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ENTREPRENEURIAL ACTIVITY OF UNDERGRADUATE AND PHD STUDENTS AT THE UNIVERSITY OF SZEGED *

Knowledge transfer by students represents one of the most significant ways of knowledge flow from the university in the direction of the economic sphere (*Goldstein – Renault* 2004, *Inzelt* 2004). One possibility of this lies in students' entrepreneurial activity, which – at least in certain cases – results in the direct economic utilization of the specialized knowledge gained at the university. Consequently, the analysis of students' company formation activity draws intense attention in the international literature, while in Hungary we have limited information in this field.

Over the past years the entrepreneurial activity of a special segment of students, namely PhD students has assumed special importance within this broader subject area. Hungarian universities – like the University of Szeged – operate with an increasing number of PhD schools, where graduated students' chances to find positions in the academic sphere are decreasing. Since this case involves highly qualified students competent in a given specialization and experienced in research, these experts may be especially attractive as potential entrepreneurs.

The present paper attempts to identify some Hungarian characteristics of students' company formation among the undergraduate and PhD students of the University of Szeged (USZ). The national research of this subject area has significant background (*Szerb – Márkus* 2007, *Csapó* 2006); however, the survey of PhD students and the analysis of the university's potential stimulating role provide our analysis a special focus.

With the help of our research we intend to develop a picture of how much students' entrepreneurial activity may be considered a real (realistic) channel of university knowledge utilization in a city planning to actively build upon the university's knowledge base like Szeged.

The Local Economic Environment and the Brief Introduction of the University

Szeged is the centre of one of those European Union regions that have the lowest GDP per capita values. The *South Great Plain region*'s GDP measured in purchasing power parities moves at about 38-40% of the EU average and does not seem to catch up[3], while, compared to the national average, significant lagging has occurred in recent years, which is also accompanied by a slightly decreasing employment rate.

Although the *Szeged subregion's* GVA per capita and income figures excel the regional average, they still show a significant lag compared to the EU average. In the competitiveness surveys of *Lengyel* and *Lukovics* (2006) the Szeged subregion was classified as an urban knowledge-transfer region, what indicates the relative development of the measurable (ex-post) categories compared to the national average, the ability to develop agglomeration economies in certain fields, and the presence of knowledge-creating institutions.

As far as *R&D figures* are concerned, the subregion excels – in national terms –, but this obviously derives from the presence of the university and other publicly financed research institutions and not the performance of the corporate sector. In national comparison, the subregion's *complex innovation performance* may

* The survey serving as the basis of this paper was conducted in the frameworks of the project entitled "Competitive Integration into the European Research Area" (National Research and Development Programme, 5/123/2004).
[3] Compared to the EU15, lagging could be noticed over the past decade.

be called strong; however, this is mainly due to the presence of the infrastructural conditions necessary for attracting and maintaining knowledge-creating ability and talent. The region's ability to exploit knowledge is relatively weaker (*Bajmócy* 2008).

In national (and international) terms, the concentration of researchers in Szeged is outstanding in the areas of medical and pharmaceutical, chemical and biological sciences[4] (*Lengyel* 2007), which is also apparent from the reputed position that the University of Szeged (USZ) assumes in the academic ranking of international universities[5]. Having a total number of 1700 lecturers and researchers, USZ assumes outstanding importance in shaping the local R&D potential.

The significance of the University of Szeged is also outstanding from the aspect of *constantly reproducing highly qualified human resource.* Over 30 thousand students attend to the university's 12 faculties (table 1), while the number of those participating in PhD or DLA training programmes reaches 650. Compared to the city's 64 thousand employees, the annual school enrolment ratio of over seven thousand is especially high (even if a significant portion of these students does not finish the training program that they started).

Table 1: The distribution of students at the University of Szeged, 2006

Faculties	Full time	Part-time correspondent	Other	Total	PhD, DLA students	New entrants
Faculty of Law	1982	2416	0	**4398**	37	783
Faculty of Medicine	1932	0	0	**1932**	89	568
Faculty of Arts	3958	2076	27	**6061**	162	1712
Faculty of Health Sciences	917	792	0	**1709**	0	520
Faculty of Economics and Business Administration	947	435	629	**2011**	22	362
Faculty of Pharmacy	620	0	0	**620**	23	135
Juhász Gyula Teacher Training Faculty	3017	3395	0	**6412**	0	979
Faculty of Agriculture	252	349	105	**706**	0	207
Faculty of Engineering	896	631	0	**1527**	0	332
Faculty of Science and Informatics	4642	560	2	**5204**	316	1513
Faculty of Music	206	0	0	**206**	0	45
Total	19369	10654	763	**30786**	649	7156

Source: Rector's Office, University of Szeged

Note: The data of the newly established Faculty of Dentistry are combined with those of the Faculty of Medicine.

Methodology and Sample

In 2006, we asked full-time senior students participating in the undergraduate[6] programme of the University of Szeged and PhD students to fill out the questionnaire. *The objective of the research* was to explore these students' characteristics related to entrepreneurship. An international survey entitled "International Survey on Collegiate Entrepreneurship" (*Fueglistaller et al* 2006, *Szerb – Márkus* 2007) that examined

[4] Measured by the number of academic public body members.

[5] Academic Ranking of World Universities 2006. Jiao Tong University, Shanghai (http://ed.sjtu.edu.cn/ranking.htm). The University of Szeged has been maintaining its position ranking between 301 and 400 for several years now. The scientific activities of universities create the basis of ranking.

[6] At the time of the survey students were still participating the "pre-Bologna" trainings that last for five years. The surveyed undergraduate students would be master students in the Bologna system.

entrepreneurial activity among university students in several European countries – and Hungary as well – was conducted parallel to our research, so in the course of planning our research we could not utilize its results yet.

The structure of the questionnaire was the same in the case of both groups of the interviewed students, although certain questions needed slight modifications, taking into account the special characteristics of the PhD status. Nevertheless, the results deriving from the samples of undergraduate and PhD students remained comparable.

Examining the students' entrepreneurial characteristics, *the questionnaire* is divided in the following main parts: basic personal data (sex, year, training area, family background, etc.), entrepreneurial and work experience (has the respondent ever set up a company, or would he or she establish one, the features of the already founded company), acquiring the resources necessary for company formation (completing already existing competencies, capital, necessary services), and the personal characteristics and attitudes potentially influencing entrepreneurial spirit. In the case of undergraduate students, all this was accompanied by a group of questions examining university activities (grade point average, Students' Scholarly Circle activities, professional experience, etc.).

In the case of undergraduate students, the economics students of the University of Szeged's Faculty of Economics and Business Administration and the students of the Faculty of Science not participating in teacher training constituted the study population. Our aim was to examine (fourth and fifth year) students close to graduation. In harmony with the special features of the credit system, we operationalized this so that respondents would be at least in the third (preferably fourth or fifth) credit year. *In the case of PhD students*, the population was composed by the total of PhD students, but we did not manage to reach the students of the PhD School for Law in the end.

The undergraduate student sample consists of 286 valuable questionnaires. 121 (42%) of these were filled out by the students of the Faculty of Economics and Business Administration, while 165 (58%) was provided by the students of the Faculty of Science. 57% of the respondents are male, while 43% of them are female. 45% of the students are in fifth year (fifth credit year), 40% of them are in fourth year and 15% are third year students.

The PhD sample includes 134 items. Out of the 17 PhD schools of the University of Szeged, the students of 16 schools were included in the sample (the PhD School for Law was left out as previously mentioned). At the same time, the size of the sample did not allow – and it was not necessary either – to carry out a separate analysis of the different schools. We established four categories:

- 57% of the sample students study in the area of natural sciences,
- 11% of them are in the areas of medicine and pharmacy,
- 20% study in the area of arts and humanities, and
- 12% of them are in the area of economic sciences.

Without the PhD School for Law, the number of active PhD students at the University of Szeged was 535 at the time of the survey. The composition of the population is slightly different from that of the sample (*table 2*). The most important difference is the smaller proportion of medical and pharmaceutical sciences in the sample, at the cost of economics. 46% of the respondents are male, while 54% of them are female. 25% of the sample PhD students are in first year, 35% are in second, while 40% are in third year.

Table 2: The representativity of the PhD sample

	Proportion in the population (%)	Proportion in the sample (%)
Natural sciences	47	57
Medicine and pharmacy	21	11
Arts and humanities	28	20
Economics	4	12

Grasping entrepreneurial activity is a rather complex task. The present survey follows the system of concepts set in the comprehensive international research conducted with the title "Global Entrepreneurship Monitor" (GEM), which makes possible the comparison of results with national and international averages. Up to the year of 2005, GEM summarized the core of entrepreneurial activity as follows (*Ács et al* 2005, p 3):

„Any attempt to create a new business unit like self employment, or the establishment of a new entrepreneurial organization or the expansion of an already existing enterprise that private persons, groups or an already existing business enterprise want to realize *may be considered an entrepreneurship*".

So entrepreneurship is definitely regarded as a process, a significant element of which lies in innovation. The approach had to face various critiques, according to which it can only capture certain dimensions of the entrepreneurial spectrum. Therefore, the latest GEM reports make a distinction of *early phase enterprises* (*nascent* – where the entrepreneur has already taken some action towards creating a new business, and already operating businesses that are *less than 42 months old*) and *established businesses* that are older than 42 months (*Ács et al* 2006).

The present paper analyses early phase enterprises and related to this, in several cases, we combine those who have already established a business with those who are committed to doing so: they are planning to form a company within a year. This allows for comparison with GEM's "Total Entrepreneurial Activity (TEA) Index"[7]. In line with this, we have distinguished three groups for the scope of the present research:

- *Entrepreneurs*: students or PhD students who are significant owners in a firm where they also work or are planning to start a company within a year.
- *Potential Entrepreneurs*: students or PhD students who plan to start a company but in more than a year's time.
- *Non-entrepreneurs*: students or PhD student who do not plan to start a company.

The Results of the Survey

2.4% of undergraduate students answered that they are *presently company owners*. 85% of company owners are students of the Faculty of Economics and Business Administration. Almost without exception, the companies founded by the students operate in the service sector. 9.8% of the examined PhD students own a company. 69% of the owners are students of the PhD School for Economics, further 23% study in the area of arts and humanities while 8% study natural sciences. Founded companies are almost exclusively of service providing nature in this case too.

Table 3: Distribution of the sample based on entrepreneurial activity

		Entrepreneur	Potential entrepreneur	Non-entrepreneur	Total
			Undergraduate students		
		N =12	N = 77	N = 195	N = 284
Science area	Natural sciences (n=163)	2.5	22.1	75.4	100.0
	Economics (n=121)	6.6	33.9	59.5	100.0
Total		**4.2**	**27.1**	**68.7**	**100.0**
			PhD students		
		N = 18	N = 68	N = 40	N = 126
Science area	Natural sciences, medical and pharmaceutical sciences (n=83)	7.0	56.0	37.0	100.0
	Arts and humanities (n =27)	11.1	55.6	33.3	100.0
	Economics (n=16)	56.2	37.5	6.3	100.0
Total		**14.3**	**54.0**	**31.7**	**100.0**

In line with the three categories defined in the methodological chapter, 4.2% of the *undergraduate students* fall in the group of "entrepreneurs", while "non-entrepreneurs" constitute the group with by far the

[7] TEA is the comprehensive index of the entrepreneurial activity of the population between 18 and 64 years. Its value in Hungary is 4.3% in 2004 and since 2000, it has shown a decreasing tendency. What is also highly important from the aspect of the present survey is the index of nascent enterprises: 1.1% in 2005 (*Ács et al* 2005).

largest number of items (almost 69% – *table 3*). In fact, based on GEM's TEA indicator, this 4.2% totally corresponds to the national average. If we take a look at the components of the three groups based on whether it is a student of the Faculty of Science or of the Faculty of Economics, we discover slight differences: overall, economists have slightly more entrepreneurial spirit.

In the case of PhD students, 14% belong to the group of "entrepreneurs", and in this instance, most respondents may be considered "potential entrepreneurs" (54%). Consequently, PhD students and undergraduate students are significantly different in this respect. If we examine entrepreneurial activity also according to science areas, we can see that among economists the proportion of "entrepreneurs" is especially high. The same number is considerably smaller among PhD students in the field of social sciences, while the area of natural sciences follows third. However, even in the case of PhD students in the area of natural sciences *the proportion is* significantly *higher than the "Total Entrepreneurial Activity Index" published by GEM.*

Based on *their attitudes towards company formation,* we attempted to classify students in groups. With the help of this, we intended to gain a picture of the extent to which making the decision to form a company is determined by personal characteristics: is some extra stimulus necessary for starting entrepreneurial activities. In the review of pull and push factors potentially influencing entrepreneurial decisions, we relied on the works of *Brandstätter* (1997), *Fueglistaller et al* (2006), *Muller – Thomas* (2001), *Shane et al* (2003), and *Szerb* (2000).

We completed a cluster analysis based on the answers given to the questions concerning attitudes. Following the standardization of variables, we carried out K-Mean clustering and formed three clusters. The behaviour of the members falling in the three clusters can be differentiated relatively well.

In the case of undergraduate students, 50% of the respondents belong to the first cluster that we called "*open*" (*table 4*). Based on their answers, they are basically open to company formation: they perceive enterprises more like an opportunity that may ensure recognition. If there existed a product or a service that they could offer on the market, then they would probably opt for company formation. They see the chances to find employment as an employee to be bad. At the same time, they think that the university does not provide the skills or knowledge necessary for company formation. The majority of the cluster members have entrepreneur family members, and their work experience gained during their school years is above the average.

Table 4: Cluster analysis based on entrepreneurial attitude (undergraduate students)

Variables	Clusters		
	Open (50%)	Hesitating (16%)	Adverse (34%)
Are there any entrepreneurs in your family	0.200	-0.469	-0.120
Did you work as an employee during your school years	0.048	-0.030	-0.149
It is more insecure to work as an entrepreneur than as an employee	-0.169	-0.348	0.423
It offers more opportunities to work as an entrepreneur than as an employee	0.632	-0.659	-0.649
A good job means greater recognition than managing an enterprise	-0.472	0.108	0.666
Entrepreneurs are at least as "wangling" as they are experts	0.205	-0.506	-0.028
Enterprise formation demands skills or knowledge for which the university has not prepared me	0.238	-1.551	0.393
If there existed a product or a service that I could offer on the market, then I would probably try company formation	0.450	-0.052	-0.660
I do not plan to form an enterprise because employment opportunities are good	-0.310	0.461	0.261

We named the *second cluster "hesitating"*. 16% of the respondents belong here. The do not see significant difference between living as an employee and as an entrepreneur, they do not have a negative judgement about entrepreneurs (they do not consider them "wangling"). They do not think it true that the university cannot prepare students for becoming entrepreneurs, but they themselves would not be likely to form companies even if they had a product or service that they considered marketable. The majority of them do not have any entrepreneurs in their family.

We called *the third cluster "adverse"*. 34% of the respondents belong here. The members of this group tend to experience entrepreneurship more as uncertainty that does not ensure such social recognition as a

good job. According to them, the university does not prepare students for entrepreneurial activities, and they themselves would not form enterprises even if they had a marketable product or service.

If the group of "entrepreneurs" mainly consists of "open" students, than we can state that the attitudes examined now may have significant influence on the willingness to form companies. 80% of the "entrepreneurs" and 75% of the "potential entrepreneurs" can be found among "open" students, but, on the other hand, 50% of "open" respondents belong to the group of "non-entrepreneurs". *This leads us to the conclusion that the attitudes examined above influence the willingness to form companies, but they explain it only partly.* Furthermore, the groups of "entrepreneurs" and "potential entrepreneurs" are highly similar in terms of the analysed characteristics, which indicate company formation must also be influenced by other factors beyond these.

Searching for further potential influencing factors, we examined whether respondents attended courses on entrepreneurship during their studies, how many foreign languages they speak, and whether they intend to engage in further studies after obtaining a degree. Simple crosstabs made apparent that the influence of these factors is marginal. At the same time, it should be mentioned that 60% of the students attending the Faculty of Science had not had any course where they could have obtained basic entrepreneurial or economic knowledge.

Table 5: Cluster analysis based on entrepreneurial attitude (PhD students)

	Clusters		
	Open (50%)	**Hesitating (26%)**	**Adverse (24%)**
Are there any entrepreneurs in your family	0.183	0.141	-0.558
It is more insecure to work as an entrepreneur than as an employee	-0.034	-0.183	0.165
It offers more opportunities to work as an entrepreneur than as an employee	0.444	0.154	-1.017
University career means greater recognition than managing an enterprise	-0.520	0.018	0.918
The free lifestyle offered by the university keeps me from starting an enterprise	0.014	-0.779	0.700
Entrepreneurs are at least as "wangling" as they are experts	0.298	-0.710	0.181
If there existed a product or a service that I could offer on the market, then I would probably try company formation	0.520	-0.728	-0.340

In the case of PhD students, we carried out the analysis of influencing factors with the same methodology. In this case, we managed to identify three clusters – practically with the same content (*table 5*). Proportions also differ to a small extent: in the case of PhD students, the group of "hesitating" respondents is larger, while the group of those "adverse" is smaller than in the previous case.

Comparing with the established groups related to entrepreneurial activity we found that *"open" respondents constitute almost 60% of "entrepreneurs" and "potential entrepreneurs", and almost 80% of "open" students belong in the group of "entrepreneurs" or "potential entrepreneurs".*

All this indicates that the analysis of attitudes provides some guideline in relation with entrepreneurial activities; however, several other influencing factors may also play a role in this case. The characteristics of the group of "entrepreneurs" and of "potential entrepreneurs" are highly similar in the case of PhD students too, which shows that *the approach towards entrepreneurial activities is greatly influenced by attitudes, but at the same time, the actual decision to form a company does not depend on this.*

From the viewpoint of our survey, it is highly important to what extent the emerging companies carry university knowledge, and *whether related to starting the given company or ensuring necessary services the university may assume a role.* When analysing this, we considered the answers of only those students relevant, who are not adverse to company formation, that is, they belong to the groups of "*entrepreneurs*" and "*potential entrepreneurs*".

In the case of undergraduate students, this resulted in an analysed sample of 88 persons, while among PhD students, the sample consisted of 86 elements.

33% of *the undergraduate students* stated that if they started a company, it would be based on the specialized knowledge obtained at the university. 56% said that they would partly utilize the special knowledge gained during their studies, while in the case of 11% the company would not be based on university knowledge. In

the case of PhD students, almost totally identical proportions can be seen (in the case of 38% the company would be based on university knowledge, 56% responded partly, while 6% would not utilize their specialized knowledge obtained at the university).

Furthermore, we examined *what basic service needs emerging companies would have*, paying special attention to certain university-related services. The analysis of service needs provides orientation also in terms of what type of activities the given company would have. If respondents think that their company to be established needs equipment and laboratories for its operation, then it is probable that they would like to utilize their special knowledge related to some technological area (naturally, it cannot be expected that the majority of these "planned" companies will in fact be formed in this way).

As expected, compared to undergraduates, a significantly grater proportion of PhD students would need equipment and laboratories (34% / 17%), use of library is present in approximately the same proportion (19% / 17%), while a greater proportion of undergraduate students would need the rest of potentially university-related services (e.g. professional trainings, server capacity).

Summary

The present paper introduced the results of a survey focusing on exploring students' entrepreneurial activity, conducted among the undergraduate and PhD students of the University of Szeged. Based on the results it became clear that *in Szeged, a small (but annually reproduced) part of students is present that may be active as "knowledge-based" entrepreneurs.*

Personal attitudes influence the willingness to form companies, but they explain it only partly, the actual decision to form a company does not depend on this. Those whose attitude is "adverse" will most probably not become entrepreneurs, but being "open", they may easily belong in the group of "potential entrepreneurs". This way, *certain initiatives ensuring special incentives for students' company formation may gain ground* – both in terms of motivations and on the professional level.

A *significant part* of the planned companies *would rely on the knowledge and skills obtained at the university.* We consider the need for equipment and laboratories as a highly important indicator that is significantly higher in the PhD sample (34%), while in the undergraduate sample it also approaches 20%. This may suggest that a group of students that (at least in the longer run) would like to exploit some of their special professional knowledge related to some technological area is also present.

At the same time, the relatively high proportion of "potential entrepreneurs" (especially in the case of PhD students) suggests that starting entrepreneurial activities may mostly be expected after gaining some years of work experience. A former analysis of the owner-managers of SMEs operating in the "knowledge-intensive" sector justifies this from another aspect (*Bajmóczy* 2007), since the proportion of those who were students right before forming a company is considerably low. Moreover, the companies of the "knowledge-intensive" sector were established after obtaining an average of 15.5 years of work experience. *Therefore, from our standpoint, university students may be considered the future's "knowledge-intensive" entrepreneurs, therefore, it would be highly important to equip them with the necessary knowledge in the areas of entrepreneurship and economy that they may utilize subsequently.*

At the same time, a smaller part of them may become entrepreneurs already in the shorter term. In this respect, the very high entrepreneurial spirit and willingness of the PhD students (far beyond the average projected on the working age population) is a good basis to rely on.

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