

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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The ELI (Extreme Light Infrastructure) is one of the largest R&D&I investment project of the European Union, which is a highlighted flagship project of the European Union. It is conducted in 3 countries; different facilities are constructed in the Czech Republic, Romania and Hungary. The ELI Attosecond Light Pulse Source (ELI-ALPS) laser research centre with its equipment unique in the world is established in Szeged, Hungary, in the less developed Southern Great Plain region, at a value of approximately EUR 200 million.

The ELI's laser technology itself is very specific worldwide, with 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-ALPS Laser Research Centre 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 questionnaire and in-depth interview 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". The local embeddedness of the research centre could be significantly increased by using university-based enterprise development activities in the close future in the Szeged region.

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

1 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

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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.

2 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"*⁵. 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 metres⁶, 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.

⁵ Source: <http://www.eli-alps.hu/>

⁶ Source: <http://www.eli-alps.hu/>

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. 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.

3 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-offs⁷ 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”⁸ 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 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

⁷ 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).

⁸ 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.

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-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.

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

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

Source: own construction based on Wissema (2009)

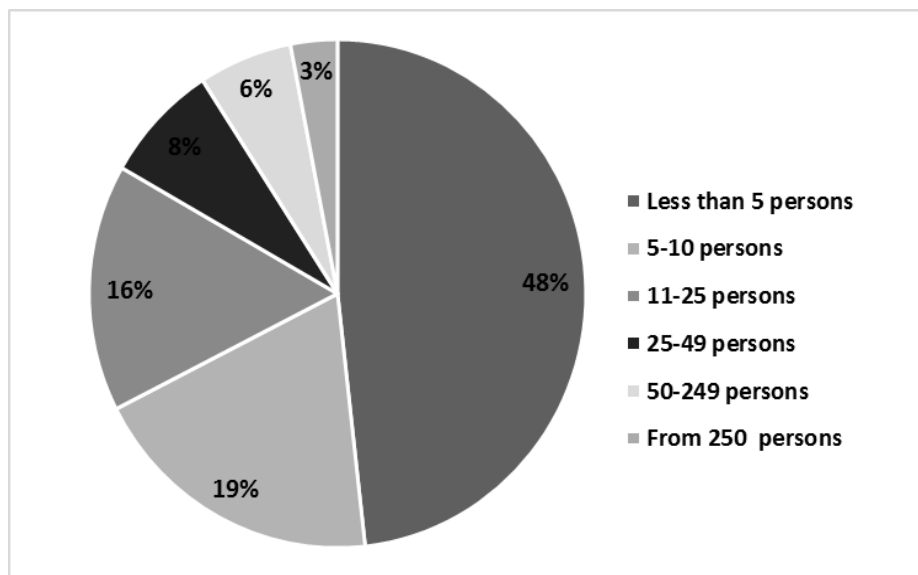
4 The Laser Research Centre – from the perspective of local enterprises

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, 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).

Figure 1 Distribution of enterprises according to the number of employees.

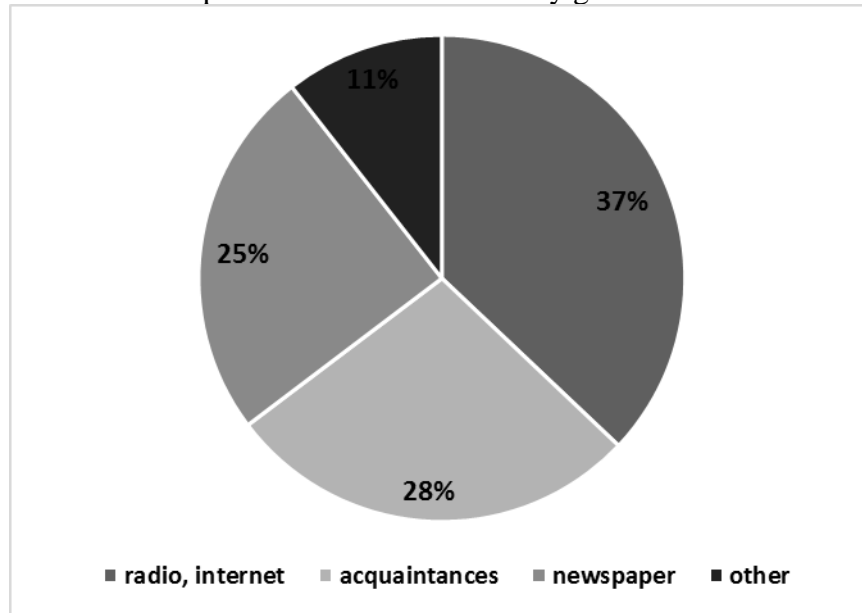


Source: Edited by the authors

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.

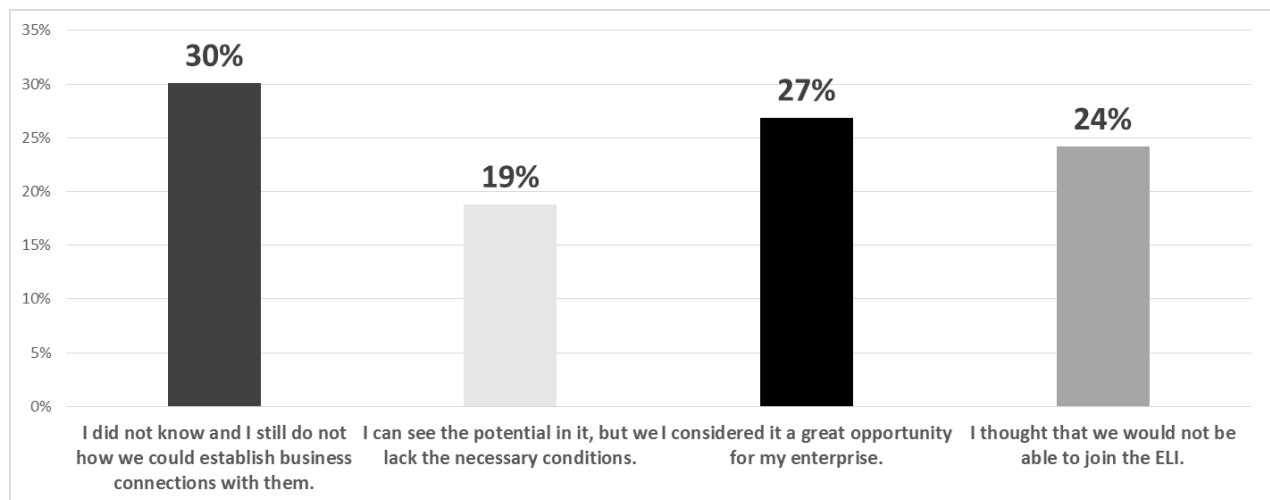
Figure 2 Distribution of respondents based on how they gathered information about the ELI.



Source: Edited by the authors

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.

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

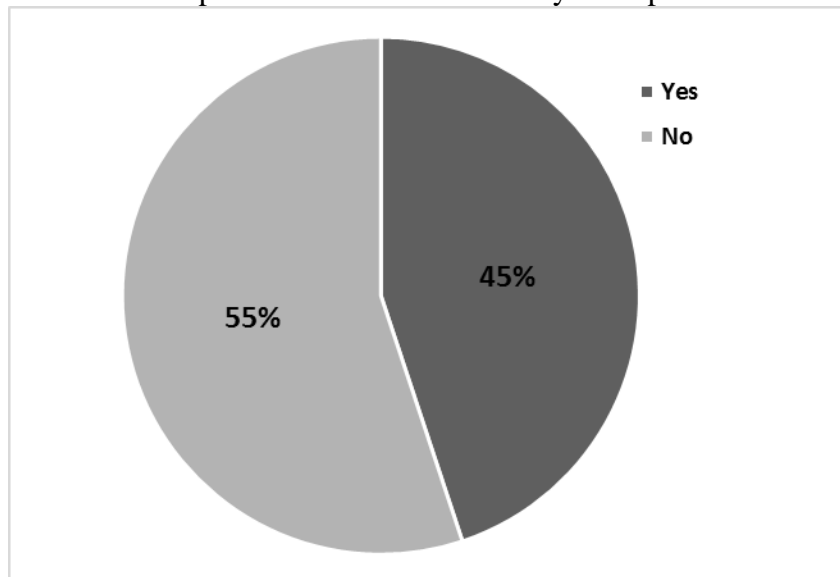


Source: Edited by the authors

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.

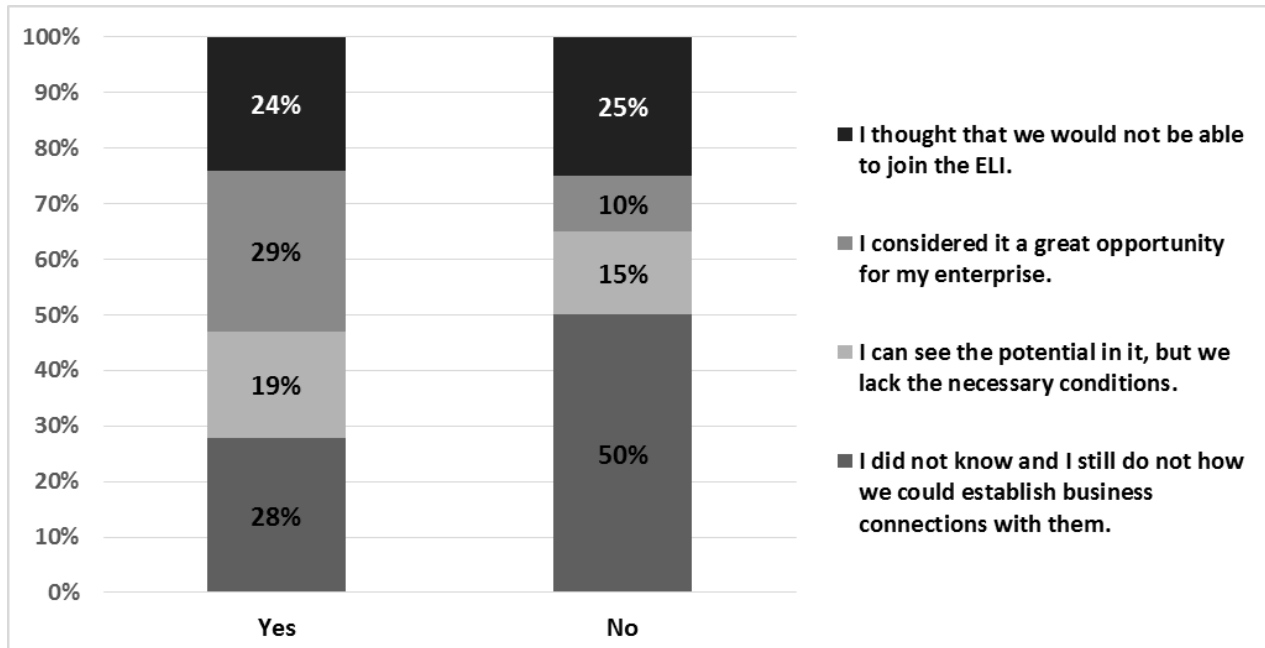
Figure 4 Distribution of enterprises based on whether they see a point of connection to the ELI.



Source: Edited by the authors

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.

Figure 5 Distribution of responses based on first impression among those who have already heard about the ELI and who have not.



Source: Edited by the authors

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 1) 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.

Table 1 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, %

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

Source: Edited by the authors

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 if they had preliminary information, they were not aware of whether they could

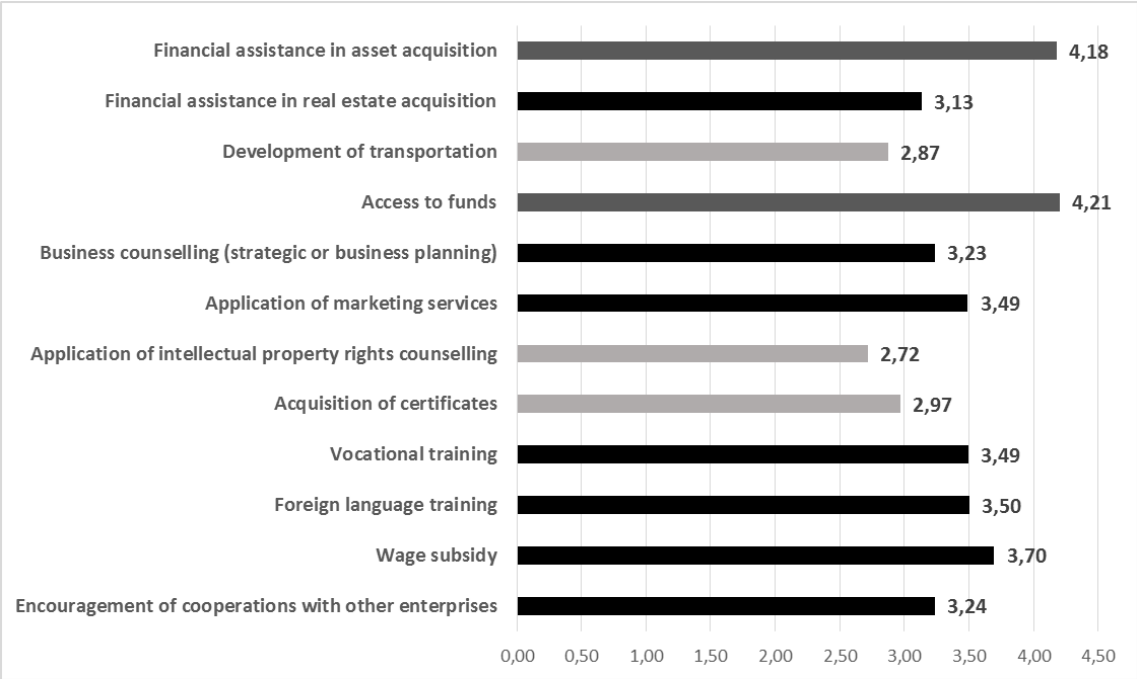
join it, if yes, how they could do so. Consequently, it is not sufficient to familiarise the firms with the investment, it is also important to provide them with as much and accurate information as possible.

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 is 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.

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



Source: Edited by the authors

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 2* 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 2 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?		
	Yes	No	Total
Responses			
Yes	91	9	100
No	24	76	100
Total	85	15	100

Source: Edited by the authors

4.3 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 and 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.

4.4 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 3).

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 3 The potential tasks of the university in the particular programmes

Name	Potential roles of the university
ELI Science park	<ul style="list-style-type: none"> - conducting the economic impact assessments of the settlers - promoting the local embedding of the settlers - contributing in the exploitation of the real economic development potential of the ELI and the science park - arranging collaborations between settling firms and university workshops - training the employees of settling firms
Regional knowledge spillover	<ul style="list-style-type: none"> - developing the local innovation system - establishing an economic and enterprise development centre - preparing economic situation analysis - operating a technology transfer office - organising informal meetings, professional forums and business clubs - organising trainings for the related activities generated by the ELI-ALPS
Cultural change: responsible innovation	<ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> - assistance in accessing investors - organising investor meetings - assistance in preparing business plans
Knowledge networks	<ul style="list-style-type: none"> - organising international conferences - arranging businessman meetings - strengthening international professional partner university relations - supporting international research cooperations

4 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.

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