Smart Specialisation Strategy of Szeged City-region: Dream or Reality?

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Abstract

The Extreme Light Infrastructure (ELI) laser project is an integral part of a certain generation of planned and currently constructed research facilities that are held together by the European Strategy Forum on Research Infrastructures (ESFRI). This research project will be carried out in 3 countries, facilities will be built in the Czech Republic (in Prague), Romania (in Bucharest) and Hungary (in Szeged) independently. The ELI Attosecond Light Pulse Source (ELI-ALPS) laser facility will be built in Szeged, Hungary in the less-developed Southern Great Plain region, from a budget of 200 million euros. The future buildings will not only give place to laser devices, but they also ensure an adequate amount of area for offices, seminar and conference rooms, a library and social places for about 200-250 researchers and administrative personnel.

In this study we attempt to summarize the characteristics of a local area that is able to accommodate the ELI-ALPS and the ELI Science Park based on international scientific results and experiences. After analysing the current situations, we propose a smart specialization strategy of Szeged city-region that will mark out realistic connections between the local economy and R&D infrastructures.

Keywords: smart specialisation strategy, high-tech laser project, knowledge-based facilities, start-up entrepreneurial development

JEL Classification: O18, O32, R11, R30

1 Introduction

In today's global economy, previously unknown, new processes can be observed, as an effect of which the concept of knowledge-based economy has emerged (Dicken 2007). Knowledge-intensive activities work effectively mostly in **spatially concentrated** form, they are cheap and reliable when the number of both innovative firms and related institutions and their employees reach a **critical mass** in a given industry/branch in the region (city region).

The concentration of globally competing firms and their business partners in city regions is based on the utilisation of **agglomeration economies**. The scholars of new economic geography (Fujita, Krugman and Venables, 1999) attribute spatial concentration to three factors: decreasing unit transport costs, increasing returns and the monopolistic competition experienced in global industries. The spatial concentration of mobile activities revalued **city regions**, for this reason, not administrative regions but the urban nodal regions have become important. The reduction of transaction costs between business partners and that of risk call the attention to the importance of local cooperation within a city region.

The **city regions of less developed regions** are in a special situation in the currently evolving new knowledge-based international division of labour. In these city regions the business and institutional environment is deficient, as a result the newly established successful knowledge-intensive firms and creative young people move to the cities of more developed regions. The universities of less developed regions also participate in international knowledge flows; lecturers research, publish, go to conferences and contact with distant business partners, but mostly have global connections, because the state of development of the economy does not allow for knowledge-intensive cooperation with local firms.

The question arises: is it worth promoting knowledge-based economy in the city regions of less developed regions, or are these programs successful only in developed regions? If yes, what kind of smart specialisation programs should be launched in the city regions of underdeveloped regions? What is the role of local universities in the creation of knowledge-intensive sectors and clusters in these city regions?

In our paper we analyse the potential local economic development role of the ELI-ALPS research centre, operating from 2016 and funded by the European Union with 200 million euros in the centre of one of Hungary's less developed regions, Szeged. After the theoretical background, first we outline the economic situation of the region and Szeged, highlighting the most important characteristics of the university and local research institutions. Following this, we describe the ELI-ALPS investment, as part of the smart specialisation strategy (S3) of Szeged.

2 Knowledge-based Local Economic Development in the City Regions of Less Developed Regions

The approach and applied tool system of **local economic development strategies** have gone through gradual changes in the past decades. Around the turn of millennium it was also realised that in the strong global competition not particular industries but cross-sectoral cooperations could act efficiently, for this reason the emphasis was placed on **bottom-up multi-sectoral integrated strategic planning highlighting collaborative advantages**, including the promotion of clusters (Stimson, Stough and Roberts, 2006).

The traditional task of universities, education and research, is expanded with the role in the development of **regional and local knowledge-based society** (Huggins, Johnston snd Stride, 2012; Lengyel and Leydesdorff, 2011). In the knowledge-based economy the role of universities is rapidly increasing in the complex process of innovation, the new tasks require universities to transform radically, preserving their traditional values but, at the same time, adapting to the new demands of the society and the economy.

The cooperation between universities and knowledge-intensive firms has special knowledge transfer interactions, which are worth considering in decisions on development (Huggins, Johnston and Stride, 2012). The creation and spatial spreading of innovation required for knowledge-intensive activities on both physical (geographical) and relational proximity (Boschma 2004). The **geographical (physical) proximity** required to knowledge spillover

basically refers to agglomeration economies, and the proximity of universities and research institutions producing the knowledge.

The permanent competitive advantages of enterprises, on which the competitiveness (productivity) of enterprises depends, according to Michael Porter (2008) are influenced by both the macroeconomic environment, and the microeconomic bases. Local economic development can affect the microeconomic bases. One part of the microeconomic bases, the **quality of the business environment**, covers the elements of the local business environment outside the enterprise (external economies of scale). Second part of the microeconomic bases, the **sophistication of company operations and strategy** depends primarily on the characteristics of enterprise management and enterprise culture, and the technological standard of the given enterprise. But the two considerably overlap, which essentially culminates in the **development of clusters,** third part of the microeconomic bases.

To summarise the above, a complex development concept is needed, which focuses on three areas: the elements of local business environment (including university training, cultural environment etc.), promotion of local enterprises and clustering. Consequently, in city region with university it is basically a social network (McCann 2013), in which the participants exploit the 'spirit of the place', the external effects deriving from spatial density and the confidential, informal, mutually advantageous cooperation, which allows the share of latent knowledge.

In cities of the less developed regions, with the potential localization agglomeration economies, the **role of local governments is particularly important**, since only they can launch processes strengthening knowledge-based local economy in cooperation with universities (Benneworth and Hospers, 2007). Universities have neither financial source nor organising capacity to continuously manage university-industry relationships and create the elements of the lacking business environment. The first step is creating the necessary conditions, generally physical infrastructure (for instance a science park), mostly for the settlement of the departments of global enterprises and the launching of start-up, spin-off local enterprises.

In the cities of less developed regions innovative industries have few experts, the risk of innovations is high, the maintenance of the industrial park and laboratories is expensive etc., therefore it is necessary to develop so-called **shared (sharable) services**, mainly from social resources and coordinated by regional leadership. According to Huggins and Strakova (2012) there are two priorities in emerging regions for enhancing the knowledge-based economic development: **system-oriented policy** and **firm-oriented policy** (Figure 1).
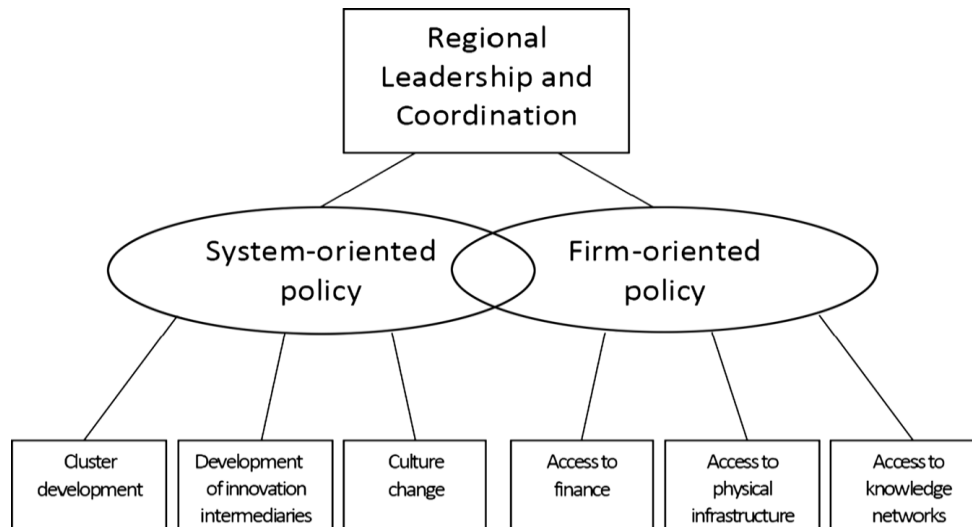
Fig. 1 Knowledge-based economic development priorities in emerging regions
Source: Huggins and Strakova 2012, p. 971.

The European Union provides special support for bottom-up, knowledge-based programs in the planning period of 2014-2020. Europe 2020 is the EU's growth strategy to become a **smart, sustainable and inclusive economy.** The National/Regional Research and Innovation Strategies for Smart Specialisation (RIS3) are integrated, place-based economic transformation agendas.

International experience implies that the ELI-ALPS implemented in a less developed region does not create multiplier effects automatically, therefore conscious political and social interventions are needed to enhance local economy. Strengthening local economy requires the active contribution of the internationally acknowledged university operating in Szeged. But the smart specialisation strategy, an integrated bottom-up economic development realised by the coordination of local government is essential for success, for which resources can be gained from the EU funds for supporting less developed regions in the period of 2014-2020.

3 ELI-ALPS Laser Facilities and the University of Szeged

The Extreme Light Infrastructure (ELI) project is an integral part of a certain generation of planned and currently constructed research facilities that are held together by the European Strategy Forum on Research Infrastructures (ESFRI). The ELI is the world's first establishment that will enable the examination of the reactions between light and matter on a far more intense level including the so-called ultra-relativistic range. The research project will be carried out in 3 countries, facilities will be built in the Czech Republic, Romania and Hungary independently.

The **ELI Attosecond Light Pulse Source (ELI-ALPS)** laser facilities will be built in Szeged, Hungary in the less-developed Southern Great Plain region, from a budget of 200 million euros (http://www.eli-alps.hu/). The primary mission of the ELI-ALPS research facilities is to make a wide range of ultrafast light sources accessible to the user groups of the international scientific community, with special consideration to coherent extreme-ultraviolet (XUV) and X-ray radiations, and to attosecond pulses. The secondary mission of the ELI-ALPS research facility is

to contribute to the scientific and technological development necessary for the generation of 200 PW peak intensity pulses.
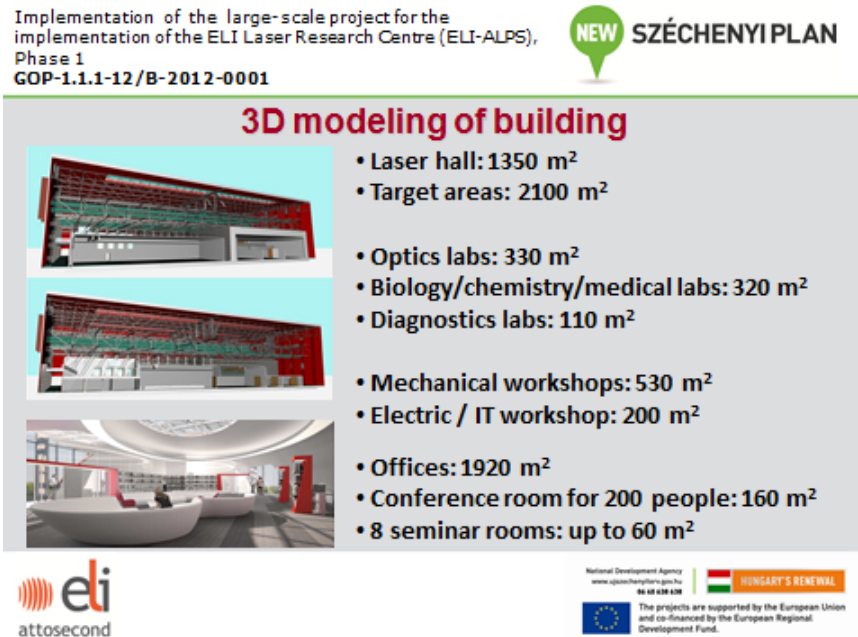

Fig. 2 Main characteristics of the ELI-ALPS building in Szeged
Source: http://www.eli-alps.hu/

The ELI-ALPS infrastructure will provide primary laser pulses and a unique combination of secondary light and particle pulses generated by them for the users from the fields of scientific research and industrial applications. **Main research and application areas of ELI-ALPS:** valence electron science, core electron science, 4D imaging, relativistic interactions, biological, medical and industrial applications etc. Possible application areas include biomedical sciences, chemistry, climate research, energy, development of new materials, semiconductors, optoelectronics, and many more.

The future buildings will not only give place to laser devices, but they also ensure an adequate amount of area for offices, seminar and conference rooms, a library and social places for about 200-250 researchers and administrative personnel (Figure 2).

Fig. 3 Location of ELI-ALPS and a planned Science Park
Source: http://www.eli-alps.hu/

This investment will give Hungary and also Szeged the chance to strengthen their local scientific capacities and to trigger the initiation of knowledge-based economic development projects. The ELI-ALPS laser facility will require 10 acres and will built on the 110 acre property of the University of Szeged. The main concepts indicate that around the ELI-ALPS a science park will emerge and will be focused on knowledge-based activities (Figure 3). The planned **ELI Science Park in Szeged** will be quite specific and unique compared to other territorial concentrations and will closely relate to the high-quality IT, medical imaging, biotechnology, pharmaceutical and materials science activities of the University of Szeged.

In Hungary there are 7 regions of NUTS2 level, including 3-3 counties of NUTS3 level: Bács-Kiskun, Békés, and Csongrád counties. Szeged is the capital and the biggest city of Csongrád county. In 2012 both the Southern Great Plain region's and the Csongrád county's GDP per inhabitant by purchasing power parities are 46% and 48%, highly lagging behind the EU average (Lengyel and Rechnitzer, 2013). Concerning the number of people employed in research, the R&D expenditures and the number of researchers the Csongrád county has an outstanding position following the capital (Central Hungary) (Table 1).

In the Southern Great Plain region there is only one university, which is located in Szeged. The **University of Szeged** is one of the most important higher education institutes of Hungary, and one of the most acknowledged universities in Eastern-Central Europe according to the Jiao Tong list (University of Shanghai). The University of Szeged has 23.000 university students, 12 faculties (medicine, science, business, education, etc.), and runs 68 university and 66 college departments. 6-7000 students graduate every year. It employs 7000 people: of which 1700 are lecturers-researchers, and 770 people have scientific qualification (PhD). 19 doctorate (PhD) schools work at the university with 8-900 doctorate students. Szeged can be categorised evidently in the type with an internationally acknowledged university; according to the census of 2011 in

the city 35% of the people aged 25-64 have higher educational qualification, which is one and a half times of the 21% national average (Lengyel and Szakálné Kanó 2012).

Table 1 Some important figures of the Hungarian NUTS2 regions and Csongrád county

Regions	GDP/inhabitant (PPS)(EU-27=100), %		R&D expenditure (GERD) per GDP, %	Researchers per 10.000 inhabitants	PhD per 10.000 inhabitants	Rate of university, college etc. graduates (age of 25-64), %
	2000	2011	2011	2013	2013	2011
Central Hungary	85,1	105,9	1,7	191	29	30,9
Central Transd.	53,2	58,7	0,8	35	6	17,2
Western Transd.	62,5	67,4	0,8	34	9	17,9
Southern Transd.	41,6	44,1	0,6	36	11	16,6
Northern Hungary	35,5	39,8	0,6	24	6	15,6
Northern Great Pl.	35,6	42,5	1,1	34	11	16,3
Southern Great Pl.	40,4	43,7	1,1	52	13	17,1
Hungary	55,2	65,7	1,2	59	15	21,0
EU-27	100,0	100,0	2,0	-	-	22,4
Csongrád county	**46,1**	**47,7**	**1,3**	**116**	**35**	**21,1**

Source: Hungarian Central Statistical Office (HCSO)

The research institute network of Szeged is the second largest in Hungary, after Budapest. Beside the university research centres, the **Biological Centre of the Hungarian Academy of Sciences** is also located in Szeged, which gained the title of Centre of Excellence of the EU in 2000 (Szakálné Kanó and Vas, 2012). 220 scientific researchers work at the Centre studying several fields of biotechnology and life sciences. Szeged also accommodates the **Institute for Biotechnology of Zoltán Bay Foundation of Applied Research** and the **Cereal Research Non-Profit Company**, both of which are closely connected to biotechnological researches. The university-industry relationships are more and more flourishing, for instance, the SOLVO Biotechnology Corporation (located in Szeged) was the winner of the Hungarian Innovation Grand Prize in 2005, and promising spin-off companies are being established one after the other.

4 ELI-ALPS as Economic Development Opportunity

The ELI ALPS as a facility suitable for basic research creates considerable prestige for the region, technology-oriented firms and the enterprises of related business sectors can benefit from the social capital and latent knowledge accumulated here. In the process of knowledge-based local economic development it is important that as many as possible have a share of these advantages, which this investment can start as an 'trigger'.

We think that in case of the local economic development effects generated by the ELI-ALPS it is practical to separate **two stages** successive in time. In the first stage, in Porter's opinion, two elements of the microeconomic bases need to be strengthened: the quality of business environment and the sophistication of company operations and strategy.

The knowledge-oriented cluster seems to be suitable for the enterprises organised around the ELI-ALPS, which is characterised by being organised around mentor groups and promoting mainly the share and exchange of experience and information, which requires strong face-to-face relationships and trust, but there are hardly any actual contracts and business relations between enterprises. The promotion of **knowledge-oriented clusters takes place in the second stage**, when the number of firms related to the activity of the ELI-ALPS has already reached the critical mass in an industry.
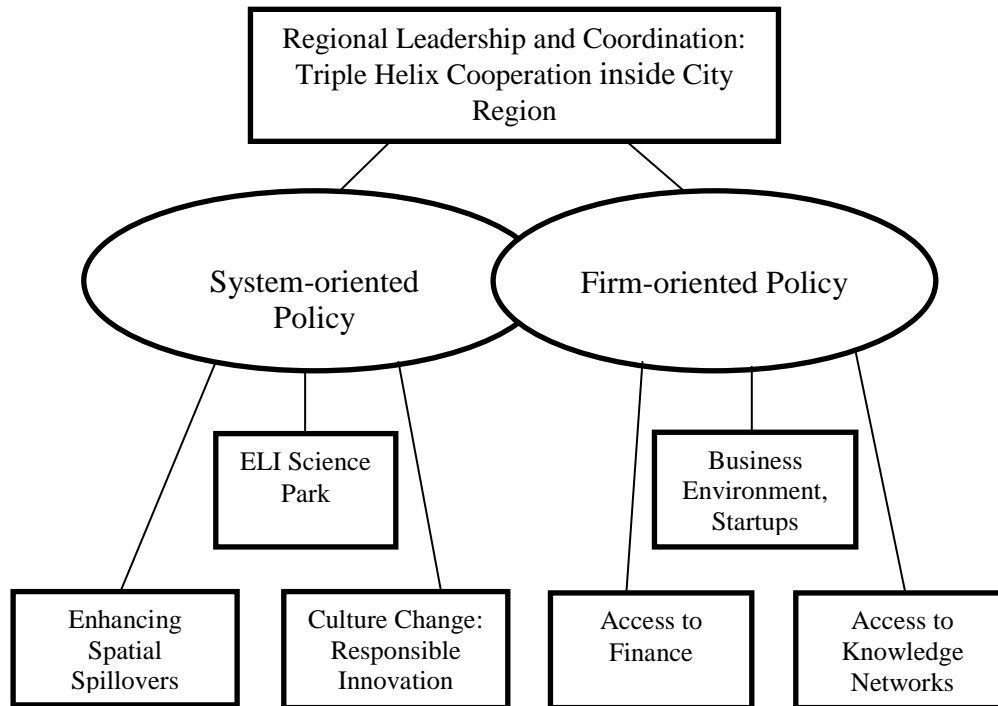

Fig. 4 First stage of knowledge-based local economic development motivated by ELI-ALPS
Source: own edition based on Huggins and Strakova 2012, p. 971.

In the emerging regions, as in Szeged city region, according to Huggins and Strakova (2012) the two elements of first stage are named system-oriented policy and firm-oriented policy. We put their model into practice, considering special conditions of Szeged city region and the importance of the role in the coordination of local leadership at this less developed region (Figure 4). In the first stage, in parallel with the ELI-ALPS investment, a science park should be established, which is located immediately adjacent to the laser facility, in the area of the university. Simultaneously, business environment development programs also need to be launched. These programs are integrated by RIS3 of Szeged city region.

4.1 System-oriented policy
Enhancing Spatial Spillovers: Another speciality of the ELI Science Park is that although there will be an integrator, the ELI-ALPS itself, it will not result in such strong supplier dependencies as a supplier network of a manufacturing concentration, but it merely has a function of starting the development of spatial concentration. The traditional motivation methods of enterprise development, economic development and investment used in the other regions can be applied here with a special target group focus, therefore it is necessary to implement a special region development program.
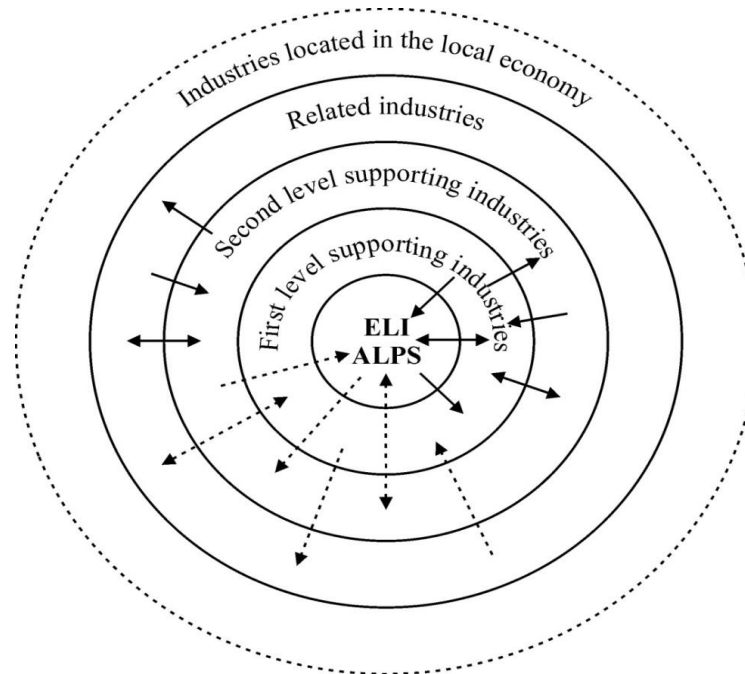
Fig. 5 The logic of the ELI-ALPS and related activities
Source: own edition

Based on the technology-orientedness of firms, the importance of spatial concentration and the demand for physical or technological (relational) proximity the following types of enterprises can be distinguished, according to the logical arrangement of their connection to the ELI-ALPS, which is expected along imaginary concentric circles (Figure 5):

- The first concentric circle around the ELI-ALPS contains the so-called **1st level supporters**, which are prospectively dominantly foreign firms having direct (even daily) relationship with the ELI-ALPS, both relational and geographical proximity is determinant.
- The second concentric circle includes the **2nd level supporters**, which have indirect relationship with the ELI-ALPS and direct (supplier or R&D&I) relationship with the firms in the first concentric circle. In this case geographical proximity with the first level supporters is determinant, since the second level supporters use the applied research or experimental development results of the first level supporters.
- The third concentric circle comprises the so-called **related settlers** having direct (supplier or R&D&I) relationship with the enterprises in the first and second concentric circles, which presumably have no direct relationship with the ELI-ALPS (e.g. patenting, interpreting, other high-level business services).
- The fourth concentric circle includes primarily those, predominantly local enterprises which have any kind of (supplier or R&D&I) relationship with the enterprises in any circles, however, for the enterprises in the fourth circle **not geographical proximity, but relational proximity is important**.

ELI Science Park: The ELI Science Park will be a spatial concentration where the structural force is not manufacturing industry but innovation, consequently its effect on the knowledge-based change in the structure of the economy of the region and thus of the country is also unique.

Beyond its innovation focus, a pronounced distinguishing feature of the ELI Science Park will be that it does not concentrate on a single R&D&I thematic area, which result in a heterogeneous, multi-focused spatial concentration producing high value added.

Culture Change - Responsible Innovation: An additional distinguishing feature of the ELI-ALPS and the Science Park can be the adaptation of the responsible innovation approach. The most recent report of the European Commission entitled *"Responsible Research and Innovation (RRI), Science and Technology"* published in November 2013 demonstrates that the RRI is a rapidly spreading approach in the European Union, which according to expectations may become a central element of the innovation ideas of the 2014–2020 programming period. It points out that today's innovation processes often fail to consciously consider any dimension of responsibility (environmental, social, ethical).

4.2 Firm-oriented Policy: integrated enterprise development program

Creating an infrastructure in itself, a Science Park in the present case, is not sufficient, but its utilisation and the establishment of new local enterprises also need to be promoted. The enterprise development sub-strategy is based on a defined system of objectives and the related actual enterprise development interventions.

Business Environment, Startups: Conscious promotion of entrepreneurship and development of an inspiring business environment enhancing the operation
- Education, conscious development of entrepreneurship and business administration competences.
- Creating special business development services for spin-off and start-up enterprises, promotion of entrepreneurship with every possible device.
- Introducing competitive technologies:

Access to Finance: Creating the financial background required for development:
- For improving the financial background supporting seed capital and business angel financing.
- Supporting donor financing, assistance in completing both domestic and direct EU applications/tenders.

Access to Knowledge Networks: Conscious promotion of external and internal market relationships:
- Supporting the extension of external market, encouraging export.
- Encouraging network economic development, establishing business relationships.

5 Conclusions

A high-tech research institute, the ELI-ALPS will be established in one of Hungary's less developed regions, a university town, Szeged, which is financed by the European Union with an amount of 200 million euros. The ELI-ALPS is brought to Szeged basically for two purposes: on the one hand, for utilising the local, internationally acknowledged scientific capacity, on the other hand, for stimulating local economic and enterprise development.

Overall it can be established about the city region of Szeged that based on the size of population, the increasing rate of population, the high rate of graduates and research workers, but even the active corporations it is an urban, dynamically growing region. In Szeged, it is an opportunity which both the town and the university intend to take advantage of in order to promote the economic development of the region.

In the first step of the development we consider the establishment of a science park effective, which is set up in the immediate vicinity of the ELI-ALPS and accommodates knowledge-intensive enterprises, incoming firms and start-ups. The research conducted in the framework of the ELI-ALPS allows for various industrial applications, thus currently it is not possible to tell which activities will cluster. Enterprise development is also very important so that knowledge-intensive firms can be established related to the university and local enterprises can be the business partners of incoming firms. The main concepts, integrated by smart specialisation strategy (RIS3) of this city region, indicate that around the ELI-ALPS a science park will emerge and will be focused on knowledge-based activities.

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