

In each stage of the development of a business, an entrepreneur encounters the need to solve certain financial problems. And in each specific case they make the decision themselves: to borrow money, use a grant, or turn to business angels or a venture capital fund. If we are talking about operating assets, then there is no need to attract a venture investor and share the business. But if an entrepreneur sets themselves a task of winning a global market, they cannot do without financial injections from a VC firm, along with its experience and connections (Nikkonen, 2013).

Also, VC stimulates the creation of more firms than it funds, which appears consistent with two mechanisms (Samila & Sorenson, 2011):

1. Would-be entrepreneurs anticipating financing needs more likely start firms when the supply of capital expands.
2. Funded companies may transfer know-how to their employees, thereby enabling spin-offs, and may encourage others to become entrepreneurs through demonstration effects.

VC, the funding of high-potential companies through equity investments by professional financial intermediaries, has existed in the USA for seventy years. The first true VC firm was American Research and Development (ARD), established in 1946 by MIT President Karl Compton, General Georges F. Doriot, who was a professor at Harvard Business School, and local business leaders. This small group made high-risk investments in emerging companies that were based on technology developed for World War II. The success of the investments ranged widely: almost half of ARD’s profits during its 26-year existence as an independent entity came from its 70,000 USD investment in Digital Equipment Company in 1957, which grew in value to 355 million USD. ARD was structured as a publicly traded closed-end fund (Gompers & Lerner, 2001).

VC funds are financial intermediates that collect funds from various sources (banks, insurance companies, pension funds, academic institutions, governments, corporations, individual investors, and others) and invest it in companies that are in early stages of development in exchange for
This financing process involves several successive stages (Figure 1). First, it is necessary for a VC fund to be effectively presented to potential investors, in order to attract the necessary funding. Then, VC fund management searches for companies that lack the financial resources and evaluates their potential based on the analysis of information on the sector of the economy in which the company operates as well as the company’s position in the industry, quality of their business plan, level of investment, skills, company’s management, exit strategies, etc. Investment decisions are directly based on this analysis. After the acquisition of equity share of the selected companies, VC fund management continues to monitor and manage the investment, with the aim of creating added value, but also preventing opportunistic or risky behavior related to the company. Once the fund management determines that certain value-add and investment goals are achieved (taking into consideration any regulatory restrictions), the fund withdraws from the company, selling its equity share back to the owners, while achieving earnings in the form of capital gains. This phase is the final stage in the VC funding process.

![Figure 1. The process of VC financing](image)

In the past, VC funds were typically capitalized by large institutional investors that consisted of pensions, endowments, foundations, and large family offices with 100 million USD to 1 billion USD in capital under management. Traditionally, the majority of these institutions maintained a low-risk, low-return portfolio of stocks and bonds that offered predictable and stable returns. A few decades ago, fund managers adopted a strategy of putting a small portion of the assets under management into higher-risk, higher-return vehicles, such as hedge funds, private equity funds, and VC funds. This generally worked well until the 2008 and 2011 economic downturns. During the downturns, it quickly became apparent that entrusting capital to third-party alternative fund managers was no longer an effective strategy, and investors began to withdraw capital. The main reason for the withdrawal was generally lower returns across the asset class; despite the high risk and long lockup periods that investors accepted in return for
a promise of premium performance, VCs were often not returning any more capital than investors would have earned by making more liquid investments in the public small caps market. Returns from VC funds have not outperformed the public markets since the late 1990s (Ford & Nelsen, 2014).

Cochrane (2005) measured the expected return, standard deviation, alpha, and beta of VC investments. He observed valuations only when a firm goes public, receives new financing, or is acquired. Cochrane stated that there are many reasons why the risk and return of VC might differ from the risk and return of traded stocks, even holding constant their betas or characteristics such as industry, small size, and financial structure (leverage, book/market ratio, etc.). First, investors might seek a higher average return in order to compensate for the illiquidity of private equity. Second, private equity is typically held in large chunks, so each investment might represent a sizeable fraction of the average investor’s wealth. Finally, VC funds often provide a mentoring or monitoring role to the firm. They often sit on the board of directors, or have the right to appoint or fire managers. Compensation for these contributions could result in a higher measured financial return. On the other hand, VC is a competitive business with relatively free and accessible (though not instantaneous) entry. Many VC firms and their large institutional investors can effectively diversify their portfolios. The special relationship, information, and monitoring stories that suggest a restricted supply of VC might be overblown. Private equity could be just like public equity, if the effective management and control practices are applied.

Lerner and Tag (2013) investigated the development of the venture capital market in the USA and Sweden. Their literature survey underscored that the legal environment, financial market development, the tax system, labor market regulations, and public spending on research and development correlate with VC activities across countries. Their case study suggested these institutional differences led to the later development of an active venture capital market in Sweden compared with the USA. In particular, a later development of financial markets and a heavier tax burden for entrepreneurs have played a key role. The researchers also concluded that there are several other institutions that could be important, but are harder to measure and model. For example, the attitudes toward entrepreneurship are often influenced by culture, customs or religion, which also affect incentives to take risk. These factors further affect the desire of entrepreneurs toward growing their business and seeking the help of the outsider financiers. Educational institutions are also important, as what is taught in schools shapes future career choices. Mass media and peers could be important in retelling and highlighting successes that inspire entrepreneurial careers.

Besides, Cumming and Dai (2010) examined local bias in the context of VC investments. Based on a sample of US VC investments between 1980 and June 2009, they learnt the VCs exhibit strong local bias in their investment decisions. VCs tend to invest predominantly in the new ventures that are located in their home states. More precisely, about 50% of the new ventures are located within 233 miles from their VCs. They also found that the VC exhibits stronger local bias when it acts as the lead VC and when it is investing alone. Finally, the authors showed that distance matters when it comes to the eventual performance of VC investments.

Like all financial intermediaries,
it is important for venture capitalists to maintain a favorable reputation if they seek to be active long-term players in the financial markets. Nahata (2008) proposed a new measure of VC firm reputation that consistently predicts VC and portfolio company performance. Controlling for the portfolio company’s quality, exit market conditions, and a number of VC specific factors that impact performance, including experience, connectedness, syndication, industry competition, and investment environment, Nahata found that companies led by more reputable VCs based on the cumulative market capitalization of initial public offers (IPOs) backed by a VC firm, are more likely to exit successfully, access public markets faster, and have higher asset productivity at IPOs—all results being economically meaningful. On the other hand, the other likely measures of VC reputation such as age, cumulative aggregate investment, cumulative number of investment rounds, or VC connectedness, do not emerge as consistent predictors of private company performance.

Schertler and Tykvová (2011) sought to extend the emerging research on the internationalization of venture capital finance. Namely, while previous research investigated and identified macroeconomic factors that help attract foreign venture capitalists to a country, they put emphasis on how macroeconomic factors (such as expected GDP growth, R&D expenditures, and stock market capitalization) affect venture capitalists’ decisions to invest outside their home countries. The results from three different perspectives within an international venture capital investment data set spanning the period 2000-2008 can be summarized as follows. In the country-pair perspective, the researchers found that expected growth differences between the portfolio company’s and venture capitalist’s country are strongly positively related to the number of cross-border deals between the two countries. In the perspective of the venture capitalist, expected growth in the venture capitalist’s home country strongly increases the number of its domestic deals, while it slightly discourages the number of its cross-border deals. A higher market capitalization in the venture capitalist’s home countries leads to more domestic as well as crossborder deals. In the perspective of the portfolio company, they confirmed the findings of previous research by finding that the number of deals financed by foreign venture capitalists increases when the expected growth and the market capitalization of the portfolio companies’ countries increase. These findings suggested that not only the expected growth in the portfolio companies’ countries is responsible for cross-border venture capital activity, but rather venture capitalists with more promising investment opportunities in their home country prefer to invest more intensively at home and less abroad.

This indicated that venture capitalists are somewhat constrained in raising additional funds when investment opportunities improve. The findings also suggested that market capitalization does not only capture investment opportunities, as already documented in previous research, but that it also captures venture capitalists’ fundraising conditions.

When the expected marginal cost of maintaining the investment is greater than the expected marginal benefit, venture capitalists exit the VC investments and thereby VC investments duration is related to entrepreneurial firm characteristics, investor characteristics, deal characteristics, and institutional and market conditions. VC investment duration data in Canada and the USA (557 and 1,607 VC-backed firms, respectively), in the period 1991-2004,
strongly support the thesis (Cumming & Johan, 2010).

As far as the end VC financing is concerned, using a sample of 35 European VC funds and 223 entrepreneurial firms in 11 continental European countries, in the period 1995-2005, Cumming (2008) studied the relation between VC contracts and exits. The data indicated that ex ante, stronger VC control rights increase the likelihood that an entrepreneurial firm will exit by an acquisition, rather than through a write-off or an IPO (i.e. weak VC control rights are associated with a greater probability of IPO exits and a greater probability of write-off). These findings are relevant for a variety of factors, including endogeneity and cases in which the VC preplans the exit at the time of contract choice.

**Metodology**

Considering multiple positive effects of venture capital financing, subject of the research is current state as well as possibilities of VC financing in BiH. In BiH, it is important to inform and educate potential stakeholders about these institutions, determine the conditions for their functioning exist, and weather there is a demand for this type of financing. With that aim, a short analysis of VC market in CEE countries was performed, followed by a primary field research on VC funds demand in BiH.

The primary goal of the research is to determine the level of demand and obstacles for VC financing in BiH, based on theoretical and empirical comprehension on VC funds as well as to give recommendations for establishing positive environment for VC funds in BiH. The main hypothesis states as follows: In BiH, although the demand for VC financing exists, there are still considerable obstacles for this type of financing.

To determine the demand for VC financing in BiH, we conducted a research which was meant to answer the following questions:

- How well are the potential consumers of VC funds familiar with this type of financing?
- What are the scope and activities requiring this type of financing?
- Are the owners ready to sacrifice part of their future profits and ownership in order to secure financing and non-financial support at the start of their business ventures?
- What do the owners consider to be the main obstacles for VC financing in BiH and how well do they understand them?

The dataset covered in this research consists of the responses collected among the companies, namely from the managers located in innovation centers (i.e. business incubators) in BiH. Data was collected using a questionnaire, which consists of four parts. The first part relates to the general information about the company, such as company name, date of establishment, number of employees, amount of income, and ownership structure. The second part includes questions about the initial and current sources of financing and company’s potential for growth, while the third part refers to the financial and professional services that each respondent’s company uses. The final part contains questions on knowledge of the possibilities of financing through VC funds, degree of readiness for such form of cooperation, the perceptions of business owners about the pros and cons of financing through VC funds as well as the barriers to the development of VC financing in BiH. Respondents were contacted in person, by phone, or by e-mail.
Results and discussion

Having in mind multiple positive effects of VC financing, we wanted to investigate weather or not this type of financial intermediaries is considered an appropriate source of financial assets for BiH companies. To do that, we first overviewed the VC market in CEE countries. The reason we chose CEE countries is that these countries gone through process of transition and EU integration several years before BiH, and BiH tends to follow their way. Fundraising activities of VC funds in CEE countries were the highest by Hungarian, Slovakian and Ex-Yugoslav Republics (Ex-Yu), and Poland VC funds (Figure 2).

Investing activities were the highest in Hungary and Poland (Figure 3). It is interesting that Slovakian and Ex-Yu VC funds had high fundraising activities but investments in these countries were low. Average investment by company was 763,140 EUR.
After short analyses of VC funds activities in CEE countries, we did a research on demand and obstacles for VC financing in BiH.

First we wanted to know whether capital structure of companies is appropriate for VC financing. Initial capital structure (figure 3) for 70% companies was entirely made of personal savings. 25% of companies used personal savings combined with donations, leasing, bank loan, and family and friend’s assets. And 5% of them used only bank loan to launch a business. Current capital structure (figure 4) for 47% companies are made of equity. Same number of companies combines equity with debt and few of them use donations as well, in addition to debt and equity.
We can see that the capital structure of the examined companies complies with VC funds. Looking at current capital structure, it is clear that own funds are not enough for the companies and that more than half of them used bank loan to finance their businesses. The reason that they use bank loan is that other sources of financing are not available for them, or are too expensive. Examinees also stated that banks have high interest rates, due to high risks associated with these companies, high collateral requests. With no other options available to them, companies must use bank loans. Ownership structure is not complicated: 80% of companies have one owner. Hence, decision making should be quite simple as well as the process of closing transaction with VC fund.

When examinees were asked if they consider that their companies have growth potential, 90% of them answered affirmative, but only 42% of them answered that they have documented growth strategy (figures 6 and 7), which indicates a largely informal and non-transparent business strategy and planning approach.

Figure 6. Growth potential

![Figure 6. Growth potential](image)

Source: Authors’ research

For 75% of the companies who do have a formal growth strategy, the level of funds needed to implement the growth were under hundred thousand EUR. These answers imply that VC funds could consider these companies as their potential portfolio companies, as opportunity to support their growth. If we compare this amount to average investment by company of VC funds in CEE, mentioned earlier (763,140 EUR), we see that this amount for financing growth in BiH is much lower. That is why VC funds, if investing in BiH, should comply with a lower level of investment by company. In the case of BiH, VC funds could adapt their strategy to effectively support a lower amount investments across a larger number of companies.

Among the obstacles that are by companies rated as high or very high we can emphasize the following external obstacles: government policy (for 57% of companies), corruption (for 52% of companies), and high financing costs (for over 80% of companies). So, the biggest obstacle to further investments in equipment, business expansion, and hiring new people are high financing costs, i.e. high banking fees, high transaction costs, high collateral requests, etc. Innovative ways of financing, such as VC, could successfully overcome this obstacle and, thus, improve the conditions...
for the growth of companies in BiH.

We also asked examinees what professional services they use, because we wanted to see if these companies need non-financial support that VC funds provide. Accounting, legal advising, marketing, and business consulting were the most used services by these companies. In further conversation with respondents on this matter, we came to the information that companies, when it comes to business consulting, often use “free” or informal forms of consultation – consultation with colleagues, professors or lecturers from training in which the participants took part. In addition, participants recognized that the market research activities are conducted rarely or not at all, although there is a strong need for it. Hence, non-financial support from VC funds could be quite useful service to these companies.

When we asked managers if they know about the possibility of VC financing, 76% of them answered “no”, while only 24% knew about this type of financing (figure 8). Respondents were informed about VC mainly through seminars, the Internet, and through personal experience abroad, and to a lesser extent through the printed media and professional literature. When we briefly explained the activities of VC funds and asked if they were willing to use this type of financing, only 9.5% of managers agreed with VC financing, with 14% willing to cooperate with VC funds but in certain conditions (such as: the existence of good development strategy and large mutual interest, good terms of the contract, and selling only a minority stake in the ownership). The greatest percentage (76%) of the respondents were not willing to finance through VC funds (figure 9).
This shows a great aversion that BiH managers have with sharing ownership and low level of openness to VC. The main reasons are lack of trust in the positive intentions of VC funds as well as losing the autonomy in decision-making. In addition, respondents point out the fear that in the event of a dispute with VC fund slow and poor legal enforcement could be detrimental to them.

Still, they are pretty much aware of VC financing advantages. They pointed these advantages: lower financial costs, provision of financial assets, no need for collateral, networking as the greatest advantages of VC financing – a clear signal that idea has a potential (figure 10).

**Figure 10. Advantages of VC financing**

![Advantages of VC financing](source)

On the other side, loosing autonomy in decision making was stated as the greatest disadvantage of VC financing (figure 11). Other options we offered in questionnaire as disadvantages were almost irrelevant to managers.
At the end we asked examinees to evaluate obstacles for VC financing in BiH. Aversion to shared ownership, government politics and insufficient knowledge on VC were noted as the greatest obstacles for VC financing in BiH (table 1).

Table 1. Obstacles for VC financing in BiH

<table>
<thead>
<tr>
<th>Obstacle</th>
<th>“Extremely low”</th>
<th>“Low”</th>
<th>“Medium”</th>
<th>“High”</th>
<th>“Extremely high”</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insufficient knowledge on VC</td>
<td>4.76%</td>
<td>0%</td>
<td>9.52%</td>
<td>42.86%</td>
<td>42.86%</td>
<td>4.19</td>
</tr>
<tr>
<td>Aversion to shared ownership</td>
<td>4.76%</td>
<td>0%</td>
<td>0%</td>
<td>23.81%</td>
<td>71.43%</td>
<td>4.57</td>
</tr>
<tr>
<td>Underdeveloped financial market</td>
<td>76.19%</td>
<td>14.29%</td>
<td>4.76%</td>
<td>0%</td>
<td>4.76%</td>
<td>1.43</td>
</tr>
<tr>
<td>Low level of entrepreneurial activity</td>
<td>38.10%</td>
<td>28.57%</td>
<td>23.81%</td>
<td>9.52%</td>
<td>0%</td>
<td>2.05</td>
</tr>
<tr>
<td>Regulation</td>
<td>19.05%</td>
<td>19.05%</td>
<td>4.76%</td>
<td>19.05%</td>
<td>38.10%</td>
<td>3.38</td>
</tr>
<tr>
<td>Government politics</td>
<td>4.76%</td>
<td>0%</td>
<td>0%</td>
<td>47.62%</td>
<td>47.62%</td>
<td>4.33</td>
</tr>
<tr>
<td>Corruption</td>
<td>33.33%</td>
<td>4.76%</td>
<td>0%</td>
<td>14.29%</td>
<td>47.62%</td>
<td>3.38</td>
</tr>
</tbody>
</table>

Source: Authors’ research

From the table above, it is evident that BiH entrepreneurs are aware of aversion to sharing ownership that exists among them as well as the lack of knowledge on VC. Also, they perceive the difficulties at the macro level, considering government policy, and to some extent the legislation and corruption as areas that could be improved in order to establish a strong and attractive VC market in BiH.
Conclusion and recommendations

Based on the research results, we can state that BiH companies do have a capital structure that corresponds with VC financing requirements. The companies have a clear growth potential, but need to improve their growth strategies in terms of formal definition and transparency. The fact that the majority of respondents believe that their company has the growth potential, and much smaller number of them have a growth strategy shows that BiH companies are not so focused on future growth, as to current operations. BiH companies need to work hard to change this situation and become more suitable and attractive for this type of investment. BiH companies should work on creating its growth strategy, in order to be ready for potential investors who would finance their growth at all times. Another very important fact resulting from the survey is that most of managers avoid additional borrowing, leasing, inclusion of new partners, even the investment of additional own funds, with the explanation that their existing company size provides sufficient income, and they do not want to bear the risks required in order to invest in further growth.

BiH companies are poorly informed about the possibilities of financing through VC funds, which highlights the need to present and explain this type of financing to them. Majority of professional literature on financing companies available in the languages of former Yugoslavia does not contain extensive coverage of VC funds, or they are not mentioned at all. At the same time, foreign language skills of many owners and employees of BiH companies are not sufficient to understand professional terminology or make use of the rich foreign literature available on this subject. Therefore, seminars, training, workshops, direct contacts, Internet, conferences, etc. are excellent ways for BiH companies to learn the basics of VC funds processes and functions.

BiH managers are aware of the main positive effects that VC financing could provide, but losing autonomy in decision-making remains their most important concern and therefore the biggest disadvantage associated with this type of financing. Better understanding and knowledge of VC funds would assist in changing the negative perception among the managers. The reason for high aversion to sharing ownership is probably the lack of information about how VC funds work, their motives, expertise and other important aspects of VC funds. This represents an additional reason for the creation of various programs which would present functioning of VC financing, the advantages and disadvantages of this type of financing as well as all other important aspects of the contracting between companies and VC fund.

Summa summarum, the research indicates that BiH companies have capital structure that is suitable for VC financing, they have a good growth potential and are aware of the main positive effects that VC financing could provide. On the other side, there is a great aversion to this way of financial assets collection (which is probably a result of insufficient knowledge about VC funds) as well as obstacles on macroeconomic level for VC financing in BiH.

On the basis of the theoretical and empirical research, we can draw certain recommendations and guidelines for the creation of favorable conditions for operation of VC funds in BiH. At first, in all emerging economies, including BiH, the government should support and stimulate
entrepreneurial culture and put efforts towards building a functioning market for development of innovative companies. One way to achieve this is to build a VC market. To fulfill this complex task, it should be noted that a functioning VC market in the first place requires simultaneous presence of these three subjects: innovative entrepreneurs, investors with liquid assets and preferences for long-term investments (characterized by high risk and high yield), and specialized financial intermediaries. 

Secondly, there is a need to inform and educate potential investors in VC funds about the functioning of these institutions as well as the benefits and costs of this kind of investment. In addition, it is necessary to create legal conditions for the successful functioning of VC market. There is also need to ensure appropriate legislations regulating the establishment and operation of VC funds in BiH, under the Law on investment funds, but other regulations regarding protection of investors and entrepreneurs, VC fund managers, intellectual property, public procurement, taxation, etc., should be specified and their practical implementation should be ensured. This way foreign VC funds will also be encouraged to invest in BiH. When we talk about regulation, it is necessary to mention the regulations relating to the investments and investment restrictions of pension funds. Perhaps it is still early to write about it, considering that in BiH it is necessary first to reform the pension system, but it is important to note that pension funds are major players in the VC market in the role of investors. Therefore, it would be appropriate to incorporate the rules and regulations that apply to pension fund investments in VC funds in new, reformed laws. 

Thirdly, it is also important to establish a local VC funds specialization of experts in various fields of economy, so that they become capable VC fund managers. In order to encourage all participants in the process of VC financing, government can lead the process by appearing as an investor in a VC fund. Fourthly, it is necessary to develop or support the practice of research and development in educational institutions, in order to increase the demand for VC. On the other hand, in order to increase VC supply, it is preferable to teach students about VC funds during their studies, to motivate some of them for further education in the area and for specialization needed to effectively manage VC funds. 

Fifty, the role of business incubators in the creation and development of VC market in BiH cannot be ignored. Many potential entrepreneurs have ideas for great products and services, but they lack knowledge of finance, management, marketing, and many other related areas. This is the area where business incubators can add more value. Seminars, conferences, workshops, and other forms of training and business consulting can prepare business incubators for a major role in connecting entrepreneurs and VC funds. Finally, VC in BiH is a relatively new concept. Government should systemically promote VC financing among entrepreneurs, potential investors, and potential managers of venture capital funds within the country, but also among potential investors and VC funds abroad, in order to encourage investment of foreign capital in BiH, and ultimately, stimulate the overall economic growth.

References


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Development challenges of Northern Ghana and their way forward

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Abstract

Many countries have passed through different stages in the quest for development. This path to development has not been smooth as countries and regions are faced with numerous challenges and obstacles that prevent them from achieving the desired qualitative transformation in the lives of people. The development challenges a region faces are numerous and are mostly interconnected working hand in hand to obstruct the course of development. These development challenges emanate from different sources which can be social, cultural, historical, economic, and physical characteristics among others. The challenges to the development of every region and country needs to be identified and solutions found before there can be any meaningful development. The main aim of this paper is to assess the contributory factors that are hindering development in the Northern region of Ghana. This is done qualitatively with the help of comparative analysis to determine the association between the challenges to development identified and how they really contribute to underdevelopment of the region. The results show that, the Northern region of Ghana has a great potential for development as it’s blessed with numerous resources and manpower, but the intermitted chieftaincy conflicts in the region serves as a great challenge as it impacts negatively on the development drive. The paper concludes with some policy recommendations that can serve as corrective measures to the development challenges.

Key words: Development challenges, development, Chieftaincy, conflicts, Ghana.

Introduction

Globally, it is widely acknowledged that every country, region and continent do not have a smooth ride in its development discourse. Countries in their development stages are faced with numerous obstacles and challenges that prevent them from attaining the desired transformation in the life of its citizens. Most of these development challenges are country specific, meaning we can’t unify the challenges of development as being the same worldwide. Generally speaking, some of these obstacles to development have arisen as a result of corruption and bad governance and thus undermine the drive to development in a negative direction (Lewis, 1992). On the other hand, these challenges arise as a result of natural and environmental conditions for which countries and individuals do not have any influence or control of (Antle & Heidebrink, 1995). Natural conditions such as geography and the physical characteristics of a place can serve as a challenge to its development. Collier (2007) suggests that the geographical location of a region or country tends to affect its development. This serves as a hindrance to development in the sense that it makes countries “land-locked”, remote, inaccessible and isolated from the ports, markets, industrial areas and the fertile farming soil needed to promote economic and human development (Collier, 2007).

Right after the end of the Second World War, Western Europe encountered its greatest development challenge as a
result of the massive destruction the war had caused. And the only option that was needed to bring back development was the “big push” by way of the Marshal plan. The development challenge was seen as the shortage of capital and the expertise or manpower requirement. In order to overcome this challenge to the development of Western Europe, the United States of America and her allies provided the needed aid and expertise that was in dire need for reconstruction. This helped to overcome the challenges to development Western Europe faced (Wexler, 1983, Hogan, 1989).

Numerous studies have been conducted in the development sphere (Seers, 1969; Rodney, 1972; Todaro, 1981; Sen, 1999) and on the various components and dimensions of development (World Development Report, 1991, Midgley 1995, Haq, 1995). However, little has been done about the challenges to development of administrative regions, especially those found within developing countries. The main aim of this paper is to assess the development challenges that the Northern region of Ghana faces.

This paper is structured as follows. Section 2 briefly focuses on the theoretical background. Section 3 introduces data selected for the analysis and the research methodology based on finding the relationship that exists between the challenges and development. I present the results of the empirical findings in section 4 and the section 5 concludes the paper.

Theoretical background

The experience from the developed countries has demonstrated that there are several ways countries can be transformed to attain the status of being classified as developed. One of such ways is for countries to overcome the challenges and barriers they face with regard to their development. When these development challenges are known, then solutions can be found for them. Since the 1950s, there have been numerous studies on how countries can develop (Harrod, 1939; Singer 1950; Lewis 1954; Domar 1957; Rostow, 1960; Prebisch 1962; Wallerstein, 1976) and it is worth noting that all these studies offered solutions to the challenges of development that prevailed at the times of the studies.

Since the 1950s and 1960s, the modernization theory of development became the dominant ideology. In the view of the proponents of the modernization theory, the lack of development countries were experiencing was attributed to the low levels of capital and savings, technology and the belief in traditional values were seen as the major challenges to development, and according to them, the only way societies could overcome these challenges was through a big push - large amounts of investments in the form of development assistance. Development was therefore seen a process of being transformed from traditional to a modern or better still a Westernized society to resemble that of Europe. Smelser (1969) emphasizes that there are four major changes that really demonstrate that a country or society has overcome its development challenges and they include the adoption of simple to complex technology, a shift from subsistence agriculture to commercial agriculture, moving away from rural to urban population, and ultimately the move from manpower to the adoption of machinery and industrialization. It is only when these changes manifest in a country before it can be seen to overcome its development challenges.

From the 1970s a new wave of development theory started blowing and it became known as the dependency theory (Ahiakpor, 1985). According to the dependency theory, the challenge to the development of third world countries was as a result of their past economic and social relationship with developed metropolitan countries. Third
world countries are undeveloped because their relationship with Western countries was not mutually beneficial, but instead it rather promoted development in the developed countries and underdevelopment in the poor core countries because of the manner in which the poor countries were exploited (Frank, 1969). The capitalist world system made these poor third world countries specialize in the production of cheap raw materials which they are prevented from adding value and due to the low value added they do not fetch the expected revenue needed for development activities. And in the view of the dependency scholars, for countries to overcome these challenges to their development, they need to consider inward looking policies and wean themselves from the world system (Cardoso & Faletto, 1979).

The period from the 1980s to date have witnessed a paradigm shift in the development discourse. There was a shift from the investment in infrastructure to the promotion of policy reforms in developing countries (Dollar & Svensson, 1998). This was the era that the World Bank and the International Monetary Fund (IMF) got so much involved in the development agenda. In the view of the international community, the development challenge or the reasons why third world countries were not developing was the interference of the state in the economy. The state’s excessive involvement in their view had created huge and unsustainable debt burden for developing countries and a slowdown in growth and development (Easterly, 2001). So these financial institutions came up with a policy intervention which became known as the Washington consensus that had the main motive of reducing the role of the state in the economy. Countries were therefore pushed to undergo some policy reforms, including but not limited to privatization, macroeconomic stabilization, opening up the economy with respect to investment and trade, and allowing market forces to regulate the domestic economy. The success of the Washington consensus has been criticized because it has not been able to promote development in developing countries as it was intended to be (Rodrik, 2006).

From this point I deem it fit to elaborate on the current state of development in Ghana and point out the current development situation prevailing. Development in Ghana is not evenly distributed across the country. The southern regions are developed whilst the regions that lie northwards are the least developed parts of the country. The north-south development gap keeps widening as shown by the Ghana Living Standard Survey (Ghana Statistical Service, 2014; UNDP GH, 2015) reports. Among the ten administrative regions of Ghana, the incidence of poverty and the poverty gap are not distributed equally. Greater Accra has a low level poverty incidence of 5.6 %, which is 18.6 % lower than the national poverty rate of 24.2 %. But that cannot be said of the Northern region of Ghana whose incidence stands at 50.4 %. One in every two persons in the Northern region is poor; this makes the region to account for a quarter of the extreme poor in Ghana (Ghana Statistical Service, 2014).

The background of inequality in terms of development that has existed between this region and the rest of the country can be explained by geographical factors such as low rainfall. The region has only one rainfall season in a year that commences in May and ends in October and the amount of rainfall recorded annually varies between 750 mm and 1050 mm this affects effective agricultural production which has been the bedrock of Ghana’s economy (Ghana Statistical Service, 2013).

This paper therefore seeks to fill the gap by assessing the development challenges of the Northern region of Ghana which emanates from historical, social, economic, geographical sources. The Northern region
of Ghana was selected for this paper because it is the biggest administrative region in Ghana and one would have expected it to be the most developed but it is among the poorest regions of Ghana despite lots of government and non-governmental organizations support.

The history of under development in the region has been blamed on many factors. This has generated many schools of thoughts. Some scholars are of the view that the lack of development in the region is caused by natural factors. Others on the other side also believe that, natural factors cannot be blamed, but deliberate man made policies like colonialism, past and present government neglects have led to underdevelopment in Northern region of Ghana.

These challenges have continued to impact on the livelihood of people in the region. People are deprived of decent standard of living and other opportunities occurring in other parts of Ghana. The high rate of Poverty and poor human development that region is experiencing are as a result of the unaddressed development challenges.

This paper therefore recommends that development practitioners in Ghana emulate the success story of Malaysia. Malaysia and Ghana both gained independence in the same year in 1957 from the same colonial master the British. Right after independence, both countries were classified as developing countries. Currently, Malaysia which used to be classified as a developing country is now classified by the World Bank as an ‘Upper Middle Income Country (World Development Report, 2014). Malaysia has made great strides by successfully reducing its poverty rate from around 50% in the 1960’s to less than 2% currently (Economic Transformation Program (ETP) Annual Report 2014). The success story of Malaysia in realizing its development goals did not happen suddenly. They occurred as a result of carefully planned policies over the past decades that were pro poor in nature. The government took calculated measures to decrease poverty and to increase the participation of people and communities in all economic activities. The country also focused on human Capital development because they believed failure to develop labour skills could stymie the development process. The Malaysian approach to development can be relied upon for the total development of Northern region and Ghana as a whole.

**Research methodology**

The methodology proposed in this article is based on the comparative comparison. This method was primarily relied on to find out how the challenges to development have possibly influenced the development process in the Northern region. Now since this article focuses on the development challenges that are preventing Northern Region of Ghana to achieve its desired qualitative changes that have taken place in other parts of Ghana. The research approach employed is mainly the qualitative one where the Northern region of Ghana was the case studied. Also the comparative analysis was done to determine the effects of some policies (be it national or private) and how they have affected or promoted the development.

This paper employed the descriptive data analysis but the comparative approach was also used to put the region on the same scale with other regions in terms of development to find out what was going wrong in the study region. Comparison of data for this study from multiple sources served to enhance data quality which was in line with the principle of convergence and the validation of findings (Knafl & Breitmayer, 1989).

In order to ascertain how these challenges can negatively affect development I relied on secondary data analysis and used...
pre-existing data rather than primary sources due to my inability to conduct field visits. Data required for this research were carefully collected from credible multiple sources and they were based on the key development indicators in the context of the study region. These data were compared with that of other regions to know the areas in which the region was falling short in term of development in relation to the research objectives. Documents analyzed in this paper were sourced from the Ghana Statistical Service and they included the Ghana Living Standard Survey 6, 2013-2015, Poverty Map of Ghana report 2015, Ghana Population and Housing Census, 2010, Ghana Living Standard Survey 6, poverty profile in Ghana.

In Ghana development is highly concentrated in the southern parts while the Savannah areas or the northern parts are mostly deprived on every development indicator. The regions of Greater Accra and Ashanti are the most developed regions, while the Northern region with its neighbours is the least developed. One would have expected that the biggest region in Ghana should have the largest population, but that is the opposite as can be seen from Figure 1 below. The graph really shows that the Northern region of Ghana is among the least populated areas in Ghana due to combinations of factors such as lack of economic opportunities, poor climate among others. It has a population of about two million but has the largest land mass in the whole of Ghana.

Figure 1: Regional population distribution of Ghana

Source: authors with data from Ghana Statistical Service, 2016 population data
Results

The challenges to development in the Northern region of Ghana emanate from different sources and they are interrelated. They work collectively to contribute to underdevelopment in the region. The challenges can be seen from the economic, social, historical perspective. The voluntary and involuntary movement of people from the region to other administrative parts of the country due to several reasons plays an important part in its development. When people move from a particular place or region, the size of the population is reduced and this can affect its development. This is because it is mostly the economically active population that moves. Migration in Ghana has mostly been from the underdeveloped North to the developed South regions of Greater Accra and the Ashanti region due to the economic prospects they offer. Certain factors such as poverty, low level of development and declining agricultural productivity forces many families in the Northern region to seek better opportunities elsewhere and this can impact on the social and economic development of the Northern region. Migration can negatively affect the development in terms of population as the aged left behind can’t do any economic activity. This affects agriculture and other economic activities especially food security.

Figure 2: Flow map of Ghana showing North-South youth migration

Again it was seen that the level and quality of education in the region is very low when compared with the other regions in Ghana. Figure 2 below shows regional trends in the Pupil-Teacher Ratio in public primary and JHS which was used to measure the quality of education. It can be seen that there existed regional variations in terms of PTR at the primary and JHS levels nationwide. The Brong Ahafo Region, Eastern Region, and the Ashanti Region had the lowest PTR 28:1 in the primary level of education. While the highest ratio of 42:1 was recorded in the Upper West. On the other hand, at the JHS level, the Ashanti Region had the lowest PTR ratio of 13:1 while the northern region recorded the highest PTR ratio of 21:1 although it was far below the national average. The Northern Region also had a higher PTR at the primary level and this was above the 35:1 target. The high rates of PTR in the region can be attributed to the shortage of teachers in the region. Most teachers fail to accept postings to the region due to the low level of development.

Figure 3: Pupil-Teacher Ratio in Public Primary and JHS by regions, 2013/2014

Conclusions

By this article, I sought to analyze the challenges to the development of the Northern region of Ghana that has prevailed from the past and current times. From the forgoing discussion, it is evident that the development challenges of the Northern region of Ghana are as a result of the interplay of numerous factors that work hand in hand to contribute to the regions under-development. Some of the development challenges occurred as a result of historical (colonial heritage), government neglect, poor climatic conditions, geography and the location of the region as well as the lack of economic opportunities. This has made the Northern region as the Northern parts of Ghana lagged behind in terms of socio-economic development as compared to the resource rich southern parts. The southern regions of Greater Accra, Western, Ashanti,
Brong Ahafo are more developed as compared to the Northern parts which includes the Upper East, Upper West and the region under study—the Northern region are the least developed and poverty stricken parts of Ghana. The paper therefore concludes that there should be premeditated efforts on the part of government and non-governmental organizations that should be geared towards promoting development of the region to bridge the widening development gap and regional disparities in Ghana.

Based on the findings, the study has made the following policy recommendations which could serve as corrective strategies to the challenges of development in the region.

1. The study recommends that there should be increased efforts to attract investors to the region. Potential investors from the region need to champion this cause to encourage other investors to invest in the huge potentials of the region like mining, tourism, agribusiness, irrigation technology, and other areas by first investing in the region. When indigenous investors do this, it will attract other investors who are not from the region to invest there. The ideal strategy will be to focus investment in areas where infrastructure has been developed like in the Tamale agglomeration area so that, they can benefit from transport link of the Tamale airport and other urban facilities.

2. Secondarily, the research proved that the Northern region is home to lots of tourist attractions such as the Bui reserve, Mole game reserve, which is the biggest in Ghana and many other undeveloped tourist sites. The Ghana Tourist board must promote these tourism potential by collaborating with the regional tourist board, district assemblies, and hoteliers associations by advertising in the local and international media by showcasing these places of interest the region has. In addition, hotels in the catchment areas can also promote these attractions because when tourists come it will have a trickle-down effect on them because they will patronize their accommodation services.

3. The study also recommends that more opportunities need to be created in the region especially employment opportunities for the youth to make the region more attractive to live. The region is losing its manpower base needed to enhance the development process. Banks and micro finance institutions need to soften their collateral demands so that the youth can have access to funds needed to start self-owned enterprises.

4. In addition, there is the need to improve upon the existing infrastructure, such as schools, health facilities, roads, potable water, and hotels. Investment in transportation infrastructure in deprived areas in the region has the potential to stimulate trade and agriculture development. It will be capable to serve as a link to market centers where they can offer their produce for sale and make some income. The expansion of electricity, telecommunication services, and water can attract medium scale enterprises to the region. This will go a long way to help bridge the gap in development.
between the north and the south which seem to attract the youth to other regions as it will offer them employment.

5. The media, religious groups, and civil society organizations need to promote educational programs on problems and challenges migrants go through in the cities and also educate the youth on their expected roles in the development process of the region.

6. The study also recommends the setting up an independent mediation committee to help find an amicable solution to conflicts in the region. Possibly a non-Ghanaian is preferred because he will remain neutral. The mediator can also in dialogue with gates draft chieftaincy succession plans with conflicting parties and pass it on to the Ghanaian legislature for it to be passed into law.

7. In order to retain health workers in the region, it is recommended that, students from the region can be sponsored by the district assemblies to pursue their health studies and after completing their studies they must serve their community as they are the ones to contribute to its development and not outsiders.

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**Brief biography of author**

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Hails from the Eastern region of Ghana. He obtained his bachelor’s degree in Integrated Development Studies from the University for Development Studies in Tamale, Ghana and then proceeded to the Palacky University in Olomouc, Czech Republic where he obtained his masters degree in International Development Studies. Currently he is studying his doctorate degree in economic policy and administration at the University of Pardubice in the Czech Republic. He currently works in a project team that studies the modeling of knowledge spillover effects in the regional and local development context. In addition he also lecturers the course in municipal finance in the same university. His academic and research interest are in development issues, public policy analysis, knowledge based economies, knowledge spillovers and development management. His hobbies are listening to country music and playing football.
Abstract

The smart specialisation concept became rapidly popular and got integrated into the reformed EU Cohesion Policy of the 2014-2020 planning period. However an undesirable result of this rapid implementation was that it left several implementation issues unanswered. An important unanswered issue is the implementation of economic impact assessment in a smart specialisation policy context. Integrating entrepreneurship and interregional network policies into an economic modelling framework is considered as the most prominent challenges. This paper introduces how these two policies are implemented in the GMR-Europe model. Policy simulations demonstrate the economic impact assessment capabilities of GMR-Europe.

Introduction

Smart specialisation policy is a recently introduced innovation-based regional development approach. According to this a future industrial specialisation of a region is considered ‘smart’ if it grows out of the regions’ own traditions instead of the (typically not replicable) experiences of well-known successful regions located elsewhere in the World. The main instruments of smart specialisation are neither traditionally implemented sector-neutral innovation policy measures (e.g., human capital development or R&D support) nor top-down policy tools targeting selected industries. Instead it is a particular combination of these elements characterised by government supported entrepreneurial discoveries. As a result a smart specialisation policy combines the support of entrepreneurs to discover ‘new domains of future opportunities’, the backing of entrepreneurs to discover these new opportunities and the promotion of structural changes by prioritising the ideas emerged from the region with non-neutrally designed policy instruments such as the promotion of human capital, R&D, entrepreneurship and knowl-
edge network development (Foray 2015).

The theoretical framework of smart specialisation policy was developed by the Knowledge for Growth expert group (Foray et al. 2009, 2011) and implemented in an explicit regional policy context by McCann and Ortega-Argilés (2015). The policy concept became rapidly popular and got integrated into the reformed EU Cohesion Policy of the 2014-2020 planning period. In order to be eligible for cohesion policy support each region is required to develop their smart specialisation programs (McCann, Ortega-Argilés 2016). However, as Foray emphasises, the undesirable result of this rapid implementation was that ‘policy run ahead of theory’ leaving several implementation issues unanswered (Foray 2015).

One of the most important unanswered issues is the implementation of economic impact assessment in a smart specialisation policy context. Economic impact assessment targets the estimation of the likely impacts of policy interventions on economic variables like GDP, employment or inflation. The purpose of economic impact assessment therefore differs substantially from project level impact evaluations because it considers direct and indirect aggregate impacts of the projects (including Keynesian demand multiplier effects, supply effects generated by inter-industry linkages or knowledge spillovers). Economic impact assessment is traditionally an essential element of cohesion policy and as such it should also play a key role in smart specialisation both in ex-ante (policy planning phase) and in ex-post (final) evaluations.

Commonly applied instruments in economic impact evaluation are specifically designed economic models. Key reasons why economic impact assessment of smart specialisation programs has not been implemented in the cohesion policy framework are the challenges in modelling implied by smart specialisation. Integrating entrepreneurship and interregional network policies into an economic modelling framework are considered as the most prominent challenges. This paper describes how these two policies are implemented in the complex impact assessment system of the GMR-Europe model. In addition, some policy examples demonstrate how these novel capabilities of the GMR-Europe model are applicable in a smart specialisation policy context.

The paper is structured as follows. The second section situates economic impact assessment in the smart specialisation prioritisation process, followed by the description of how the mechanisms of knowledge network and entrepreneurship development policies are integrated in the GMR-Europe model in the third section. Then, the fourth section illustrates the model’s capabilities by means of policy simulations. Summary closes the paper.

**Economic impact modelling in smart specialisation policy prioritisation**

Smart specialisation is not new, what is novel is the analytical description of the phenomenon and the development of the concept of smart specialisation policy (Foray et al. 2009, 2011, David et al. 2009, Foray 2015, McCann, Ortega-Argilés 2015). Smart specialisation is the capacity of regions to implement structural change in their economies through the discovery of new domains of opportunities and the concentration of resources to those domains (Foray 2015). The key concepts of smart specialisation are ‘entrepreneurial discovery’ and ‘structural change’. Discoveries include activities aiming at exploring, experimenting and learning about possible directions of a future economic change within a sector or between different sectors (Foray 2015). It follows that discovery is not innovation but precedes the stage of in-
novation. Entrepreneurs who are in good positions to understand a region’s economic capabilities take the lead in discovering new domains of opportunities (Hausmann and Rodrik 2003). Then, knowledge spillovers from successful initial discoveries result in a series of imitative firm entries, leading to the concentration of resources in the new domain and a consequent structural change in the region’s economy. Structural change may take different forms ranging from diversification and modernisation of industries to the appearance of radically new sectors in the region (Foray et al. 2011).

Smart specialisation therefore describes a form of innovation-based regional economic development, which begins with discoveries by entrepreneurs, progresses with new firm entries generated by spillovers from successful original discoveries and matures with firms agglomerated in certain industries of the economy. Smart specialisation policy stimulates this process in a non-neutral logic favouring selected new activities by means of concentrating resources to those that are anticipated to transform existing economic structures. Prioritisation is therefore central to smart specialisation policy. Selecting the most promising alternatives involves an interactive process in which entrepreneurs discover the new activities and the assessment of their potentials as well as the empowerment of selected actors are carried out by the government (Coffano and Foray 2014).

Establishing a strict assessment procedure for selecting from alternative activities is crucial to minimise the costs of making mistakes (Foray 2015). Entrepreneurial discoveries are assessed along three main dimensions in the course of prioritisation: the discovery’s individual features, its regional spillover capacity and the new activity’s economic significance. The first dimension incorporates individual characteristics of the discovery such as the degree of novelty of the activity, the extent to which it targets discovering new opportunities for the region, the existence of global demand, identification of main competitors and regional availability of key supply factors (Foray 2015).

A discovery may be highly valued according to the first dimension but it might not be rich enough in spillover potentials to generate firm concentration. The second dimension of assessment therefore reflects the capacity of the discovery to initiate the process of firm agglomeration by means of imitative entries. Intensity of learning opportunities from the original discovery is related to domain size and the connectedness of the domain with other domains. Relevant domain size concerns the size of the sectors that could potentially benefit the most from knowledge spillovers from the original discovery (Foray et al. 2009). Furthermore domains that are more connected with other domains provide better opportunities for learning than those that are less connected (David et al. 2009).

McCann and Ortega-Argilés (2015) reformulate the relevant size domain concept within the framework of regional economic policies. They draw on the findings of evolutionary economic geography, which emphasises that new firm formation is systematically higher in regions that diversify into sectors, which are closely related to the dominant (i.e., highly embedded) industries of the region. (Boschma et al. 2012, Neffke et al. 2011). The density of input-output linkages with the rest of the region’s industries measures embeddedness in this context. Therefore the combination of the principles of embeddedness, relatedness and connectedness drive the assessment of the spillover potentials of a discovery.

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1 One example of a discovery is private sector R&D directed towards exploring the potentials of nanotechnology to improve the efficiency of the pulp and paper industry in Finland (Foray et al. 2011).
discovery (McCann, Ortega-Argilés 2015).

Even if a discovery has excellent spillover potentials the project might be too narrow in terms of its regional economic significance measured by jobs or GDP (Foray 2015). The third dimension of discovery evaluation therefore targets its likely impact on the region’s economy. Economic impact evaluation of a discovery is a key aspect of prioritisation, however, the approach suggested for economic significance estimation (i.e., the new activity’s demand for regional resource inputs) addresses the impacts only partially (Foray et al. 2011, Foray 2015).

Furthermore, different government interventions aimed at promoting smart specialisation may also affect a discovery’s economic significance. Proposed policies range from discovery-specific public venture capital and entrepreneurship development programs to those which support the improvement of human capital conditions, R&D competences and the region’s embeddedness in interregional research networks (Foray 2015). Activity-specific combinations of these interventions therefore naturally influence the economic significance of individual discoveries.

Assessing entrepreneurial discoveries is thus a very complex process: discoveries have different individual features, they may belong to different industries, their spillover capacities vary as well as their economic effects, they also necessitate different mixtures of policy interventions and different requirements for financial support. Systematic prioritisation along these dimensions is thus extremely important and particularly challenging at the same time.

Thus far, substantial progress has been made in assessing a discovery’s spillover potential (McCann, Ortega-Argilés 2015, Balland et al. 2017), but the approach suggested for regional economic impact assessment has not been advanced much since the first proposal (Foray et al. 2011). According to this, economic impacts (on trade balance, aggregate employment, professional and skilled workforce) of an industrial sector’s expansion are related to ‘direct and indirect resource inputs from both the private and public sector suppliers’ (Foray et al. 2011, p. 13). This proposal thus identifies economic impacts with the so-called ‘backward linkages’, which can be computed from a regional input-output table. However, backward linkages cover economic impacts only partially leaving out other mechanisms (like forward linkages, production effects and the impacts of changes in demand, interregional trade, migration or productivity) from the picture (Miller and Peter 2009, Varga et al. 2017). This lack of a general evaluation of wider economic impacts of discoveries calls for the development of more comprehensive tools which are able to link innovative and economic activities within a region, embedded in a wider economic environment. The goal of this paper is to present a possible tool of this kind.

A more comprehensive assessment of a discovery’s economic significance requires certain technological and financial information about the discovery on the one hand and the development of a suitable economic impact model on the other. Expert assessments along the first two dimensions of prioritisation (i.e., individual features of discoveries and their spillover potentials) generate important information for economic impact assessment, such as the identification of the discovery’s industrial sector together with the anticipated need for factors of production and intermediate inputs. Estimated values of public venture capital investments and subsidies addressing regional entrepreneurship, human capital, R&D and interregional knowledge network developments (Foray 2015) then provide further important information for economic impact assessment. With this in-
formation in hand together with specifically built economic models one can estimate the regional significance of alternative discoveries. Moreover, the estimated economic impacts of these discoveries can also be related to the estimated costs of the policies, which provide key information for the entire assessment process.

A suitable economic impact model needs to incorporate the accurate spatial and industrial dimensions in its structure. Since the unit of analysis of smart specialisation policies is the sub-national region, economic models have to address this geographical scale directly. Furthermore, cross-regional interactions in smart specialisation (like knowledge imports from more developed regions or interregional migration induced by policy interventions) necessitate the models to incorporate multi-regional aspects as well. Additionally, the models need to be multi-sectoral because smart specialisation policies aim at stimulating regional structural changes.

Most economic models applied in cohesion policy impact assessment are national, single-sector macroeconomic models, like the QUEST (Ratto et al. 2009) or the HERMIN (Bradley 2006) models. However, some multi-regional and multi-sectoral spatial computable general equilibrium models such as the RAEM (Ivanova et al. 2007) and RHOMOLO (Brandsma, Krancs 2015) models are already available for European regions and as such these models may potentially be integrated in a smart specialisation impact assessment framework. The models should also be able to characterise the particular impact mechanisms of smart specialisation policy interventions. Some existing models like RHOMOLO, MASST (Capello 2007), the dynamic evolutionary simulation model of European regions (Fratesi 2015) and GMR-Europe (Varga 2017) already incorporate features that make them capable for the assessment of regional human capital and R&D development policies.

However, the estimation of the impacts of policies addressing entrepreneurship and knowledge network development is still a challenge. The most recent developments of the GMR-Europe model address this challenge. The following section provides a more detailed account of how GMR-Europe is extended in order to estimate the impacts of entrepreneurship and knowledge network development policies. A complete technical description of the GMR-Europe model including the list of equations, estimation/calibration of parameters as well as data description is provided in Varga, Járosi, Sebestyén, Szerb (2015).

Knowledge networks and entrepreneurship in the GMR-Europe model

The GMR policy impact modelling approach

The GMR (Geographic, Macro and Regional) modelling framework has been established and continuously improved over the past two decades to provide support in economic development policy decisions. As long as models usually applied in Cohesion Policy impact analysis are national models (Bradley 2002, Bayar 2007, Ratto, Roeger and Veld 2009), the novel feature of GMR-models is that they provide national and (sub-national) regional level impact estimates. The models also incorporate geographic effects (e.g., agglomeration, interregional trade, migration). GMR models provide support in the evaluation of different kinds of policy interventions such as R&D, human capital, private investment or physical infrastructure development.

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subsidies.

The first realization of the GMR approach was the EcoRET model built for the Hungarian government for ex-ante and ex-post evaluations of EU Cohesion Policy (Varga and Schalk 2004). This was followed by the GMR-Hungary model, which is currently used by the Hungarian government for cohesion policy impact analyses (Varga 2007, Varga, Járosi, Sebestyén 2013). GMR-Europe was established in the IAREG FP7 project (Varga 2017) and further developed in the GRINCOH FP7 project (Varga, Járosi, Sebestyén, Szerb 2015). In one of the applications policy impact simulations were carried out for the European Commission (LSE Enterprise 2011). The most recent version of GMR-models is GMR-Turkey (Varga and Baypinar 2016).

The GMR-framework is rooted in different traditions of economics (Varga 2006). The Romerian endogenous growth theory influences knowledge production modelling (Romer 1990). Spatial patterns of knowledge flows and the role of agglomeration in knowledge transfers are modelled through insights learned from the geography of innovation (Anselin et al. 1997). Interregional trade and migration linkages as well as dynamic agglomeration effects are incorporated in the tradition of the new economic geography (Krugman 1991). Specific macroeconomic theories provide the foundations for modelling national level impacts.

Modelling the impacts of policies targeting extra-regional knowledge networks development

Discoveries integrate different types of knowledge. Related diversification of a region’s dominant technology is naturally based on the knowledge possessed by the region but its extension towards new dimensions may require additional knowledge which is not necessarily available locally. The discovery of new domains of opportunities might therefore require the integration of the local knowledge base with scientific or technological knowledge developed in universities, private research institutes or specialised research groups located in other regions. Identifying those regions that possess the complementary knowledge, selecting the individual partners to cooperate with or establishing the initial connections are complex and non-trivial tasks, potentially requiring professional assistance as part of the discovery process. As a result, the support of less-developed regions’ access to the knowledge which is missing locally but available in more advanced regions is a central tool in smart specialisation policy for reinforcing regional entrepreneurial discoveries (Foray 2015).

With the increasing complexity of knowledge its further development becomes more and more the result of a collective process. Knowledge therefore develops in collaborative networks of different institutions (e.g., universities, public or private research labs) and the actors participating in these networks do not necessarily locate in one region. It is thus important to emphasise that the external knowledge required for a discovery is not necessarily possessed by one region exclusively, but may be distributed among different regions (Autant-Bernard, Hazir 2014, Maggioni et al., 2016, Varga, Sebestyén 2016). The discovery process therefore necessitates connecting regional entrepreneurs into a network of externally located actors. This justifies the need for those specific policy interventions that target the development of a particular region’s external knowledge network.

However, the decision process can easily become complex even for one individual region. A region may come up with several discoveries from which governments need to select a limited number
to support but each discovery may require the development of connections to different networks. Additionally, the knowledge necessary for a discovery might be accessible not only from one particular network but also from different networks. Therefore a variety of alternative network policy options could arise and the selection among the different options is not obvious.

Economic impact models may provide important information for the selection of directions for external knowledge network development. However, the integration of extra-regional knowledge networks into economic impact models involves at least two challenges. The first is about measuring the knowledge accessible from the network while the second is about modelling further dynamic changes in the network caused by the region’s access to it. The two aspects are interrelated since network dynamics initiated by the region’s entry into the network may affect the amount of knowledge the region can access from the network.

The level of knowledge a region can access from a particular network relates both to the region’s connections with immediate partners (i.e. the ego network) and to the connectedness of the ego network to more distant parts of the entire knowledge network. To measure the knowledge accessible from a region’s position in the network we apply the index of Ego Network Quality (ENQ) developed and introduced by Sebestyén and Varga (2013a, 2013b).

The concept of ENQ builds on three intuitions directly influenced by the theory of innovation. First, the level of knowledge in an agent’s network is in a positive relationship with the level of knowledge that the (direct and indirect) partners already possess. Second, the structure of connections in the agents’ network largely influences the amount and accessibility of new knowledge (see e.g. Coleman 1986; Burt 1992). Third, partners in the ego network contribute to diversity through connections to different further groups not linked directly to the agent.

The ENQ index is structured around two concepts, which are then augmented with a related third aspect. The two concepts are: (i) Knowledge Potential (KP), which measures knowledge accumulated in the direct neighbourhood and it is related to the number of partners and the knowledge of individual partners, and (ii) Local Structure (LS), which is associated with the structure of links among partners. Local Structure is important for the dynamics of accessible knowledge. We assume that a network where the actors’ collaboration intensity is high results in a higher level of new knowledge production than otherwise. The third concept is Global Embeddedness (GE), which captures the quality of distant parts of the network (beyond immediate partners). However, this aspect is implemented by applying the concepts of KP and LS for consecutive neighbourhoods of indirect partners in the network.

The ENQ index first calculates the Knowledge Potential for neighbourhoods at different distances from the node in question as the sum of knowledge levels available in that neighbourhood. Then these KP values are weighted by the Local Structure value of the respective neighbourhood. Finally these weighted knowledge levels for the different neighbourhoods are also weighted by a distance-decay factor and summed over neighbourhoods. The ENQ index thus can be divided into a sub-index measuring the knowledge accessible in the direct neighbourhood (ego network) of the node in question and a sub-index called Global Embeddedness, which reflects the knowledge accessible beyond this direct neighbourhood.3

The second challenge is modelling

3 The reader is directed to Sebestyén and Varga (2013a, 2013b) for a more detailed discussion of the ENQ index.
network dynamics. Once the region (actors in the region) enters a network by establishing connections with immediate partners the region also gets closer to other network members who are already connected with the region’s immediate partners. If the region searches for additional suitable partners the increased proximity to these further network members eases the establishment of more connections. Launching the region’s initial connections therefore sets a dynamic process of creating further network linkages of the given region. The process gets more complex when accounting for further feedback effects: by establishing connections with new partners, the opportunities of these partners to extend their connections with the region’s existing connections also become easier. This dynamic process thus alters network structure by affecting the number of connections of several partners in the entire knowledge network, which will affect the ENQ value of all the regions.

Modelling this dynamic process requires a specific methodology that accounts for simultaneous ‘movements’ of actors in the network. Agent-based modelling provides a promising method where understanding the behaviour of mutually interrelated agents is in the centre of study. In order to estimate the impact of network formation dynamics on the level of knowledge accessible for the region (measured by the value of the ENQ index) we built a multi-regional agent-based model of network formation (Sebestyén, Hau-Horváth, Varga 2016, Sebestyén-Varga 2017). This model is linked to GMR-Europe to estimate the economic impacts of policies supporting regions’ access to extra-regional knowledge networks.

**Modelling the impacts of policies targeting regional entrepreneurship development**

The general level of regional entrepreneurship may crucially determine the efficiency of smart specialisation policies. Experiences already suggest that the effectiveness of programs addressing smart specialisation varies across European regions. In economically and institutionally more developed places the implementation of programs appears to be more promising than in lagging regions (McCann, Ortega-Argilés 2016). This difference in the efficacy of smart specialisation policy could partly be due to the entrepreneurship level in a region. In a less developed region where entrepreneurship is relatively modest the variety and richness of discoveries might not be sufficient enough to initiate the expected structural change. In order to create a better environment for smart specialisation these regions might therefore be motivated to take steps to reinforce discoveries by way of implementing entrepreneurship development policies (Foray 2015).

However, entrepreneurship is a complex phenomenon, which emerges in the context of system-wide interactions amongst its different components (Acs et al. 2014). Accordingly, to raise the level of entrepreneurship the region may select a particular intervention from the set of different alternative policies or decide to implement a certain combination of them. Alternative entrepreneurship supporting policies could range from improving entrepreneurs’ access to financial resources or raising the skills of start-ups to intensifying collaborations among businesses. Due to the systemic nature of entrepreneurship mutually interconnected policies could potentially strengthen or weaken each other. The design of a suitable policy mix to target the intensification of regional entrepreneurial discoveries is therefore an extremely complicated process.

With impact models the economic effects of various regional entrepreneurship poli-
cies can be estimated. As such these models can provide important information in the process of policy selection. However, at least two major challenges have to be solved in order to successfully integrate entrepreneurship into an economic impact model. The first is about measuring the level of regional entrepreneurship whereas the second is about modelling the system-wide impacts of entrepreneurship policies. Similar to what was underlined earlier for the case of knowledge network policies these two challenges are interrelated here as well because at the end entrepreneurship policies change the level of entrepreneurship in the region. To tackle these challenges in economic impact assessment the Regional Entrepreneurship and Development Index (REDI) (Szerb et al. 2013) is being integrated into the GMR-Europe policy impact model.

The REDI index has been designed to provide a holistic view on the functioning of EU’s Regional Systems of Entrepreneurship and it should be of particular utility when identifying gaps and bottlenecks that prevent a given region from fully exploiting its entrepreneurial potential. The REDI method builds on the National Systems of Entrepreneurship Theory (Acs et al. 2014) and provides a way to profile Regional Systems of Entrepreneurship. The key idea of this systemic index is therefore that system performance is “co-produced” by its constituent elements. This means that the different system components are interrelated. Although entrepreneurial actions are undertaken by individuals, they are always embedded in a given institutional context. For example, technology-based new ventures will find it difficult to innovate if the regional job market does not supply workforce with the required special skills. In a regional system of entrepreneurship it is the combination of the different components that ultimately determines whether the system will function well or not (Szerb et al. 2013).

Table 1 presents the structure of the Regional Entrepreneurship and Development Index (REDI). REDI organizes the various factors that determine the level of entrepreneurship in a region in a systemic manner. The index is composed of three sub-indices. The entrepreneurial attitude (ATT) sub-index aims to identify the attitude of the people in a region towards entrepreneurship. In REDI the attitude is characterized by the level of opportunity recognition and start-up skills within the population, the extent to which the fear of failure of starting a business is present in the region, the strengths of personal networks and the sufficiency of cultural support of successful entrepreneurs.

The entrepreneurial abilities (ABT) sub-index is principally concerned with measuring certain important characteristics of both entrepreneurs and start-ups with high growth potential. Abilities are related to the extent to which new opportunities motivate business startups, the share of technology intensive and creative sectors in the region, the education levels of entrepreneurs and employees, and the extent of competition in the business sector. The entrepreneurial aspiration (ASP) sub-index refers to the distinctive, qualitative, strategy-related nature of entrepreneurial start-up activity. Aspiration level is associated with the degree of innovativeness - both product and technology - and the extent to which high growth, internationalisation and good access to finance characterise entrepreneurial businesses.

All three sub-indices contain four or five pillars, which can be interpreted as quasi-independent building blocks of this

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4 The full report entitled „REDI: The Regional Entrepreneurship and Development Index – Measuring regional entrepreneurship“ is downloadable with this link: http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/regional_entrepreneurship_development_index.pdf
entrepreneurship index. Each pillar reflects the characteristics of individual entrepreneurs and the regional institutional context. The idea behind this approach is that entrepreneurship is considered as a systemic phenomenon and as such it is the result of both individual and contextual factors. Technically each of the 14 pillars is therefore the result of the multiplication of an individual variable and an associated institutional variable (Szerb et al. 2013).

Table 1. The structure of the Regional Entrepreneurship and Development Index

<table>
<thead>
<tr>
<th>Sub-indexes</th>
<th>Pillars</th>
<th>Variables (individual/institutional)</th>
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<tbody>
<tr>
<td><strong>ENTREPRENEURIAL ATTITUDES SUB-INDEX</strong></td>
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<tr>
<td>Opportunity Perception</td>
<td>Opportunity Recognition</td>
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<td>Market Agglomeration</td>
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<td>Startup Skills</td>
<td>Skill Perception</td>
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<td>Risk Acceptance</td>
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<td>Networking</td>
<td>Business Risk</td>
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<td>Cultural Support</td>
<td>Carrier Status</td>
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<td></td>
<td>Open Society</td>
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<tr>
<td><strong>ENTREPRENEURIAL ABILITIES SUB-INDEX</strong></td>
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<tr>
<td>Opportunity Startup</td>
<td>Opportunity Motivation</td>
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<td>Technology Sector</td>
<td>Business Environment</td>
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<td>Human Capital</td>
<td>Technology Level</td>
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<td>Competition</td>
<td>Absorptive Capacity</td>
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<td>Education and Training</td>
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<td>Competitors</td>
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<td></td>
<td>Business Strategy</td>
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<tr>
<td><strong>ENTREPRENEURIAL ASPIRATION SUB-INDEX</strong></td>
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<tr>
<td>Product Innovation</td>
<td>New Product</td>
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<tr>
<td>Process Innovation</td>
<td>Technology Transfer</td>
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<tr>
<td>High Growth</td>
<td>New Technology</td>
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<tr>
<td>Globalization</td>
<td>Technology Development</td>
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<td>Financing</td>
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<td>Informal Investment</td>
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<td>Financial Institutions</td>
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Source: Szerb et al. (2013)
The second challenge is modelling the system-wide impacts of entrepreneurship policies. REDI deviates from traditional ‘one-size-fits-all’ policy approaches and acknowledges that entrepreneurship policy should be case-based (tailor-made) (Acs et al. 2014). Moreover, REDI benchmarks the optimal configuration of the fourteen pillars as being balanced (have the same level). The presence of a bottleneck indicates imbalance and consequently a lower efficiency in the system. A bottleneck is the worst performing element or binding constraint and is defined as a shortage or the lowest level of a particular entrepreneurial pillar as compared to the other thirteen pillars.

According to the Penalty for Bottleneck (PFB) principle, REDI is constructed in such a way that the value of each pillar is penalized by linking it to the score of the pillar with the weakest performance in the region (Acs et al. 2013, Rappai and Szerb 2011, Szerb et al. 2013). This simulates the notion of a bottleneck, and if the weakest pillar were raised, it would have a multiplicative effect to improve the other pillars and therefore the whole REDI would show a significant improvement. Raising a non-bottleneck pillar would have only a minor effect on that particular pillar; hence it can be viewed as an inefficient policy step.

The optimum allocation of all entrepreneurial inputs is attained when all the bottlenecks are alleviated. Therefore, decreasing the retraction influence of the bottleneck pillar(s) drives the selection among the potential policies. The notion of this policy is based on the classical public policy view about the correction of market failures; i.e. intervening only where the private market system has weaknesses (Stiglitz, 1989). This approach is present in regional development (Bartik 1990) and innovation policies (Dodgson et al. 2011). Here, the aim of entrepreneurship policy is to correct system failures (Autio and Levie 2015). The resulting change in REDI enters the GMR-Europe model where economic impacts of the policies are estimated.

Assessment of smart specialisation policies: productivity effects

The third dimension in prioritisation targets the assessment of discoveries’ economic impacts. Part of this relates to the evaluation of discovery-specific policy interventions: the assessment of public venture capital investment support, human capital, R&D, interregional network and entrepreneurship policies. The current section outlines how GMR-Europe models the productivity impacts of policies whereas the subsequent section focuses on the estimation of their economic impact.

Total factor productivity (TFP, the overall productivity of production factors) is one of the most crucial variables in GMR-Europe. It represents the main point through which different aspects of smart specialization policy interventions interact with other parts of the model. The TFP block of the GMR system serves as the point where ‘soft’ and ‘hard’ factors behind innovation are modelled. Then, in line with the traditions in economic modelling, all these factors are implemented in the rest of the model through one a technology variable, the TFP. An increase in TFP (ceteris paribus) results in higher GDP, which may be associated with lower production costs or with the introduction of new products on the market.

Figure 1 illustrates the setup of the TFP block in GMR-Europe. It consists of two equations: one is the knowledge p...
duction function which links new knowledge (measured by regional patent applications) to knowledge inputs. The second is the TFP equation, which links, among others, regional knowledge to TFP. The two equations are first estimated econometrically then based on these estimations individual regional parameters are calibrated.

Figure 1: Smart specialisation policy instruments in the TFP block

The main role of the TFP block is to provide a sophisticated background for determining TFP and implement innovation-oriented policy interventions for each region in the model. The TFP block is based on the knowledge production function approach. New knowledge (represented by patent applications) is produced using knowledge production factors, namely R&D expenditures and personnel (technology employment), as well as the already existing knowledge represented by national patent stock. In addition to this standard approach, knowledge available through interregional networks (measured by the ENQ index) is also assumed to affect the productivity of R&D in knowledge creation. The specification follows the assumption that a better interregional network position leads to higher knowledge output for the same amount of R&D inputs. New knowledge, i.e. patent applications at the regional level then feed back into knowledge creation in a dynamic way by building up national patent stock.

TFP is primarily linked to the regional knowledge level (measured by the patent stock) in the model, but two additional factors are added directly and a third indirectly. First, the size of the region also assumed to have a positive impact on TFP, implementing an agglomeration externality in the model. Second, the level of human capital in the region also affects TFP. Third, as a novel element of this setting of the GMR approach, we incorporated the level of regional entrepreneurship (measured by the REDI index) to the model. It is also assumed to have a positive influence on TFP, via enhancing the contribution of human capital to TFP. The argument behind this setting is that a better entrepreneurial climate in a region mobilises regional human capital to participate in the discovery pro-
cess, which eventually leads to increasing total factor productivity.

Assessment of smart specialisation policies: The economic impacts

GMR models reflect the challenges of incorporating regional, geographic and macroeconomic dimensions in development policy impact modelling by structuring the system around the mutual interactions of three sub-models, which are (i) the Total Factor Productivity (TFP), (ii) the Spatial Computable General Equilibrium (SCGE) and (iii) the Macroeconomic (MACRO) model blocks. The mutually interconnected model-block system is depicted in Figure 2.

Figure 2: Regional and macroeconomic impacts of the main policy variables in the GMR-Europe model

Economic effects of policy interventions at the regional level are calculated in the SCGE block. SCGE models add the spatial dimension to the (usually a-spatial) CGE models. Economic units are regions, which are interconnected by trade linkages and migration. Transportation costs, positive and negative agglomeration effects are also parts of the model structure. The model distinguishes between short run and long run equilibria. In the short run markets are in equilibrium within and across all regions. However, this does not necessarily mean that the whole regional system has reached a balanced situation. In the long run, differences in utility levels across regions induce labor migration (followed by the migration of capital) leading to a long run spatial equilibrium where interregional utility differences are eliminated.
The macroeconomic block is a standard, large-scale DSGE (Dynamic, Stochastic, General Equilibrium) model. The role of this block is to model dynamic economic effects and to provide a framework for the static SCGE block through determining the dynamics of given macroeconomic variables. We apply the QUEST III model developed by the European Commission for the Euro area, and re-estimated it for the purpose of our model with data on additional Central European countries. The description of the original model can be found in Ratto et al. (2009).

The macroeconomic block of GMR-Europe calculates policy impacts at the EU and national levels while the 181-region NUTS 2-level TFP and SCGE blocks provide results at the regional level. The model calculates the policy impacts on various economic variables such as GDP, GDP growth rate or employment at the regional, national and aggregate European levels.

Some of the policy interventions are modelled in the macroeconomic block (such as changes in international trade, in tax regulations or in income subsidies) via policy shocks affecting specific macroeconomic equations. However, smart specialisation policies are modelled at the regional level, stimulating the regional base of economic growth such as public venture capital investment support, human capital development, R&D subsidies, promotion of (intra- and interregional) knowledge flows and entrepreneurship. These interventions are modelled in the two regional-level model blocks and they also interact with the macroeconomic part.

Without interventions TFP follows a steady state growth rate in each region. The impacts of interventions run through the system according to the following steps.

1. Interventions related to R&D, human capital, interregional knowledge networks and entrepreneurship first affect regional TFP levels through the TFP block (see Figure 1).

2. Changing TFP levels induce changes in regional output, prices and factors of production in the short run. In the long run migration of production factors implies further changes in the level of TFP not only in the region where the interventions are applied but also in regions that are connected by trade or factor migration.

3. Public venture capital investment support expands regional private capital, which implies further changes in regional variables (output, prices, wages, TFP, etc.). This impact also affects the macro model as well via increased private capital.

4. For each year, changes in regional TFPs are aggregated to the national level where the aggregated changes enter the macroeconomic block as time specific shocks. The macroeconomic block calculates the changes in all affected variables at the national level (primarily employment, investment, output and price level).

5. Changes in aggregate employment and investment calculated in the macroeconomic block are distributed to the regions following the spatial pattern of TFP impacts.

6. The SCGE block runs again with the new employment and capital values to calculate short run and long run equilibrium values of the affected variables.

7. The process described in steps 5 and 6 run until aggregate values of regional variables calculated in the SCGE block converge to their corresponding values calculated in the MACRO block.

With an extension towards the industrial dimension the GMR system can be
applied in comprehensive short- and medium run economic impact assessments of discoveries in a given region. Evaluations along the first two dimensions of prioritisation provide key information about the discovery’s industrial sector, its input and output linkages together with production factor requirements. In a discovery’s economic impact assessment, estimated magnitudes of discovery-specific venture capital investments, human capital and R&D support as well as entrepreneurship and knowledge network development interventions enter the model as policy shocks. The model estimates the short run policy impacts on various economic variables at regional and supra-regional levels.

Medium term impacts are largely influenced by the spillover potentials (resulting in the likely future patterns of new firm formation and industrial sector development) of the discovery. Expert estimates of potential spillover paths of a discovery provide information for alternative medium run economic impact scenarios. The comparison of short and medium run impact estimations of the discoveries in the region then provide important information for prioritisation.

Ex post impact estimation is a traditional element of cohesion policy evaluations. The GMR model system can also be applied in ex post impact assessment of smart specialisation policies. Data on the real magnitudes of smart specialisation policy interventions as well as discovery-specific industrial sector expansions are available ex post, which provide the estimations of more precise economic impacts of the implemented policies.

**Simulating the economic effects of entrepreneurship and knowledge network development policies**

The most recent extensions of the GMR-Europe model address the economic impact analysis of interregional knowledge network and entrepreneurship development policies. The previous section described how these policies get integrated in the GMR model system. In this section two sets of simulations illustrate the capabilities of the model in policy impact evaluation.

**Regional differences in the productivity effects of entrepreneurship and knowledge network development policies**

The first set of simulations considers the issue whether smart specialisation policies impact regional economies similarly or differently. Differences in the experiences of European regions suggest that smart specialisation policy effects might not work similarly across the territories (McCann, Ortega-Argilés 2016). The simulations concentrate on the regional effects of interregional research collaboration network and entrepreneurship development policies in 181 Eurozone and Central-Eastern European regions.

In Figure 3 we can follow the impact of a policy that aim to extend European Framework Program collaborations of each European region on regional TFP levels. In the simulation we increased the ENQ index of every region by 1 percentage (as a proxy to supporting research collaboration among European regions) and calculated the resulting percentage changes (elasticities) in regional TFP levels.

The figure suggests differences in the productivity impacts of research collaboration support across Europe. A clear East-West divide is shown in the map: the productivity effect of the research network development policy is stronger for example in many French, German, North-Italian or Spanish regions whereas in the Eastern regions of Europe only the elasticities of the capital regions (Berlin, Bratislava, Budapest, Prague) gets closer to the stronger Western regions. There are some outstand-
ing regions with respect to this TFP effect like Ile-de-France, Stuttgart, Rhone-Alpes or Oberbayern.

Figure 4 shows TFP elasticity values for regional entrepreneurship development policy in a similar manner. In these simulations the REDI indices were increased by 1 percentage in every region then the model calculated the resulting percentage changes in regional TFP levels. Though the average change in the Eastern part of Europe is below the corresponding value of Western regions the divide is much smaller than for the promotion of interregional research collaborations. Although there are notable concentrations of high elasticities in France, Germany or Spain, the elasticities in regions of Poland, Hungary or Eastern Germany distribute with lower variation for entrepreneurship policies.

Figure 3: The elasticity of TFP with respect to a policy supporting European Framework Program participation
The two figures therefore suggest considerable differences in the impacts of individual smart specialisation policies across Europe. The promotion of interregional research collaborations seems to be more effective in regions that are economically and institutionally more advanced whereas entrepreneurship development policies appears to be a promising way for the support of productivity improvements in most of the regions of Europe.

The previous two simulations suggest that regions should consider the differences in the likely impacts of policy instruments while designing their own smart specialisation programs. The simulations therefore advice regions to introduce place-specific mixes of smart specialisation policy instruments.

Economic impact analysis of place-specific development policies for a Hungarian region

The following set of simulations examines two place-specific policy designs introduced for Hungarian regions. In the first simulation we increased European Framework Program collaborations of Central Hungary (the capital region of Hungary) with the top performing European regions with respect to research by 10 percentages in the period of 2015-2020. Figure 5 presents the percentage impacts (relative to the baseline, no-intervention case) on regional, national and EU-level gross value added resulting from the policy. The impacts in Budapest cumulate over the period and the effects are present even after 2020. The results also suggest that there is only a minor spillover effect of the policy targeted on Central Hungary on the rest of the Hungarian regions.
Figure 5: The effect of the policy to increase European Framework Program participation of Central Hungary on gross value added – regional, national and EU-wide impacts
Figure 6: The effect of the policy to support entrepreneurship development in each Hungarian region on gross value added – regional, national and EU-wide impacts
In the next simulation every Hungarian region receives the same amount of resources for entrepreneurship development. Following the Penalty for Bottleneck principle described in section 3.3, the optimal mixture of entrepreneurship policies varies across the regions. Resources are spent on cultural support in Central Hungary, product innovation in Western Transdanubia and North Hungary and financing in the rest of the regions to produce the highest improvement in the REDI possible (eliminating bottlenecks). Figure 6 depicts the percentage impacts of these interventions on regional, national and EU-level gross value added. It is clear that in spite of the same resources there are differences in their absorption among the regions. On average the impact on regional GVA in Central Hungary and in the two regions in the North Western part of Hungary (i.e., the most industrialised regions of the country) is about 40 percentages higher than in the rest of the regions of the country.

**Summary and conclusions**

Smart specialization is a recently developed framework to foster regional economic development based on the bottom-up principle of entrepreneurial discovery but supported by specifically designed government policies at the same time. Although the theoretical concept is quite advanced, there are several challenges in the economic impact analysis of the policies targeting smart specialization. The most important challenges are capturing entrepreneurship and knowledge networks on the one hand and embedding their complex interrelationship with wider economic mechanisms shaping the impact of policies targeting smart specialization.

In this paper we provided a brief review of the GMR-Europe policy impact modelling framework, the latest developments of which renders it suitable for the evaluation of smart specialization policies. We showed the specific ways knowledge networks (the ENQ index) and entrepreneurship (the REDI index) are integrated in the model and described the basic mechanisms through which the model is able to capture regional and supra-regional economic effects. The model is built around three blocks: one captures the background of productivity changes at the regional level and implements knowledge network and entrepreneurship effects (the TFP block), the second accounts for market equilibrium, trade and migration between and across regions (the SCGE block) while the third is responsible for macroeconomic aggregation, international trade, fiscal and monetary policies and provides the dynamics for the model framework (the MACRO block).

With the help of this model framework we made some illustrative simulations of impact assessment of possible smart specialization policies. In the first set of simulations we calculated the productivity impact of policies targeting knowledge network formation and entrepreneurship respectively. The main conclusion from these scenarios is that different regions should focus on different sets of policy tools. Generally, while focusing on knowledge network development seems to have the most impact in Western European regions, targeting entrepreneurship is shown to be a more suitable option for Eastern European regions – however, there are important differences within these groups of regions as well. A second set of simulations illustrated how the model is able to capture the economic impact of policies implemented in a specific region or a group of regions within the targeted regions and through different spillover mechanisms (interregional trade, factor mobility) on national and EU-level economic variables.

Future plans to extend the GMR model framework involve developing it
into a multi-sector and multi-region model which renders it more suitable to assess the specificities of entrepreneurial discoveries with respect to their sectoral composition and taking into account intra- and inter-regional input-output linkages across different sectors. This extended framework is then planned to be applied in the context of prioritisation for concrete European regions.

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Abstract

In today’s rapidly evolving employment landscape, the ability to anticipate and prepare for future skills requirements, job content and the aggregate effect on employment is increasingly critical for businesses, governments and individuals in order to fully seize the opportunities presented by these trends. To be able to take part in this “Big Shift” change from a push paradigm that still pretty much dominates how we act, to a pull paradigm, that sets new ways to operate and engage is needed. Pull type learning environment starts with the question: “What are you interested in?” This study presents Team Academy, a pull type learning model and its tools. One method of the model is the so-called personal learning contract which efficiency is examined by primary research between the students and coaches of Team Academies in Europe, special regard to Team Academy Debrecen in Hungary. The result of the primary research shows that personal learning contract is a pull type of learning tool. It is recommended in higher education and drives a process of transformation towards more entrepreneurial mindset.

Keywords: higher education, pull type of learning, entrepreneurship, personal learning contract, Tiimiakatemia

Introduction

Robinson and Aronica in their book Creative Schools (2016) define two important role of education: helping youth to discover the world and help to discover their own talent. The revolution Robinson is advocating is based on a belief in the value of the individual, the right of self-determination, the potential to evolve and live fulfilled life, and the importance of civic responsibility and respect for others. In their view is that traditional education is almost entirely focus on the world around us and do not give enough attention to discover ourselves. Result of Dobos (2013) suggests similar message. Dobos (2013) case study about a coaching process with a Master of Arts student describes that the MA student had problem in communication when he had to talk about himself or about his visions, otherwise he gave excellent lectures on topics related to his studies.

In the understanding of the authors the relevance of the challenge is that a more entrepreneurial education model needs more space for students to discover themselves, their own talent. While push type of learning (defined also as formal learning, providing the learner with all the information on the topic) is rather linked to the role of discovering the world, pull type of learning environment have higher role in discovering students’ own talent. Pull type learning environment starts with the question: “What are you interested in?”.

To transform education in the direction of a more entrepreneurial model, informal, pull type of learning environment has to gain higher role. This kind of environment for example helps youth to discover their own strength, increase self-confidence which is basic to become a good entrepreneur.
The Award-Winning Tiimiakatemia (later on Team Academy) of the JAMK (Jyväskylä) University of Applied Sciences is combining the worlds of education and business. It was founded in 1993 by Johannes Partanen. In Team Academy students operate in teams, as independent cooperative companies. They have to do real-life projects, which they have to find themselves, to cover all the expenses of the company. Projects function both as learning environments and as ways of doing business. Learning is a process that is not divided into modules or subjects like marketing or leadership. Team Academy has no legal control over its team companies; it only provides the coaching for the learning process. Nowadays Team Academy is spreading around the world as a brand that creates Teampreneurship. It spread to France, Germany, the Netherlands, England, Spain, Brazil, Argentina and Hungary.

Authors of the paper are working in Team Academy at University of Debrecen in Hungary and have the experience of transformation from traditional education to an innovative entrepreneurship education. The purpose of the study is to give answer to the question how to drive a process of transformation towards a more entrepreneurial culture, by demonstrating the importance of pull type of learning environment in higher education through the introduction of a Team Academy’s education model and by evaluating personal learning contract a tool used along the model.

Literature review

One popular estimate referred by World Economic Forum (WEF, 2016) is that, 65% of children entering primary school today will ultimately end up working in completely new job types that don’t yet exist. In such a rapidly evolving employment landscape, the ability to anticipate and prepare for future skills requirements, job content and the aggregate effect on employment is increasingly critical for businesses, governments and individuals in order to fully seize the opportunities presented by these trend. Zhao (presidential chair and director of the Institute for Global and Online Education in the College of Education at the University of Oregon) also calculated that in the twenty-eight years from 1977 and 2005 more than a million jobs annually disappeared from existing firms in the United States. During that same time, new firms created more than three million jobs a year. Many of these new jobs needed significantly different skills sets from the old, lost jobs, and there was very little advance warning over what those skill sets might be (Robinson and Aronica, 2016).

Hagel et al. (2010) explain that this Big Shift is emerging in three waves, each with distinctive characteristics:

- the first wave (Infrastructural Shift), involves the rapid evolution of a new digital infrastructure and parallel shifts in global public policy. It is all about lowering barriers to entry and movement, and so, intensifying competition;
- the second wave (knowledge flows) shows what happens when those barriers go away: the sources of economic value move from “stocks” of knowledge to “flows” of new knowledge. In this context, Tacit knowledge becomes more valuable than Explicit knowledge;
- the third wave (institutional innovations), corresponds to a situation in which organizations learn to harness the first two waves of change through innovations in institutional architectures.
So, to be able to take part in this Big Shift we need to change from a push paradigm that still pretty much dominates how we act, to a pull paradigm, that sets new ways to operate and engage. Push approaches begin by forecasting needs and then designing the most efficient systems to ensure that the right people and resources are available at the right time and the right place, using standardized processes. Push approaches treat people as passive consumers whose needs can be anticipated and shaped by centralized decision makers. Pull is a very different approach. Hagel et al. (2010) define pull as the ability to draw out people and resources as needed to address opportunities and challenges. Using pull, conditions by which individuals, teams and even institutions can achieve their potential in less time and with more impact than ever before are created. Pull is about expanding awareness of what is possible and evolving new dispositions, mastering new practices and taking new actions to realize those possibilities. Pull approach start with the questions: What does it take to turn our passion into success? What interests us? What are we passionate about? (Hagel et al., 2010)

Senge et al. (1994) drew attention to people’s different views of their relationship with the world: reacting orientation (“the world is happening to me”), creative orientation (“I create my future”) and interdependent orientation, which is when, although recognising their integrity as separate person, they also feel ‘a part of’ the system. With regard to how we create our own reality and how we can change it, Senge (1990) lists five areas which will not be successful without each other: system thinking, personal mastery, mental models, team learning and shared vision. In the case of personal mastery (which starts with clarifying the things that really matter to us, of living our lives in the service of our highest aspirations), he stresses that there are only few people who are ready to develop themselves to be able to lead their own lives. “No one can increase someone else’s personal mastery. We can only set up conditions which encourage and support people who want to increase their own (Senge et al., 1994, p193). Senge et al. (1994) emphasise that we do not live in any of these frames of mind all of the time. We might have an interdependent attitude toward civic life, a creative attitude toward work and a reactive relationship with people with whom we regularly interact.

Creating an entrepreneurial environment could support a shift from being reactive to creative and also interdependent. Haase and Lautenschlager (2011) suggested changing the role of the entrepreneurship educator. Its tasks consists more in acting as a promoter, facilitator and manager, instead of being a teacher.

The experience of the authors is that Team Academy’s (an innovative Finnish higher education model has been run at JAMK University of Applied Sciences in Jyväskylä since 1993) methods give one kind of answer to the above mentioned challenges, and can be defined as a pull type dominant education model. Senge (1994) named five areas which would not be successful without each other about ‘How do we create our own reality – and how can we change this?’ in his book ‘The Fifth Discipline’. The five areas are: system thinking, personal direction, mental models, joint vision and group learning. Development of these areas is also a strong basis of Team Academy.

Team Academy, a four wheel driving learning developed by Partanen (Toivanen, 2014) includes theory (books), learning contract, dialogue and practical actions with customer (projects) (Partenen, 2012). The main methods are learning by doing and team learning. Real business projects (Table 1.) offer opportunities to apply studied theory directly into practise and also provide a platform for students to reflect
on theory in light of their own experiences while studying. Students read books that support their actions, do not load themselves with reading, read what they need. Teams use dialogue as a tool to share knowledge and think together. The purpose of dialogue is to go beyond one individual’s understanding – the whole organizes the parts, rather than trying to pull the parts into a whole. In dialogue, people become observers of their own thinking.

Table 1. Main differences between the traditional education and Team Academy

<table>
<thead>
<tr>
<th>Traditional education</th>
<th>Team Academy</th>
</tr>
</thead>
<tbody>
<tr>
<td>students</td>
<td>team entrepreneurs</td>
</tr>
<tr>
<td>classrooms</td>
<td>an open plan office</td>
</tr>
<tr>
<td>teaching</td>
<td>learning</td>
</tr>
<tr>
<td>teachers</td>
<td>coaches</td>
</tr>
<tr>
<td>simulations</td>
<td>real business</td>
</tr>
<tr>
<td>control</td>
<td>self-organizing</td>
</tr>
</tbody>
</table>

Control and self-organization (Table 1.) is examined in the study of Molnár (2009) as well, where control means that a system adapts to the environment through feedback in accordance with the criteria and the goals, while in the case of self-organization (above these) even the system can change, transfer (or even the goal, criteria can change). Thus, self-organization already includes the concept of learning. Szilágyi (2017) presents that self-organized learning is a conscious activity focusing on the learning project determined and prepared by the student. In this process students are the ones who decide the aim of learning, the direction of it, the used information, the tools for searching information, the evaluation methods and indicators of learning. The student take responsibility of his or her learning, manage the development of his or her knowledge alone or with help.

In an earlier study of the authors (Gál et al., 2016) four groups (Table 2.) were created from the 30 tools used in Team Academies regarding their focus in the development. These groups are Personal Development (10 tools), Theory (4 tools), Learning by Doing (9 tools) and Cooperation (6 tools) and Rocket Model which gives the basis of the methodology. Among the Personal Development tools Learning Contract, training diary, passport, portfolio, values-mission-vision used as self-coaching tools, they serve to improve the self-responsibility of students during their studies.

Table 2. Tools of Team Academy methodology

<table>
<thead>
<tr>
<th>Tools</th>
<th>Personal Development</th>
<th>Theory</th>
<th>Learning by Doing in team companies</th>
<th>Cooperation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Contract; Training Diary; Q47; 360° evaluation; Individual’s development discussion; Skill profile; Internal Leadership Program; Passport; Portfolio; Around the World Trip</td>
<td>Learning Contract; Book of Books; Bookpoints; Essay Bank; WWW Theory (MOOCS, TED)</td>
<td>Values-Mission-Vision; Pre-Motorola; Post-Motorola; Customer Visit; Birth Giving; HIT Mr Leadership; Brand Envelope; Leading Thoughts; Network Day&amp;Forums</td>
<td>Co-working office; Team coaching; Team learning; Rules of dialogue; Houston calling; Belbin test</td>
<td></td>
</tr>
</tbody>
</table>

Source: Gál et al. 2016:3459
Gál et al. (2016:3461) based on in-depth interviews for the assessment of the tools had the following results for personal learning contract, the tool examined in this study as well: “personal learning contract is used by all Team Academies. In the Netherlands it is used monthly, this is the most frequent use of this method. In Spain and in France it is used 3 times in a year. In Finland and Hungary it is used twice a year, when the semester starts and it is evaluated in the end of the semester. This method develops the following competencies: personal learning to learn methods and attitudes (mental models), spontaneity, self-managing skills, planning skills, coaching skills, courage to make decisions and ambition, courage and will to break boundaries. All team coaches evaluated this tool as a very useful one. The only challenge is that in the beginning of the learning process it is hard to set clear learning targets but during the learning process it becomes easier.”

Personal learning contract is a tool for self-organized learning. Students sign a contract with themselves. This contract gives space for students to determine their own learning path. The five main questions they give answers in the contract are the questions of Cunningham (1999) self-managed learning structure:

- Where have I been? - history
- Where am I know? – current reality
- Where am I going? – vision
- How do I get there? – strategy, actions
- How do I know that I am there? – measurements, milestones

**Methodology**

Agreeing with Aronica and Robinson (2016) that education has two roles helping youth to discover the world and help to discover their own talent, and that traditional education has a focus on the first role (discovering the world) the hypothesis of the authors is that personal learning contract (introduced along the Finnish Team Academy education model in higher education) helps young people in exploring their talents. This means that the application of personal learning contract strengthen the role of education in helping students to discover their own talents.

A questioner was carried out to underline the hypothesis. It was examined if students and team coaches would offer the application of personal learning contract in higher education, a tool used by all Team Academies.

An open and a close question were asked. The questions were as follows:

1) From a scale from 1 to 10, would you recommend personal learning contract in higher education?

1 = I do not recommend and

10 = definitely recommend

2) Please, explain why you choose that number!

In the first round team coaches and teampreneurs (students studying in Team Academy) from Team Academy Debrecen were asked. In the survey carried out in the spring of 2016 students studying or graduating from the following courses Commerce and Marketing, Tourism and Catering and Finance and Accountancy, and also joining to Team Academy Debrecen (running at Debrecen University since 2010) along their studies were asked. The coaches (4 person) taking part in Team Academy Debrecen education and also authors of this study gave answers to the questions and collected their experience with the use of personal learning contract in a focus group discussion. Teampreneurs got
the questions personally through the social media. Most of the teampreneurs being part of the Team Academy program are forming a closed group with the help of the social media. From the 75 teampreneur in the closed group 66 were reached and 44 gave answers to the questions. Answers were analyzed with Excel program, and through content analysis (Lehota, 2001).

In the second round of the primary research teampreneurs and coaches from other parts of Europe applying Team Academy method were asked. Answers were collected from three countries above Hungary, such as Tampere University from Finland, Mondragon University from Spain and West England University from Bristol.

Results

Coaches from Hungary, similarly to coaches from Finland gave 10 to the first question. They definitely offer the use of personal learning contract in higher education. In the explanation of their answers they emphasized the following viewpoints:

- SELF-KNOWLEDGE – A tool for self-knowledge.

- GOALORIENTATION, AWARENESS – personal learning contract is living document. It helps to formulate individual goals, so students will be purposeful. Awareness is under attention, it helps to consciously build their future.

- EVALUATION, REFLECTION – student create an inventory, evaluate the path, what went well and what did not, what they would change, what they have done well, where they would have arrive when doing things differently.

- TEAM, TRUST - helps the team work by building trust. Discove-

ring the personal learning contract of others helps in accepting the others and in building trust between them. Both the individual and the coach and the team members can look at it and they can give feedback.

Focus group study of personal learning contract also revealed that this tool greatly assists the uniqueness of the training that students are learning in teams. This is due to not only writing the answer for themselves, but they share them with their peers and also with their coaches. They present it in front of each other, so it becomes a reference. It also means that the team will take it in mind when finding tasks for the members along their projects, and they try to find tasks which are in line with the person’s contract, from the field he or she wants to develop. It is important to keep personal goals in line with the goal of the team. It means they will not lose anybody from the team. The application of personal learning contract also turned up along the focus group examination. It was observed, that this tool works well, if teampreneurs use it at the beginning of their Team Academy studies and after it in every semesters. Coaches see added value in asking the contract in visual form.

University students taking part in Team Academy Debrecen education were grouped according to the year they entered Team Academy Debrecen (Table 3.), to examine if there is difference between the answers of different years. Majority of the asked teampreneurs would offer the application of the learning contract, 38% of them similarly to the coaches gave 10, which means that they would offer it definitely.
Table 3. Evaluation of the Learning Contract by the participants of Team Academy Debrecen

<table>
<thead>
<tr>
<th>Entering to Team Academy Debrecen</th>
<th>Number of teampreneurs giving answers to the questions (1: do not recommend, 10: definitely recommend)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>1. year, 2010</td>
<td>-</td>
</tr>
<tr>
<td>2. year, 2011</td>
<td>1</td>
</tr>
<tr>
<td>3. year, 2012</td>
<td>-</td>
</tr>
<tr>
<td>4. year, 2013</td>
<td>-</td>
</tr>
<tr>
<td>5. year, 2014</td>
<td>-</td>
</tr>
<tr>
<td>6. year, 2015</td>
<td>-</td>
</tr>
<tr>
<td>Altogether</td>
<td>1</td>
</tr>
</tbody>
</table>

Source: own results, 2016

Examining the contract also in internationally, the average value of the answers (Table 4.) were in each cases higher than 8. The average of coaches from England was lower than 10, because one of the coaches took part on the self-managed learning program of Cunningham, and indicated that the freedom offered by the contract cannot be treatable in each cases.

Table 4. Evaluation of the Learning Contract by the participants of different countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Coach</th>
<th>Teampreneur</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of responders</td>
<td>Average of the given values</td>
</tr>
<tr>
<td>Hungary</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Finland</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>England</td>
<td>3</td>
<td>8,83</td>
</tr>
<tr>
<td>Spain</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: own results, 2016

Teampreneurs also emphasized the viewpoints mentioned by the coaches. From these points they put evaluation and reflection to the first place of importance. The most often used expression in this field was the TRACEABILITY. More of them underlined the importance of the written form, so as they can again and again take it in hand. Contract carries weight in written form. GOALS, CONSCIOUSNESS and SELF-AWARENESS stood on the second space. They used the words awareness, purposeful, conscious planning, responsibility, sense of responsibility. Here the appearance of responsibility has to be underlined. SELF-REALISATION was put next to self-knowledge. Answers pointed
out that important element, that personal learning contract has to count with own skills and has to build on these skills. TEAM, working in teams was also part of the answers of the teampreneurs, but with the exception of the Spanish teampreneurs (who put its most important role in building teams) got less attention than in the case of the coaches.

New viewpoint given by the teampreneurs was MOTIVATION: More of them told that preparation of the contract motivates and urge them.

Answers of those who are not recommending personal learning contract in higher education can be grouped along four points:

- its application depends from personality,
- it is difficult to find and plan goals,
- there is no consequences from the university side, if you do not succeed,
- rigidity and regulation of traditional system.

One of the teampreneurs from the first year defined this as follows: “Traditional system is very rigid, it is difficult to move there. There are rules in them which you have to follow. Personal learning contract worked in Team Academy, where system has more freedom, and I can build my own path, I can develop what I have interest on and define my goals on the basis of these.”

There was only one Hungarian teampreneur who gave value 1 to the first question, who did not recommend personal learning contract in higher education. The answer was as follows: “The reason why I do not recommend, because this depends on personality whether or not a contract written on a paper helps personal development. For me for example it did not mean anything, it did not help my development, it was only compulsory to do. On the other hand it could be very difficult to build the contract in the frame of the traditional education, because this is not accountable and cannot be forced to the student to take it seriously. This has to be a decision of the student if he/she would like to have his/her goal in a written form like this, or this does not give any extra to him/her.”

Some of those in the Hungarian education prepared their personal learning contract in English, so feedbacks were given on this topic as well. There were some who evaluated this as a positive aspects, because his/her English develops, others said that it is easier for him/her express themselves in their mother language.

**Conclusion**

Personal learning contract a Team Academy tool in higher education was introduced. Based on the results personal learning contract is a good example how the presence of pull type of learning can be increased in higher education. As it was presented in Table 2., there are a lot of tools helping personal development in Team Academy, including personal learning contract. Dobos (2013) as a next step of her research suggests the theoretical and practical development of coaching-oriented education opportunities. Results of primary research show, that Team Academy and its tool, personal learning contract can be a good answer to help coach-oriented education. The questions of the personal learning contract are also questions of different coaching models. One of these models is the GROW model, which steps are: defining the goal, exploring the current situation, identifying options, planning the path of the road. (Komócsin, 2009). The application of personal learning contract in higher education is recommended by students and coaches as well. The use of the
contract can be an answer to the challenges outlined in the literature (Scharmer, 2013; Robinson and Aronica, 2016), that how university can help students to discover their own talent. It can be an answer to the problem underlined by Polónyi (2013), who draws the attention to the fact that while the performance of the post-socialist model is lagging behind every European capitalism model, their schooling rate approaches the highest numbers. This difference can happen by the fact revealed by Csepeli (2010) that in the Northern European countries the rate of acting citizens is significantly higher than in the Eastern countries. Szilágyi (2017) in her work referring Chien et al. indicates, that self-organized learning is such a competence increasing activity, which has a positive effect on democracy and active citizenship. By ensuring pull type of learning environment the number of acting citizens can increase, which can decrease the difference in the economic performance.

Hausmann et al. (2011) argue that the secret of modern societies is not that each person holds much more productive knowledge than those in a more traditional society. The secret to modernity is that we collectively use large volumes of knowledge, while each one of us holds only a few ‘bits’ of it. Society functions because its members form webs that allow them to specialise and share their knowledge with others. The more knowledge (‘bits’) one holds and the more colourful/diversified the ‘bits’ owned by local people the more they can share and use to build their region. By giving importance of team and team learning the method introduced also helps this process, collectively using volumes of knowledge. The use of personal learning contract with its role played in building and trust creates a higher level in development, which although appears also from the side of the students, but it is still stands in the back against the building of their own path. Interestingly there are differences between cultures. In the case of Spanish teampreneurs between their responses team-building appears as the most important role of the personal learning contract.

Those who does not recommend the examined tool, that there is not any control, evaluation (good or bad mark) from the direction of others. Personal learning contract is a neutral evaluating tool, which is unusual for university students. There is no right or wrong answers, they measure themselves to the goals they set for themselves, increasing also students’ sense of responsibility. It highlights the fact that self-development is primary the responsibility of their own.

Use of the personal learning contract from the entry to the university and its update from semester to semester is important because in many cases it takes time to understand the importance of if for students. This is also the message one of the teampreneurs answering the questions: “I would definitely offer the use of personal learning contract in higher education. At the beginning I did not understand, why I have to write a contract and why I have to update it. Later, when I took it seriously I changed my mind. Indeed it is important to systematize our goals, our tools and the installation of measure points and evaluation. When I updated my contract I always thought over my last semester, and planned the next one. It is truly useful when there is something to rely on when we are lost.”

Finally from the side of teampreneurs it was also mentioned, that they would offer personal learning contract in other field of life as well. Some of them would introduce it already in grammar schools.

References


Brief biographies of the authors

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A spatial analysis of the territorial servitization process in European regions

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Abstract
Manufacturing businesses are increasingly integrating value-adding services in their operations, and at a territorial level this phenomenon has the potential to enhance territorial competitiveness and economic growth (a process called territorial servitization). However, and despite the extended literature at the firm-level, the regional analysis of the process attracted only limited scholarly attention. The paper intends to fill in this gap by extending spatial scope of the existing research field and seeks to determine the effect of the manufacturing base, the quality of entrepreneurial ecosystems and neighboring regions’ characteristics on new KIBS firms’ formation rate across European regions. The sample consists of 121 European regions from 24 countries. The data was obtained from Eurostat and the Regional Entrepreneurship and Development Index (REDI) datasets for the period of 2012–2014. Our findings reveal that there is a positive relationship between the stock of manufacturing businesses and the creation of knowledge-based service businesses across European regions. Also, the quality of the regional entrepreneurial ecosystem and cross-regional effects affect the relationship between manufacturing and KIBS firms. Policy makers should reconsider their overall reindustrialization plans and build on the existing knowledge base of regions.

Keywords: territorial servitization, knowledge-intensive business service, manufacturing sector, reindustrialization, spatial econometrics, European regions

Introduction
In 2012, the European Union set explicit goals to increase manufacturing’s share to at least 20 percent target in the union’s overall GDP by 2020 (European Commission, 2014). Although higher industry level—or reindustrialization—might resemble a sharp turnaround in the road to the innovation-driven status of the economy, EU policy makers expect higher employment rate and economic growth from interdependencies with other industries. A new light might come from the growing interconnectedness between knowledge-intensive business service (KIBS) firms and manufacturing businesses (Bienkowska, 2015) and their potential impact on territorial competitiveness (Lafuente, Vaillant, & Vendrell-Herrero, 2016).

KIBS businesses provide knowledge-based and high value-added services that might stream to small and medium sized manufacturing firms in the form of servitization strategies, which refer to the actions adopted by manufacturing businesses that result in the integration of product-related services in their operations seeking to maintain their competitiveness level (see e.g., Muller, & Zenker, 2001; Jacob, & Ulaga, 2008). Potential firm-level advantages are numerous in the literature: product differentiation, increased value to the customers, enhanced customer engagement and reaching a competitive advantage. However, there is only a few
number of studies that considered the potential benefits of servitization strategies for a region.

We aim to fill this gap in the literature by adopting an approach to territorial servitization that accounts for the spatial interactions between neighboring regions. In this study we evaluate the effect of manufacturing firms on the development of new KIBS businesses in 121 European regions. In addition, we propose a model in which regions’ entrepreneurial ecosystem play a key role in moderating the relationship between manufacturing businesses and new KIBS firms. We also argue that territories that are closer in space affect the KIBS’ business formation rates in neighboring territories.

The empirical analysis uses multiple sources—Eurostat and Regional Entrepreneurship and Development Index (REDI)—to create a unique dataset including information for 121 European regions during the period 2012-2014. We employ spatial econometrics methods to test and deal with potential spatial effects (Anselin, 1988; Anselin, & Bera, 1998). This method has been adopted by a growing number of empirical applications (see e.g., Anselin, Varga, & Acs, 1997; Dettori, Marrocu, & Paci, 2012; Pijnenburg, & Kholodilin, 2014).

The findings provide evidence that territorial servitization is an existing phenomenon in Europe and that it enhances KIBS firms’ formation or attracts new KIBS firms to regions with a solid manufacturing base. However, our results also show that neighboring regions are different in terms of their new KIBS’ formation that might be the consequence of different industrial specialization, lower development level or competition between regions for knowledge-intensive firms. We also find evidence that the prevalence of a healthy entrepreneurial ecosystem contributes to a higher new KIBS’ rate as well.

This study has two main contributions to the literature. First, this paper is the first attempt to develop an extensive spatial analysis of manufacturers’ servitization process that at the same time reflects on the renaissance of manufacturing proposed by European policy makers. Second, by considering and incorporating the potential spatial effects between neighboring European regions, we can provide more reliable results as a feedback of these strategies and, consequently, open the debate on potential future policy interventions.

Section 2 presents the relevance of servitization in promoting regional development and is divided to two subchapters that underpin our proposed hypotheses. Section 3 provides the sample, variables and methods. In section 4 empirical results are presented, while section 5 gives space for the discussion and the concluding remarks.

Servitization: a potential source of territorial development

Over the last decade, scholars have documented how manufacturing businesses are enhancing their competitive advantage through the incorporation of knowledge-based services into their value chain, a process defined as business servitization (Matthyssens, & Vandenbempt, 2008; Baines,& Lightfoot, 2014; Vendrell-Herrero et al., 2016). The benefits resulting from the integration of product-related services in business operations are well documented in prior studies, including the development of value-adding customized solutions to consumers (Muller, & Zenker, 2001; Visnjic, & Van Looy, 2013; Kohtamäki, & Partanen, 2016), and a greater product
differentiation and customer engagement (Vandermerwe, & Rada, 1989; Cusumano, Kahl, & Suarez, 2015; Vendrell-Herrero et al., 2016).

In parallel with the call made by different public administrations in the US and Europe about the potential transformative power of service innovation (European Commission, 2011, 2012), a recent stream of research has addressed the potential impact of servitization processes at the territorial level (Arnold et al., 2016; Lafuente, Vaillant, & Vendrell-Herrero, 2016). Lafuente, Vaillant, & Vendrell-Herrero (2016, p. 2) propose that territorial servitization represents “the aggregate outcomes—e.g., economic, employment and other social outputs demanded by stakeholders—resulting from the various types of mutually dependent associations that manufacturing and knowledge-intensive service businesses create and/or develop within a focal territory.”

Underlying this definition is the assumption that the interconnectedness between knowledge-based business service (KIBS) firms and manufacturing businesses can enhance territorial competitiveness. Knowledge-intensive business service (KIBS) firms provide knowledge-based and high intellectual value-added services mostly to other small and medium sized manufacturing firms. KIBS’ services are mostly related to R&D, management consulting, or IT outsourcing (Strambach, 2001; Lafuente, Vaillant, & Serarols, 2010). Therefore, KIBS businesses play a critical role in the innovation behavior of territories by channeling value-adding knowledge-based services to manufacturing businesses. Also, KIBS businesses might be one of the beneficiaries of these interactions as a growing manufacturing sector potentially attracts or stimulates the creation of complementary knowledge-intensive service firms.

Servitization can take basically two forms that affects spatial structure and relationships between businesses in a region (Visnjic, & Van Looy, 2013). First, manufacturing firms can acquire the necessary skills and provide a service (e.g. after-sale maintenance) that is internalized in the product offering. According to Gebauer et al. (2008), Neu and Brown (2008) and Oliva and Kallenberg (2003), from the part of the servitizing manufacturer, successful implementation of this strategy is conditioned by firm-level characteristics such as sufficient management qualities, human capital, organizational design, culture and information technology. Second, manufacturing firms can also opt for external servitizing by outsourcing the concerned service activity to a service-provider. However, as it raises questions about the partner company’s skills and reliability, outsourcing requires increased trust between the manufacturer and the service provider, especially in case of outsourcing customer relationship management (Johnson, 2007).

From a territorial perspective, consolidated manufacturing sectors are characterized by agglomeration economies (Rocha, & Sternberg, 2005), and their economic activity has direct consequences on local business performance. Thus, the territorial servitization process contributes to regional development via positive externalities, knowledge spillovers and positive effects on input-output markets (Tavassoli, & Jienwatcharamongkhhol, 2016). This creates the conditions for entrepreneurial activity, thus enhancing the local development of knowledge-based sectors (Lafuente, Vaillant, & Serarols, 2010; Arnold et al., 2016).
Relationship between businesses at a regional level

It has been well documented in the literature that agglomerations—i.e., people and businesses—can be beneficial because of potential external economies of scale in case of the existence of industrial linkages and different types of complementarities (Marshall, 1890; Krugman, 1991). When it comes to industrial linkages, scholarly literature differentiates the effects of intra-industry and inter-industry interactions.

Intra-industry interactions become more evident via cooperation between businesses, such as industrial districts or manufacturing clusters. Fritsch and Changoluisa (2014) found that the market entry of new manufacturing businesses results in productivity improvement of their incumbent counterparts. They attribute this effect to increased competition in the output market. Also, in this situation, incumbent firms with more up-to-date technology improve their productivity much more than their counterparts.

As for the interaction with other private sector businesses, Fritsch and Changoluisa (2014) found that the formation of new private sector firms does not affect the productivity of incumbent manufacturers. However, as many studies support, positive effects might occur between industries in the presence of related variety (e.g., Tavassoli, & Jienwatcharamongkhol, 2016) According to Castaldi, Frenken and Los (2015), related variety not only means diversity of activities, but also that industries partially share their knowledge and skill base. Empirical evidence shows that the higher the related variety in the region, the higher the survival rate of entrepreneurial firms (Tavassoli, & Jienwatcharamongkhol, 2016), the level of innovation (Tavassoli, & Carbonara 2014; Castaldi et al. 2014), and regional growth (Glaeser et al., 1992). Boschma and Iammarino (2009) also argue that related variety can make a region more resilient to sector-specific shocks.

Related variety might be found in a region as a consequence of interconnectedness between KIBS and manufacturing businesses in terms of servitization processes. At the regional level, Lafuente, Vaillant and Vendrell-Herrero (2016) found that a virtuous circle of interindustry processes can take place in regions related to servitization processes. The existing base of resilient manufacturing firms can stimulate the formation of KIBS or attract new KIBS in the region. Besides the size of the manufacturing industry, its economic intensity is a relevant quality factor that can mediate a positive relationship between new KIBS rate and the employment rate of new manufacturing businesses. In their view, KIBS firms can fuel job creation in the manufacturing industry by providing high value-adding services, however, value appropriation depends on the characteristics of the territory’s manufacturing industry and the quality of regional networks that can ensure connection between businesses.

Businesses with sufficient level of human capital (both in quality and quantity) and stable financial position might internalize their service activity because of higher control and lower costs. According to Visnjic and Van Looy (2013), at the beginning, very low levels of service activity might already raise the profit margin that can cover the decline caused by the higher level of service investments (one manifestation of servitization paradox), until economies of scale are reached. The situation changes when it comes to small businesses with resource constraint and lack of economies of scale that should
rather opt for outsourcing. As these firms are more prevalent in the European Union (99.8 percent of businesses belong to small and medium sized enterprises (SMEs)) (European Commission, 2015), we believe that servitization processes rather take place between KIBS and manufacturers and propose the following hypothesis:

Hypothesis 1: A positive relationship exists between the stock of manufacturers in a region and the business formation rate of knowledge-intensive business service firms (KIBS).

The relevance of entrepreneurial ecosystem and extraregional spillover effects

A growing number of studies are recognizing that regional-level characteristics might be even more important in firms’ quality and performance than their individual characteristics (e.g., Falck, 2007; Spigel, 2015). A popular concept of entrepreneurial ecosystems has evolved from this view that acknowledges the benefits and self-impulsive context of entrepreneurial processes in a focal territory. The entrepreneurial actors play an organic part in creating and maintaining a healthy ecosystem, while the ecosystem catalyzes successful entrepreneurship (Acs, Autio, & Szerb, 2013; Stam, 2015). According to Szerb et al. (2013), the positive effects of the ecosystem depend on how comprehensive and available its specialized resources are to its entrepreneurs.

While entrepreneurial ecosystems are somewhat unique in nature (Isenberg, 2010; Mason, & Brown, 2014), they share some common characteristics too. First, as businesses are contextually embedded, entrepreneurial ecosystems can be found in continuous territories covering different spatial areas. Some of the most well-known examples are Silicon Valley, Copenhagen and Cambridge. Second, they refuse the one-dimensional approach of entrepreneurship and identify different determinants to evaluate the quality of entrepreneurial activity. As Szerb et al. (2013) proposes, one of the quality factors are innovation, knowledge and technology intensity and value creation that are inherent characteristics of KIBS businesses. Following this line of thought, our second hypothesis is:

Hypothesis 2: A positive relationship exists between the quality of the regional entrepreneurial ecosystem and the business formation rate of knowledge-intensive business service firms (KIBS).

Besides positive intraregional effects and synergies gained via a developed entrepreneurial ecosystem, we should take into account cross-regional effects as well. As Boschma and Iammarino (2009) argue, this is a relatively unaddressed topic in the territorial research frame. Although some studies incorporate potential spatial effects from neighboring regions, they report no significant effects. For example, Fritsch and Changoluisa (2014) did not find any significant effect on the productivity of incumbent manufacturing firms neither from the market entry in the same industry nor in other private sector industries. Other studies suggest that in general, incumbent firms benefit more from interactions with businesses in the same industry (Mashallian externalities), while diversification can be more beneficial to young businesses (Jacobian externalities) (Szerb et al., 2013).

Boschma and Iammarino (2009) find that cross-regional positive effects (knowledge) only take place if the sectoral specialization of the other region is related but not the same as in the given region. They argue that if the external knowledge does not add further value to the region’s
accumulated knowledge stock, it will not contribute to its regional growth. Thus, they emphasize the relevance of related variety for experiencing positive extra-regional effects. Therefore, neighboring effects of new KIBS firms can be expected in the close geographic proximity due to the lack of a solid local market position, and to the existence of Marshallian externalities that would increase intra-industry competition.

Thus, our third hypothesis is the following:

**Hypothesis 3:** The higher the business formation rate of knowledge-intensive business service firms (KIBS) in a region, the lower the formation rate is in the neighboring regions.

**Data, variables and method**

Our sample consists of data from 24 European countries that we obtained from 1) Eurostat, taking the average of years from 2012 to 2014 to eliminate the temporary market shocks, and from 2) the Regional Entrepreneurship and Development Index (REDI) dataset. As the REDI dataset contains information about mixed NUTS 1 and NUTS 2 level regions, we kept this classification in further analysis. As a result, we had 125 European regions, from which we had to eliminate the regions without direct neighbors to be able to analyze potential spatial effects between neighbors sharing common border(s). Our final sample consists of 121 regions in 24 countries, 67 regions at NUTS 1 and 54 NUTS 2 level. Figure 1 shows the location of the regions included, and Appendix 1 depicts the level of analysis for all the analyzed countries.
Our first independent variable is the stock of manufacturers in a region measured by the number of manufacturing businesses based on Eurostat’s Regional business demography database. This is aligned with the work of Lafuente, Vaillant and Vendrell-Herrero (2016). To quantify the quality of a regional entrepreneurial ecosystem, we chose the REDI score of each region. The higher the regional REDI score, the better the level of its entrepreneurial ecosystem. Our choice can be explained by more advantageous characteristics of the index. First, it incorporates entrepreneurial characteristics using individual-level data from the representative survey of Global Entrepreneurship Monitor (GEM) dataset, together with the features of the institutional context, where the firm operates. Second, most of the entrepreneurial businesses operate, so the main effects should stem from these territories. Third, it captures potential interregional differences that might come from the industry structure and economic base (Szerb et al., 2013).

The control variables are GDP per capita, population density, and unemployment rate. GDP per capita is a widely-used indicator of economic output and development level (see e.g., Szerb et al., 2013; Lafuente, Vaillant, & Vendrell-Herrero, 2016). Values for this variable are expressed in constant euro at purchasing power parity standards to facilitate comparability across regions. The data was obtained from the REDI dataset. Population density is measured as the total regional population per square kilometers. As Fritsch and Changoluisa (2014) state, high population density might result in higher demand that increases competition between manufacturers and thus the demand for KIBS firms’ service offerings. Boschma and Iammarino (2009) also use it as a control variable. According to Fritsch and Falck (2007), high unemployment rate only has a positive effect in the short term, thus, a three-year-average might eliminate the potential effects. Table 1 contains information on mean values and standard deviations for the analyzed variables. In the final model specification, note that the stock of manufacturers, the REDI score, the GDP per capita and the population density were logged to reduce skewness.

### Table 1. Descriptive statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean value</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate of new KIBS among new businesses</td>
<td>0.3021</td>
<td>0.1621</td>
</tr>
<tr>
<td>Stock of manufacturers</td>
<td>17531.90</td>
<td>23716.65</td>
</tr>
<tr>
<td>REDI score</td>
<td>46.5405</td>
<td>15.7696</td>
</tr>
<tr>
<td>GDP per capita (in PPS)</td>
<td>23950.41</td>
<td>8498.07</td>
</tr>
<tr>
<td>Population density (inhabitants per km²)</td>
<td>349.80</td>
<td>907.56</td>
</tr>
<tr>
<td>Unemployment rate</td>
<td>0.1085</td>
<td>0.0652</td>
</tr>
</tbody>
</table>

*Sample size: 121 regions.*
In our empirical analysis, first, we run a linear regression model (OLS) to estimate the impact of the analyzed variables on new KIBS’ formation rate. However, this baseline model does not include the spatial feature of our dataset. To test the existence and the feature of spatial effects between adjacent regions (Hypothesis 3), first, spatial weight matrices should be created that determine the proposed structure of spatial interactions (Anselin, & Rey, 2014). In our analysis, we created four types of spatial weight matrices (Table 2). The first one is based on the assumption that territories that share a common border affect each other more than other regions (queen contiguity). The second handles equally the regions that are the four closest to the given region, no matter if they share a common border or not (4 nearest neighbors). The third weight matrix considers that the spatial effects reach to a certain distance (binary distance, threshold: 377.95 km), while last one assumes the same but it associates decreasing effect to the regions, that are further in spatial distance.

In the next step, Anselin and Rey (2014) proposes to use Lagrange Multiplier and robust Lagrange Multiplier tests to reveal the potential spatial autocorrelation in our model. Spatial autocorrelation can take two basic forms: spatial lag and spatial error. In the first case, the dependent variable of a region affects the dependent variable of the adjacent region. In the last case, the effects of the spatial proximity appear in the error term of the model that can be the result for example, of an omitted variable or wrong spatial level to analyze the relationship between our chosen variables.

After conducting the necessary tests with the different weight matrices, we found that the spatial effects are the strongest with the inverse distance matrix with 377.95 km threshold distance and refer to the presence of a spatial lag.

### Table 2. Spatial dependence tests

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LM lag</td>
<td>1.38</td>
<td>1.124</td>
<td>3.97**</td>
<td>7.354***</td>
</tr>
<tr>
<td>Robust LM lag</td>
<td>3.19*</td>
<td>2.162</td>
<td>2.294</td>
<td>3.475*</td>
</tr>
<tr>
<td>LM error</td>
<td>0.29</td>
<td>0.158</td>
<td>2.062</td>
<td>4.291**</td>
</tr>
<tr>
<td>Robust LM error</td>
<td>2.1</td>
<td>1.196</td>
<td>0.385</td>
<td>0.411</td>
</tr>
</tbody>
</table>

*, **, *** indicate significance at the 10%, 5% and 1%, respectively.

To correct the inconsistency in the beta parameters, after estimating the baseline model with OLS (Model 1), we used maximum likelihood estimation method and a spatial lag model. Model 2 incorporating spatial lag dependences takes the following form:

\[
\text{New KIBS firms' rate} = \rho \text{New KIBS firms' rate} + \beta_0 + \beta_1 \text{Stock of manufacturers} + \beta_2 \text{REDI score} + \beta_3 \text{Control variables} + \varepsilon
\]
In equation (1), $\beta_0$ represents the constant term, while the main independent variables include the stock of manufacturers and the REDI score of the regions. The model also contains a variable for the spatially lagged new KIBS firms’ rate with the belonging $\rho$ regression parameter (Anselin, & Rey, 2014). The set of control variables are related to the development level of the region (GDP per capita), population density and the unemployment rate. We also used country dummies in our analysis. The term $\varepsilon$ is the normally distributed error. Regression parameters ($\beta_j$) are estimated via maximum likelihood method (ML) (Greene, 2003).

**Results**

Results are presented in Table 3. Besides the spatial diagnostics, we also ran some non-spatial diagnostic tests. To test the presence of collinearity, we computed the average variance inflation factor (VIF) for all variables (Greene, 2003). In our baseline model, the average and highest VIF values do not exceed the generally accepted rule of thumb of 10, so our results do not raise collinearity concerns. However, the result of the Jarque-Bera (1987) normality test refers to the non-normality of error terms. This provides further support for choosing other type of estimation method. As Chasco (2013) states, in case of non-normal errors, the Koenker-Bassett test is more reliable than the Breusch-Pagan test to decide whether the error term is homoskedastic or not. As the test statistic is not significant, we can apply the maximum likelihood method.

From Model 2, we see that the prevalence of incumbent manufacturers in a region catalyzes new KIBS’ formation: the more manufacturers operate in the region, the higher the proportion of new KIBS among new businesses. Based on this result, we can confirm Hypothesis 1. Also, we find positive and significant result for the parameter of the REDI score that means that new KIBS appear more likely in regions that have better entrepreneurial ecosystem. This finding provides support to Hypothesis 2. Finally, we also find that the new KIBS’ rate in adjacent regions is significant; however, it negatively influences the region’s new KIBS’ rate. According to this, we accept Hypothesis 3.
### Table 3. Regression results

<table>
<thead>
<tr>
<th>Model 1 (Without space)</th>
<th>Model 2 (Spatial autoregressive model, SAR)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OLS</td>
</tr>
<tr>
<td>Stock of manufacturers (ln value)</td>
<td>0.0279* (0.0158)</td>
</tr>
<tr>
<td>REDI score (ln value)</td>
<td>0.1953** (0.0773)</td>
</tr>
<tr>
<td>GDP per capita (in PPS) (ln value)</td>
<td>-0.0195 (0.0740)</td>
</tr>
<tr>
<td>Population density (ln value)</td>
<td>0.0159 (0.0151)</td>
</tr>
<tr>
<td>Unemployment rate</td>
<td>0.3633 (0.4039)</td>
</tr>
<tr>
<td>Country dummies</td>
<td>Yes</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.5918 (0.6013)</td>
</tr>
<tr>
<td>New KIBS’ rate in adjacent regions</td>
<td>-</td>
</tr>
<tr>
<td>VIF (minimum-maximum)</td>
<td>2.63 (1.18-6.65)</td>
</tr>
<tr>
<td>Jarque-Bera test (H0: errors are normally distributed)</td>
<td>12.064***</td>
</tr>
<tr>
<td>Breusch-Pagan test (H0: errors are homoskedastic)</td>
<td>38.454***</td>
</tr>
<tr>
<td>Koenker-Bassett test (H0: errors are homoskedastic)</td>
<td>21.74</td>
</tr>
<tr>
<td>F-test</td>
<td>5.9861***</td>
</tr>
<tr>
<td>(Pseudo) R2</td>
<td>0.5137</td>
</tr>
<tr>
<td>Adjusted R2</td>
<td>0.4279</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>92.622</td>
</tr>
<tr>
<td>Akaike information criterion</td>
<td>-147.243</td>
</tr>
<tr>
<td>Schwarz information criterion</td>
<td>-94.123</td>
</tr>
</tbody>
</table>

Standard errors are presented in brackets. *, **, *** indicate significance at the 10%, 5% and 1%, respectively.

**Conclusion and future implications**

In this study, we sought for evidence of servitization processes and their driving forces in 121 European regions. After considering relevant theoretical findings in the field, to support (or refuse) our first hypothesis, we replicated the analysis proposed by Lafuente, Vaillant, & Vendrell-Herrero (2016). We found evidence that there is a mutually dependent and reinforcing relationship between existing manufacturing firms and new KIBS firm formation rate in an extended, European environment. Besides, we analyzed the effect of further region-specific and cross-regional factors that can either enhance or set back the associated regional economic development processes.

As our results suggest, there is a generally positive relationship between the stock of manufacturing firms and the creation of value-enhancing knowledge-based services across European regions. However, the overall quality of regional entrepreneurial ecosystem plays an important role in this relationship. Following the definition used in our study, the entrepreneurial ecosystem includes individual and institutional elements that interact with each other and might be essential to attract and support new KIBS firms in the region. It seems that cross-regional effects hinder the overall high rate of new KIBS businesses that as we had proposed, might be explained with interindustry competition between new KIBS firms in close proximity. However, it can also result from the fact that in some context more attractive regions “drain” knowledge from spatially close regions.

Policy implications can be drawn from the results of our study. Although,
both the regions’ specialization in manufacturing activities and the better development level of entrepreneurial ecosystems catalyze KIBS formation rate they can change (evolve) only in a long term. Thus, policy makers should revise whether serious interventions really pay off in a long term or it is just about finding an easy-to-solve bottleneck that hinders the performance of territories as a temporary shock. If the region’s characteristics are less attractive in a certain field, they should find a sustainable niche built on its existing knowledge base.

Finally, we should mention some limitations that represent future lines of research. First, future studies should study the territorial servitization hypothesis using data at a lower-level of regions, for example for local labor districts that might indicate the underlying processes better than statistical regions. It would be also interesting to dig deeper and find the reason underlying for the knowledge drain processes by identifying and quantifying potential spillover effects from other regions. Further data on the innovativeness of KIBS and manufacturing firms, and on the role of clusters in a territory may represent valuable information to expand the proposed analysis at the meso-level.

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[43] Szerb, L., Acs, Z. J., Autio, E.,


Appendix

Appendix 1. Countries and the NUTS level of analysis

<table>
<thead>
<tr>
<th>Country</th>
<th>NUTS level</th>
<th>Number of regions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>NUTS1</td>
<td>3</td>
</tr>
<tr>
<td>Belgium</td>
<td>NUTS1</td>
<td>3</td>
</tr>
<tr>
<td>Croatia</td>
<td>NUTS2</td>
<td>3</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>NUTS1</td>
<td>1</td>
</tr>
<tr>
<td>Denmark</td>
<td>NUTS2</td>
<td>5</td>
</tr>
<tr>
<td>Estonia</td>
<td>NUTS2</td>
<td>1</td>
</tr>
<tr>
<td>Finland</td>
<td>NUTS2</td>
<td>5</td>
</tr>
<tr>
<td>France</td>
<td>NUTS1</td>
<td>8</td>
</tr>
<tr>
<td>Germany</td>
<td>NUTS1</td>
<td>16</td>
</tr>
<tr>
<td>Greece</td>
<td>NUTS1</td>
<td>3</td>
</tr>
<tr>
<td>Hungary</td>
<td>NUTS2</td>
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Krisztina Horváth

Krisztina Horváth is a PhD candidate at the Faculty of Business and Economics of the University of Pécs and member of Regional Innovation and Entrepreneurship Research Center (RIERC). Her research interests focus on the role of knowledge-based organizations on territorial economic performance, informal investment, and financial bootstrapping.

Brief biography of the author

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Group Dynamics in Entrepreneurial Team Formation – Case Study

Péter Popovics – Tímea Gál – Judit Katonáné Kovács – Georgina Árváné Ványi

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Abstract

Tuckman named five stages of team formation: forming, storming, norming, performing and adjourning. A new team cannot be expected to perform as an excellent team when it first comes together. It takes time forming a team, and they often go through recognizable stages as they change from being a collection of strangers to a united group with common goals. You have to understand it at first, than you can help your team become effective more quickly.

In this research the authors would like to look at how we can use this model in our team entrepreneur education system to build high performing teams.

Introduction

Getting in contact with different quantity and quality of teams is quite unavoidable in one’s life. Experiencing of these connections starts even in childhood, although the way, we form our relations in these ages are entirely instinctive. Our feelings inside are altered constantly between the allurements of being alone to process the diverse effects are generated by numerous stimuli of our environment and the desire of linking to somewhere, where we are parts of interactions, based on information, experiences, feedbacks.

Growing up we find ourselves in

In 2010 the innovative Finnish higher education system (Tiimiakatemia – Team Academy) was launched at University of Debrecen Faculty of Economics and Business, which was also awarded by OECD and has been run at JAMK University of Applied Sciences in Jyvaskyla since 1993. In this system, we create team entrepreneurs who have to work together in teams.

Authors of this study work as team coaches in Team Academy Debrecen. In the last 6 years we have worked with several teams and experienced how group dynamics present at the teams and change through the learning process. We have faced with great storming period at different teams and managed to build high performing entrepreneur teams as well. Our experiences are introduced as case studies, after analysing, consequences will be concluded. As in the EFQM model we can find that to survive in the global competitive markets companies need the best teams for the best results.

Keywords: high performing teams, Team Academy, higher education, learning by doing, innovation in education, EFQM model, team coaching
various “natural” (such as family, group of friends) and “artificial” (such as school, sports club) systems and the request of belonging to somewhere is conceived in us more consciously. The results and consequences of our belongings are determined by how we were impressed by these different effects and feedbacks. While the positive effects, the comfortable environment encourage us to be strength and self-confident, that the negative influences, the panic zone can result the loss of our sense of security, making us to be shy.

We work always with multiform, smaller or bigger teams in the educational process of the university. The quality of the nexus between the members of these teams isn’t so important from the aspect of the teaching in traditional manner. According to this point of view, there isn’t any significance whether there is interpersonal harmony or disharmony in the group during the lectures with frontal way. The personal relationships of the students changed a lot in the past 20 years. They are a bit separated, and they prefer organizing themselves only into small groups, cliques. This phenomenon of the groups influences also the social life of the students.

These alterations were established when the educational system, especially the higher education became to function as mass education. In our opinion, the consequences of this process influence negatively the quality standards as well. The students are low motivated. The individual performances mean only data, that doesn’t have any effect on the team. The flexibility of the credit system of the higher education gives the opportunity to graduate the university with a relatively low achievement. Because of the high number of students not only the lectures and seminars, but also the exams become impersonal. Most of the exams are written exams based on lexical knowledge instead of creativity, innovative thinking, individual attitude.

We faced with these facts when we tried to introduce a new educational method in the Faculty of Economy of the University of Debrecen, which is called Team Academy Debrecen in 2010. Originally it was a Finnish method (Tiimiakate-mia, established by Johannes Partanen, in Jyvaskyla, Finland, in 1993). Its foundations are quite similar to those, which were written about forming and functioning of learning organisations in Fifth Principle by Peter M. Senge (Senge, 1994). It shows how to create team entrepreneurs from students. The individual skills and capabilities and their development are emphasized essentially in this educational system. Team formation is primary requirement of the system, because the teams have to organise and operate a common enterprise. It cannot be otherwise, just breaking with the traditional limits. The students are called team entrepreneur here and their most important skills are the creativity and innovativeness, underlying the last one.

About the innovative thinking a mysterious Professor Ikujiro Nonaka and his friend Hiroaka Takeuchi started a project in the 1970s, studying the innovation process of Japanese companies. Their conclusion was that the innovation process is not only handling information but grasping, creating, utilising, and maintaining knowledge (Nonaka & Takeuchi, 1995).

The teams work on their business projects in open offices instead of lecture rooms. The focus is on the learning instead of teaching. Team coaches are, who help their works instead of teachers. The goal is to experience real business transactions, real management of a project, instead of learning theoretical models. The self-im-
The team coaching is mentioned with different attributive in the literature, such as real time team coaching (Mulec and Roth, 2005), in the moment team coaching (Anderson et. al., 2008), team effectiveness coaching (Goldberg, 2003), but they were used nearly in the same meaning.

The team coaching was defined by numerous authors in the past years. According to Goldberg the team coaching “serves assists teams in enhancing their effectiveness through real time, practical action learning that generates immediate and cumulative results” (Goldberg, 2003).

Clutterback said that team coaching is such a kind of intervention, which aims learning with which we raise the capability and the performance of the group or the team. For this the team coaching uses the following concepts: supported reflection, analysis, and motivation for changing. (Clutterback, 2009; Horváth, 2012).

The team coaching is a developmental strategy, with which we (the team coach and the members of the team together) work on the more effective operation of the team.

- We establish a diagnosis firstly describing the current features of the team, defined their strength and their requirements. We appoint the topics together to work on to evolve the team.
- The coaching appointments, train-
ings are to develop the team; we try to do together to facilitate the communication between the members and to find solutions to their problems. We confirm the effective functional features of the team, and reflect firmly what does the team know now and what are their strengths.

- During the coaching the participants are able to think about themselves as a team and get tools for the follows:
  
  o How to give space for alternative thinking?
  
  o How can they accept that the others can perceive the same reality on differently?
  
  o How can they generate fresh energy from inside?
  
  o How can they distinguish between individual ambition and need of team?
  
  o How can they pledge themselves to actions that serve the purpose of the team? (Horváth – Szabó, 2017)

These thoughts above show the importance of our study, in which we focus on the team, how it is formed, how it operates and how its dynamics looks like.

**Group versus Team**

It is important to make it clear what is the difference between group and team. Rudas defines the group as a kind of cooperation between members who perceive each other directly, and they do interactions with each other regularly (Rudas, 2016). While the team consist of persons who have common tasks and aims, and they dependant of each other mutually from the aspect of information, resources and capabilities. They integrate their strengths to fulfil their common goals. The roles and rules are known and accepted by everyone. The boundary of the team is clear for all the people in or out of the team (Horváth - Szabó, 2017).

Berne emphasises some characteristic features of the team. It has got main external and internal and boundaries. The main external boundary determines who is in and out of the team. The membership has regular interactions with each other, and of course also with those (e.g. stakeholders), who are outside of the boundary. The main inner boundary defines the leadership. According to E. Berne the team without leadership are not able to function. It means not necessarily a real manager position, but one’s role in the team that is accepted by everyone. This person can be the team coach, facilitator as well. In such cases this person has to lead the team without any position. This situation can be more complicated by the members do not work in the same office, the workspace is just virtually, where the interactions can happen. It has to be highlighted that there is a significant difference between team and group. In the team – in contrast with the group – the membership works in mutual interdependence. This condition needs more responsible attitude from the membership. There should be “we” instead of “I”, team goals instead of individual ambitions, and management of the interpersonal relationships instead of self-management. Working in a group or in a team needs different competences and the authority of the leader and/or coach will be also quite dissimilar. Berne said that the teams are characterised by how they can manage the boundaries of their team.
including the internal, external boundaries as well as the boundaries between the various members. What do these boundaries look like? Are they flexible, accessible or rigid and inflexible? Therefore, it is an important step of the amelioration of a team that the managing of the boundaries should be adjusted to the goals of the team. If the cohesion should be strengthened the external boundary should be closed avoiding coming-and-going, and the inner boundaries (between the members and between the membership and the leadership also) should be made less tight in parallel to create space for communication and linkage. If the team needs innovation, new, fresh energy should let in the team; therefore, the external boundaries should be opened. If the thinking of some of the members tend to be too one-sided than those inner boundaries should be loosen, which are between the members or departments to facilitate the communications and giving common subtasks, projects can be also useful.

The team coaching is the most complex intervention among the various coaching processes. The Team Academy offers excellent philosophy, tools, methods and models for us to do team coaching in our educational system. What is the mission of a team coach? According to the TA the task is to help every member of the team: to get system wide recognition about themselves, to be able to define themselves, to perceive the reality more consciously, to be able to locate themselves in the stakeholder’s world, to be able to observe how they function together and what kind of constructive and destructive processes they have (Berne, 1996).

**Tuckman model: Group Development process**

Tuckman named five stages of team formation: forming, storming, norming, performing and adjourning. The model is shown in Figure 1. A new team cannot be expected to perform as an excellent team when it first comes together. It takes time forming a team, and they often go through recognizable stages as they change from being a collection of strangers to a united group with common goals. You have to understand it at first, than you can help your team become effective more quickly. As a team coach, you have to monitor the team, and determine which stage is it on. It is important to know, that team can also regress to an earlier stage if the conditions are altered (e.g. a new member join to the group). The coach can manage with conscious interventions these events.

**The Group Development Model**

Psychologist Bruce Tuckman first came up with the memorable phrase “forming, storming, norming, and performing” in his 1965 article. He used it to describe the path that most teams follow on their way to high performance. Later, he added a fifth stage, “adjourning”.

![Figure 1: Tuckman’s model - Stages](image)

**Forming**

In this stage, members disclose in-
formation about themselves in polite but tentative interactions. They are optimistic, positive and proud of being the member of this team. They explore the purposes of the group and gather information about each other’s interests, skills, and personal tendencies. Some are anxious, as they haven’t clearly understood what work they will do. The leader play a dominant role at this stage, because team members’ roles and responsibilities aren’t clear. This stage can last for some time, as people start to work together, and as they try to get to know their new colleagues.

**Storming**

Next, the team moves into the storming phase, which is a very turbulent and dissonant period, where people start to push against the boundaries established in the forming stage. There are many disagreements about procedures and purposes surface, so criticism and conflict increase. Much of the conflict stems from the challenges between members who are seeking to increase their status and control the group. This is the stage where many teams fail. People may work in different ways for all sorts of reasons but, if differing working styles cause unforeseen problems, they may become frustrated. Team members may challenge the authority of the leader. If the leader hasn’t defined clearly how the team will work, people may feel overwhelmed by their workload, or they could be uncomfortable with the used approach. Some may question the worth of the team’s goal, and they may resist taking on tasks. Team members may experience stress, particularly as they don’t have the support of established processes, or strong relationships with their colleagues.

**Norming**

Once the group agrees on its goal, procedures, leadership, norms, roles, and social relationships, this means the team moves into the norming stage. This is when people start to resolve their differences, appreciate colleagues’ strengths, and respect the authority of the leader. Now the team members know each other better, they may socialize together, and they are able to ask one another for help and provide constructive feedback. People develop a stronger commitment to the team goal. There is often a prolonged overlap between storming and norming, because, as new tasks come up, the team may lapse back into behaviour from the storming stage.

**Performing**

They reach the performing stage when hard work leads, without friction, to the achievement of the team’s goal. The group focuses their own energies and attention on its goals, displaying higher rates of task orientation, decision making and problem solving. The structures and processes that they have set up support this well. The leader can delegate much of his work, and can concentrate on developing team members. It feels easy to be part of the team at this stage, and people who join or leave won’t disrupt performance.

**Adjourning**

Many teams will reach this stage eventually. They prepare to disband by completing its tasks, reduces levels of dependency among members, and dealing with any unresolved issues. Team members who like routine, or who have developed close working relationships with
colleagues, may find this stage difficult, particularly if their future now looks uncertain (Mindtools, 2015).

**The EFQM excellence model**

People often talk about _excellence_, and in general they feel they are doing an _excellent_ job, but what is _excellence_? _Excellence_ is more than just doing well, or being good. _Excellence_ is when people strive to be the best they can be and this applies to organisations as well.

The EFQM Excellence Model allows people to understand the cause and effect relationships between what their organisation does and the results it achieves.

There are five ‘enabler’ criteria (those on the left in Figure 2) concerned with how an organisation does things, and four ‘results’ criteria concerned with what an organisation has achieved. It helps the teams understand the role each part of their organisation needs to play in effectively implementing their strategy; whether that’s in an SME, a school or a global company. In the Figure 2 below we can see percentages as well, which shows us the importance of each elements (Integrating Performance, 2012).

*Figure 2: The EFQM model*

*Source: Integrating Performance, 2012*
To survive in the global competitive market, organizations must understand, how they connect with others in their operating environment. Fundamental concept is the values of the excellence model. There are many different ways of achieving excellence, important to continuously improving themselves.

According to each enabler element of the model has their own focus. The leadership should focus on how they lead to deliver a better organization. In their strategy, they should decide the organization’s long term aims and how they can achieve them. About the people they should make the decision how to manage them. In connection with the partnerships and resources they should think it over how to make the best use of what they need. About the processes, products and services they should always improve what they do and they should ensure customer focus before and after delivery of products or services.

Thinking about the result elements they need loyal, satisfied customers, who use their more; satisfied people, who are engaged and wanting their company to succeed. As a society result they should check what is their effect on the outside world and what do they think of the company. And as a business result they need to achieve their strategy and long term aims demand.

Implementation of the team coaching concepts and the empirical observations

In our team academy program, we used the team coaching method beside other methods like mentoring, facilitating, coaching and training to develop excellence teams from group of strangers as they came to our team academy system. We always try to put on that type of hat which is needed in the process.

The question might arise that why the team coaching was the most obvious tool for developing teams? In fact, the basic theoretical knowledge can be acquired from books. Learning the entrepreneurial skills is basically not a problem, it could be learned. However, we believe that for someone to become a team entrepreneur is required to have special skills and ability, which is not feasible in the traditional educational framework, with frontal teaching. Our experience shows that small groups of 12-15 people proved correct size, where appropriate skills and abilities can be developed through trainings using the dialogue circle. This is the size, in which everyone’s knowledge and thoughts effectively can be on the table with respect to certain issues in the dialogues, so it may have a kind of synergistic effect. After the inserted knowledge and skills are quite diverse, which allows for a multilateral approach. At a size of one’s learning, progress can be monitored.

Team Coaching is such an interactive process through which a team coach both challenges as well as supports a team to accelerate its development and performance over a given period (e.g. 4 to 12 months). Team coaching can be leveraged to increase results, to enhance employee engagement, to drive organizational change, to foster the development of leadership cultures, and more (Llewellyn, 2015).

The traditional sense of team coaching process that was in business for a company or for a project team used a short process. While usually lasts 4-12 months of such a process in business, in our system 42 months was available for each team. This time frame allows a slow but extremely deep learning process, since knowledge gained experientially behind it. Many changes, developments we have witnessed in that time and his assistants, of course. In our system basically deals only one coach with each team, but we managed to experience a different protocol.
We experienced that each member took many improvements in the system, but the team’s maturation, as well as becoming excellence teams was one of the most striking change, what we faced with as team coach.

Our aim is to create excellence team entrepreneurs, who are not only one kind of learning organizations, but they can organize successful projects for themselves. In our previous Team Academy learning system (2010-2014), students were started their learning process after the 4th semester of the bachelor level at university and lasted for 3,5 years till the end of the master degree. But between 2014-2016 we had to change our system because of the changing regulation and their learning journey was shortened for only 1,5 years. This short period was not enough for the teams to become high performing teams. In Team Academy Debrecen students start their learning process in September in each year.

The first 3,5 months is the *forming period* for the groups. They got to know each others. This is the “polite” stage in which the team starts to form. All the team members are trying to figure out what the team concept is. Initial “silent” leaders may take the rein. The team is usually positive for the initial meetings. No one has offended anyone at this point. They try to define the tasks and how they will be accomplished. Here comes the first successful small project. Feelings and behaviors of the members are excitement, anticipation and optimism, but they also have fears from the unknown. As a team coach, we have to deal with the feelings and behaviors. We support them with creating their safety with the clarification of the frames, time frames, goals, roles. We should give them all shareable information, involve them to find the common goal.

At the beginning of the next semester they usually establish their own companies, so the honeymoon is over. They step on the next stage, which is the *storming stage*. The silent leaders may be clashing for control of the group. People disagree and may blame the team concept, saying it doesn’t work. Experienced characteristics are conflicts, struggling for authority, criticism, challenges, absenteeism, cliques, defensiveness, competition and choosing side. There are sharp fluctuations in attitude about the team and the project’s chance of success. The members often arguing even when they agree on real issues. The team coach should keep the focus on the positive results and do interventions when someone over dominant the others. The team coach should support the team to live and processing the emotions. They are beginning to understand one another. This phase sometimes takes 3 or 4 meetings before arriving at the Norming phase.

At the *norming phase* the team is starting to work well together, and has turned around from the “storming” phase. They may start to “brag up” the team concept to others who are not in the team and will be very positive about their role/team. Often, the team will bounce back and forth between “storming” and “norming” when issues crop up. Regression will become fewer and fewer and the team will bounce back to “norming” in quicker manner as the team “matures”. This team still takes management direction, but not as much as storming. The team members have an ability to express criticism constructively. They also have an attempt to achieve harmony by avoiding conflict. There is more friendliness, confiding in each other, and sharing of personal problems. The team coach task is to consolidate the good routines and norms. He mainly operates as an observer and only do some intervention if someone break the rules. He mainly encourages and strengthen the members.

The *performing phase* is the level where the team is a high-performance
team. The team can build on the strengths of the members. They can be given new projects and tasks and accomplish them successfully, and very seldom fall back into the “storming” phase. They are a complete self-directed team and require little, if any management direction. The only task for the team coach to support the team if it is needed and to help in processing the individual questions. In our team academy system, this can take 1 year or longer to reach this stage and this was a real problem we faced with in our latest 1.5 years program.

So, as a solution we changed our mind and in 2017 we will launch a 2 years program for the new volunteers.

As we started our 3.5 years team academy system in Debrecen, we reached the adjourning phase. This period is a closing period. The teams end up with the common projects, but many relations formed within these teams continue nowadays as well. If the team was an excellence and successful team, this stage is the hardest for them. The team coach’s task is to support the closing and to evaluate.

Conclusion

Over the last six years of our experience is in accordance with the location of the team coaching of university-level education. The team entrepreneurial skills are excellent developed with the using of the team coaching toolbox. In the world, there are many good examples showing that, since the year 1993, founded the team academy training system in Finland has been successfully introduced and is now covers more than 10 countries.

Due to the nature of the university environment as well as the participants in the process are university students is a slower but much deeper learning process compared with the business world.

In the last period, a Bachelor’s degree level training system of the University of Debrecen’s experience shows that such skills development is not sufficient for 1.5 years, as the Tuckman kind of team development phases regarding only the “norming” stage can the teams develop and so there is no chance of the teams to enjoy the benefits of the “performing phase”.

The team coach efficient and effective support is necessary for the teams to be able to get through each phase.

To be able to become a real team the trust, the credibility and the permanence of a team coach is essential. The team coach’s task to design for the participants a safe environment in which the clarify of the frames can help.

In our education system, the storming phase occurs in the second semester when things turn serious, especially if the team is already beyond the first failure. There may be tensions could come up within a team, where members put their own personal interest forward of the team’s interest.

References


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Brief biographies of the authors

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He is an assistant professor at University of Debrecen (UD), Faculty of Economics and Business, Debrecen, Hungary. He received his Ph.D. in Management and Business Administration from the UD in 2007. His main research interest is focused on econometrical analyses and international comparative analyses of the Hungarian dairy sector; price transmission analyses; asymmetric price effects; coordination and integration mechanisms in the agri-food economy. His research results are published both in Hungarian and English. He acted as a member of Hungarian (OTKA) research program, including: “Multidisciplinary theoretical and empirical analysis of milk and dairy products’ marketing channel, with special respect to co-ordination mechanisms” (2005-2007). He is a member of an international professional body (EAAE).

Since 2011 also working as a team coach in Team Academy Debrecen, a Finnish method used for learning team entrepreneurship. This modern coaching method gives marvellous possibilities for students to get personal touch with business on the one side and real challenge for coaches to reveal how theory acts in practice on the other side.

Author 2 (Dr. Tímea Gál, PhD assistant professor, trainer)

She graduated from University of Debrecen in 2008 as an agroeconomist with specialization in English technical translation. She got her PhD in 2012 in the field of logistics. She has many years of experience in the field of team coaching, training and organizational development.

Her personal mission is to help and motivate people to find their place in their lives and as a coach she supports them to reach their goals. Her professional calling is to promote young people to be entrepreneurs, which she has been doing at Team Academy Debrecen at University of Debrecen.

She continuously develops and trains herself by acquiring new methods and skills to do a higher performing work. She believes in lifelong learning.

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