

SME innovation activity and cooperation with universities in the South Transdanubian Region of Hungary

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Abstract

The wellbeing of a country or a region is influenced by many factors, but innovation, cooperation in innovation and entrepreneurship play key roles in competitiveness, in development and in growth. Over the last ten years, mainly large and foreign owned multinational businesses have been the engine of growth and development in the Hungarian economy. While SMEs contribute around 70% of employment and 50% of value added, they play a marginal role in entrepreneurship and innovation. The weaknesses and low competitiveness of SMEs are even more prevailed in lagged regions, like South Transdanubia, where foreign investors are missing. An alternative way of regional development would be to increase the innovation capacity and activity by mobilising local resources and unleashing the entrepreneurial potential. However, this development requires a different strategy where businesses, local institutions and universities cooperate with each other. As the largest university in Hungary, the University of Pécs (PTE) is an important potential and influential player in this process. Based on a research within the framework of the “Business potential for R&D activities in the university environment and their transfer to SMEs in the Cross-Border Region project” this study aims to examine (1) the characteristics of innovation activity of local SMEs, (2) the collaboration practices between the local businesses and PTE, (3) the obstacles of university and business co-operation. Finally, the study concludes with policy recommendations. The novelty of the research is the application of the third version of the Oslo Manual that incorporates not only product and process but also marketing and organisational innovations.

Key words: innovation, SME, cooperation

1. Introduction

The development of a region or a country is influenced by many factors. The availability of natural and human resources, the structural pattern of industry, the infrastructure itself, the quantity and quality of local private and public institutions as well as tradition and culture can be responsible for the emergence or the decline of a country or a region. In Hungary, it is well known that the relative position of the Transdanubian region (including Baranya County) has worsened since the start of the economic transition in 1990. In terms of the most important economic indicators (per capita GDP, investment, development resources etc.), the county ranked from 3 to 5 in the order of the 19 counties of Hungary, whilst today it is located in the 11 to 14 bracket. Despite considerable economic restructuring, the relative position of the county has worsened in terms of growth, employment and industrial production. The unemployment rate is well above the national average, and the unemployment rate among highly qualified people (those with a university or college degree) is especially high – in fact, dangerously so, since this leads to increasing emigration.

An important factor of the decline of Baranya County is the disappearance of the traditional industries including coal and uranium mining. It is worth noting that the whole Trans-Danubian region – Baranya, Somogy and Tolna Counties – has been able to attract only three percent of the total Hungarian foreign direct investment (FDI) over the last 15 years, so ranking last among the seven regions of Hungary. The export capacity of the region is extremely low due to the lack of foreign businesses and highly competitive innovative domestic firms.

The existing infrastructural backwardness of Baranya County, as that of the whole region, will probably improve in the not-too-distant future as the M6 motorway nears completion. However, foreign investors are not expected to arrive in the region in large numbers and so a development policy based on local resources would appear to be the most viable solution. A potential breakthrough might lie in tourism - especially in the Pécs-Harkány-Villány triangle and based on historical winemaking skills and wellness services. Currently, there are high expectations for the development of Pécs which has been designated as a European Capital of Culture for the year 2010. However, even a dynamic development of the tourism industry and that of the Cultural Capitol project do not make it possible to change the relative position of Baranya County to any great extent. This would require the mobilisation of local resources and the unleashing of entrepreneurial potential. Local business development and the improvement of the small- and medium-sized enterprises can only be achieved by improving innovative potential and innovative activity.

In traditional terms, innovation is defined as the introduction of something new - which can be a product, process, business organisation, market or source of raw materials [1]. The Oslo Manual, commonly applied in innovation surveys, focuses mainly on two types of innovation - that is, innovation in product and process, which together are termed technological innovation. Today, innovation is not the result of the heroic efforts of a few geniuses of superb quality who work alone in some remote location and there conceive their brilliant ideas; it is, rather, embedded in the social and economic context of a region or a country and is a result of collaborative efforts [2] [3] [4].

Moreover, an innovative idea alone is not enough to improve the wellbeing of a region; further requirements include realising the idea by entrepreneurship and the consequent spillover of innovation and knowledge. Several actors, individuals, companies and institutions -

and their collaboration - play a vital role in the innovative capacity of a geographical area [5] [6].

Universities and research institutions can serve as sources of new knowledge, whilst bridge institutions (such as state and local business development agencies and technology parks) transmit this new knowledge to businesses and individuals who can exploit it [7] [8]. However, the exploitation of knowledge requires a capacity to identify opportunities and specific skills which help new or established firms or individuals competent to absorb and exploit it [9] [10]. Any weakness in the process of knowledge-generation, spill-over and absorption renders most of the efforts for innovation ineffective. If the universities or research units produce new knowledge but this knowledge is not transmitted to the entrepreneurs, then this knowledge remains within the bounds of scientific territory and is not exploited practically [11]. The same holds true if there are no mechanisms to transmit the knowledge. A third negative outcome emerges even if the new knowledge is generated and transmitted, but if the absorption capacity and the willingness of local business to collaborate are low.

2. Description of the data set

Similar to other innovation analyses, the basic aim of the survey has been to identify the most important innovative small- and medium-sized (SME) businesses in the South Transdanubian region. Several registers, including that of the Pécs-Baranya County Chamber of Commerce and Industry, the Baranya County Enterprise Development Centre, lists of companies successful in innovation tenders, as well as firms with previous connections with the University of Pécs served as the basis of the sample. It was important to identify potentially prosperous businesses which could also provide the necessary accounting data, and so we ignored businesses formed on the “sole trader” basis and approached only partnerships. Altogether we asked 472 firms to participate in the survey. The questionnaire was completed on a face-to-face basis by selected students who took part in a two-hour-long preparatory presentation. The survey was conducted between June and September 2006, with corrections, the inclusion of missing data and the harmonisation of the data set taking place in October of that year.

We finally collected information from 201 businesses, producing a 42.6% response rate. In the light of missing data, our sample consists of 197 individual firms, but it should be noted that we may apply a smaller sample size in some steps of our analysis due to this missing data and to inconclusive answers. The basic characteristics of the sample can be seen in Table 1. Columns 2-5 show a description of our sample businesses, whilst the final column depicts the regional data representing the total number of active businesses in the whole of the South Transdanubian region.

Table 1: The basic characteristics of the sample

Description/ business size	0-9	10-49	50-	Total	Regional data as% of total number of active businesses at the end of 2004 (HCSO data)
Number of businesses in the sample	105	64	28	197	62 079*
Legal form					
<i>Unlimited partnership</i>	48	6	1	55	17,9
<i>Limited partnership</i>	56	58	24	138	15,0
<i>Co-operative</i>	1	0	2	3	0,25
<i>Private company</i>	0	0	1	1	0,06
Sector	104	64	28	196	
<i>Agriculture</i>	8	2	3	13	5,8
<i>Industry</i>	20	24	12	56	20,1
<i>Trade/transport</i>	27	24	6	57	34,3
<i>Services</i>	49	14	7	70	39,8
County	105	62	28	195	
<i>Baranya</i>	70	37	14	121	43,1
<i>Somogy</i>	13	10	9	32	32,7
<i>Tolna</i>	22	15	5	42	24,1
Size of settlement	105	64	26	197	
<i>Village</i>	26	9	5	40	30,7
<i>Town</i>	20	16	9	45	30,6
<i>City</i>	59	39	14	112	38,7

* as number of operationally active businesses

Source: own data collection and HCSO: A működő vállalkozások számának az alakulása a Dél-Dunántúlon 1999-2004 között, Központi Statisztikai Hivatal Pécsi Igazgatósága, 2006 november 17/2006 Pécs

It worth noting, that the data set, as with other innovation surveys, is not representative. Official EU harmonised business demography data are available from the Hungarian Central Statistical Office (HCSO) [12]. According to this office, there were 62,079 economically active businesses in 2004 in the South-Transdanubian Region. Of these there were 12,213 general partnerships and 10,631 limited liability businesses. As mentioned previously, the aim of the survey was to identify potentially innovative businesses, and so the limited liability business form is over-represented in the sample. Altogether, we approached 472 businesses, equal to 2.1% of all partnerships in the region, and, based on the response rate, we have collected data from 0,88% of all partnerships in the whole of South Transdanubia.

One further point to be noted is that, in the following sections, the micro-sized business class is divided into two parts - those employing 0-5 and 6-9 employees respectively. The reason for this differentiation is twofold: firstly, we wished to provide a balanced view of the innovation activity of the businesses; secondly, innovation activity in the smallest businesses is limited, and we experienced significant differences in terms of such activity between firms employing fewer than 5 and those employing 6-9 people.

3. Innovation frequency, innovation expenditure and innovation success

Previous surveys of innovation activity, including Inzelt and Szerb [13], have applied an older modified version of the EU/OECD harmonised Oslo Manual and the Frascati Manual which focused on technological - product and process - innovation. In this survey, we relied on the newer version of the Oslo Manual (version 3), which incorporates other types of innovation: organisational innovation as the change of the organisational structure and marketing innovation as the application of new marketing methods [14]. Marketing innovation is measured as the penetration of new markets or market segments. Moreover, we included not only totally new innovations, but also improvements to existing products, technologies or the organisational structure. The seven types of innovation activity and their intensity can be seen in Table 2.

Table 2: Different types of innovation and innovation intensity in terms of business size

	Noting	The intensity of innovation			Sum
		Not too intensively	Intensively	Very intensively	
New product/service	89	25	45	37	196
0-5	49	8	12	5	74
6-9	10	5	10	5	30
10-49	21	11	16	16	64
50-	9	1	7	11	28
Improved product/service	56	33	79	29	197
0-5	30	10	28	7	75
6-9	7	3	16	4	30
10-49	14	14	24	12	64
50-	5	6	11	6	28
Penetration of new markets	55	40	62	40	197
0-5	24	16	21	14	75
6-9	10	4	10	6	30
10-49	16	15	22	11	64
50-	5	5	9	9	28
New technology	108	22	37	30	197
0-5	52	7	10	6	75
6-9	16	4	4	6	30
10-49	31	8	14	11	64
50-	9	3	9	7	28
Improved technology	89	22	61	25	197
0-5	43	8	16	8	75
6-9	13	2	11	4	30
10-49	24	10	23	7	64
50-	9	2	11	6	28
New organisation	142	17	29	8	196
0-5	66	4	3	1	74
6-9	17	4	7	2	30
10-49	46	5	12	1	64
50-	13	4	7	4	28
Improved organisation	107	40	39	10	196
0-5	56	12	3	3	74
6-9	14	5	10	1	30
10-49	28	18	15	3	64
50-	9	5	11	3	28

Based on table 2, businesses were most active in product improvement and market penetration, whilst the building of a new organisation proved to be the least popular. Most firms engage not only in one types of innovation. If we consider a firm to be innovative when someone undertakes a specific activity “intensively” or “very intensively”, we can find very intensively innovative businesses even in the smallest size category. Almost half (45%) of the 196 businesses - that is, 88 firms - are involved in 2, 3 or 5 types of innovation. Only 12 businesses in the smallest size category - that is, some one-fifth of the 57 micro-firms - do not innovate at all.

Of the 162 firms providing a more reliable information about innovation, only 59, or 36% of the sample, undertook no product or process innovation in the period examined (2003-2005). Almost the same number, 60, carried out either product or process innovation, whilst 43 firms, some 26% of the sample, undertook both product and process innovation. It is evident that, as the size of a business grows, so does the level of technological innovation activity. Whilst 50% of the businesses employing a maximum of 5 workers undertook no innovation, only 17% of those in the medium-sized bracket neglected all forms of technological innovation. These numbers are very similar to the Inzelt and Szerb (2006) survey outcomes, where 40% of the businesses undertook no innovation and 25% introduced both new products and new technology. Since the selection process of the samples was very similar, we can conclude that there has been no real change in terms of the frequency of innovation in the SME sector of the South Transdanubian region since 1998-2000 - which was the time-frame of this earlier survey.

Whilst the success of innovation depends on many factors, including the environment and the skills and attitudes of employees, the most important decisive factor is probably the size of innovation expenditure. This is shown in Figure 5. The problem of innovation in small businesses is not only the lower level of innovation activity, but also the low level of innovation spending as compared to net sales. Around 45% of the small businesses of our sample spend nothing on innovation, and only 5% re-invest more than 25% of their annual sales in innovation. The larger businesses, therefore, have a twofold edge in that they spend more money on innovation in absolute value terms and that their expenditure is higher in terms of sales turnover.

Table 3 Innovation expenditure as a percentage of sales in different business size

Business size (number of employees)	Innovation spending (% of net sales)					Total
	0%	5%	6-10%	11-20%	above 20%	
0-5	31	16	16	3	4	70
6-9	8	11	4	3	4	30
10-49	15	20	10	9	8	62
50-	1	7	10	4	5	27
Total	55	54	40	19	21	189

An important measure of the success of innovation is the percentage of newly developed products in terms of sales. We examine the proportion of sales derived from new products developed between 2003 and 2005 – and this can be seen in Table 4.

Table 4: New products as a proportion of sales in different sizes of business

Business size (number of employees)	New product (developed 2003-2005) proportion of sales					Total
	0%	5%	6-10%	11-20%	Above 20%	
0-5	28	8	12	12	13	73
6-9	8	5	3	6	8	30
10-49	15	9	8	13	19	64
50-	4	7	1	7	8	27
Total	55	29	24	38	48	194

About one-third of the businesses sell only products more than three years old, and most of these belong to the smallest business-size category. Small and medium-sized firms are more successful, with some 50% of these having more than 11% of their turnover in sales of products developed during the last three years.

The success of innovation is even more pronounced when we examine this in terms of innovation expenditure. The more money spent on innovation: the greater is the chance of success. Some 60% of firms reported the failure of over half of their attempts at innovation, but, of those spending more than 20% of their annual turnover on innovation, the failure rate was only 20%.

4. Research and development, patents and technology

There are two principal sources of innovation: a company's own research and development work, and outside purchase. In this section of the report we deal with the former. A further crucial factor of R&D activity is the attitude of companies to collaboration, and in this case one potential partner is the university.

Below, Table 5 shows the basic characteristics of research and of development in the sample, respectively.

It is clear from table 5 that there is a considerable lack of R&D activity in business in the region. 81% of the 197 businesses did not do any research or development over the examined three year time period. That matches our existing knowledge of local R&D potential. It is also clear that most businesses do not work together in research and development with other partners. Only 15 businesses - 7,6% of the sample – had some R&D collaboration. This low level of collaboration decreases the chance of success and also ignores the potential advantages of risk-sharing.

Table 5 The basic characteristics of R&D activity in different business size in 2003-2005 time period

Research activity 2003-2005					
	Nothing	Yes, alone	Yes, together with partners	Total	
0-5	65	5	5	75	
6-9	24	5	1	30	
10-49	51	9	4	64	
50-	20	3	5	28	
Total	160	22	15	197	
Development activity 2003-2005					
	Nothing	Yes, alone	Yes, together with partners	Total	
0-5	54	17	4	75	
6-9	15	11	4	30	
10-49	35	19	10	64	
50-	8	16	4	28	
Total	112	63	22	197	
The frequency of R&D activity					
	Nothing	Occasionally	Regularly	Continuously	Total
0-5	30	10	4	2	46
6-9	5	5	6	4	20
10-49	16	16	5	7	44
50-	4	9	5	5	23
Total	55	40	20	18	133
The number of R&D personnel (full time basis)					
	0	0,1-1	1,1-3	over 3	Total
0-5	59		1	7	67
6-9	14		2	8	26
10-49	31		3	13	55
50-	11		1	6	26
Total	115		7	34	174

Another important question which arises is of how frequently a firm engages in research or development. According to Table 5, the vast majority of companies do not involve themselves in one or the other either regularly or continuously. It is no surprise, of course, that larger businesses are much more frequently involved in R&D.

In the sample there are only 11 firms who have a distinct R&D section or entity. These are located solely in cities: eight are in Pécs, two in Komló and one in Kaposvár.

It is also important to see how many employees are engaged in R&D. The numbers are shown in Table 5. The analysis relates to full time employment. Of the 175 businesses which responded, only 18 employ more than three personnel in R&D, and it is more typical for one (or more) employees to do R&D work on a part-time and/or full time basis. Naturally, the lowest R&D intensity can be expected from the smallest businesses, but 40 percent of the firms employing 6-9 people conduct some R&D, typically on a shared, part-time basis. Probably most of these personnel do not conduct their own R&D, but play a key role in absorbing externally sourced R&D. This can be good news for universities as potential providers of their R&D capacities to these businesses.

The patenting activity of the South Transdanubian businesses reflects well to the R&D activity. Table 6 reports the number of patents, patenting efforts and trademark movements.

Table 6: Patenting and trademark activity of the businesses

Frequency	0	1	More	Total
Number of patents	146	6	4	156
Initiated patent	147	5	4	156
Number of trademarks	133	13	11	157

Only 4 businesses that is 2,5% of the sample businesses possesses patent and only 11 (7%) has a trademark. Therefore, further development and innovation cannot be expected from business own research but rather from other resources.

The technological backwardness of businesses in transitional countries is well-known, the situation of our sample being illustrated in table 7.

Table 7: The level of technology by business size in percentages

	Below average	Average	Lead in region	Lead in country	Lead in the world	Total
0-5 (%)	19,2	72,2	13,0	0,0	0,0	54
6-9 (%)	1,9	57,7	7,7	15,4	0,0	26
10-49 (%)	12,5	66,0	18,9	11,3	1,9	53
50- (%)	12,5	16,7	29,2	37,5	4,2	24
Total number	17	93	26	19	2	157

More than half of the businesses claim they possess an average level of technology. The frequency of technology development is very similar in both micro- and small-businesses, the only exception being the medium-sized business in which more than 70% of the firms claim that they are leaders in technology - at least within the region. Of the 157 firms, there are only two who declare themselves as world leaders in technology terms. The generally low level of technology is probably one reason for the low level of competitiveness of the smaller businesses.

One further important question concerns the origin of this technology. This can be seen in Table 8.

Table 8: The source of new technology

	Not important at all	Rather unimportant	Rather important	Very important	Total
Bought in	67	14	15	63	159
Own development	85	9	25	40	159
Development with customers/suppliers	107	12	19	21	159
Licensing	131	10	9	9	159
Development with competitors	142	8	4	5	159
Development with universities	144	8	3	4	159

As we know from previous examinations of research and development, most businesses do not have their own R&D units and personnel. Table 8 reinforces this finding by showing that the most important source of technological development is by purchase from external sources; in-house development comes second, whilst all other sources are merely of marginal

importance. Not surprisingly, universities are found at the bottom of this list. Of the 159 businesses in our sample, only seven (4.4%) consider universities as important or very important source of new technology.

5. Collaboration with business, other organisations and the University of Pécs

A vital aim of the research was to identify potential partners for other Croatian and Slovenian businesses as well as for other organisational units, including the University of Pécs. Table 9 offers evidence concerning attitudes towards business collaboration.

Table 9: Collaboration between Hungarian and other businesses

	Not planned	Planned	Rare collaboration	Frequent collaboration	Total
Hungarian	29	13	18	102	162
Other countries	71	27	24	40	162
Croatian	107	33	15	7	162
Slovenian	120	29	8	5	162

According to Table 9, most (around 82% of the sample of Hungarian businesses) plan to cooperate with other businesses, but mainly with domestic partners. Of the total, there are 55 and 42 Hungarian firms who would like to co-operate with neighbouring Croatian and Slovenian business partners respectively. It is clear that more firms plan to co-operate than presently do so, and it is noteworthy that South Transdanubian firms consider co-operation with firms in other, more distant countries more important than with those in neighbouring countries. Greater information regarding Croatian and Slovenian projects, business opportunities and potential partners in co-operations could, perhaps, improve this situation.

Table 10 shows the extent of collaboration, both actual and planned, of the Hungarian sample businesses with other organisations.

Table 10: Collaboration of Hungarian firms with other organisations

	Not planned	Planned	Rare collaboration	Frequent collaboration
Chambers (of Commerce etc)	85	24	23	30
South-Danubian Regional Development Agency (DDRFÜ)	101	33	13	15
University of Pécs (PTE)	98	19	29	16
Other Universities	122	17	14	9
Technology Parks	138	16	4	4
INNOPOINT	142	15	3	2

It is evident most Hungarian businesses are unwilling to collaborate with non-business organisations. The most popular non-business organisations for past and future co-operation

in the South Transdanubian region are the Chambers (of Commerce and Industry etc) (47%), the University of Pécs (40%), and the regional innovation centre (DDRFÜ) (37%). All the others are listed as not important. One possible reason for the poor showing of the Innovation Relay Centres is, as shown above, that most businesses do not even know of their existence.

Table 11, below serves to identify the types and frequency of connection between businesses and different faculties of the University of Pécs.

Table 11: The types and frequency of co-operation between university and business

University and business cooperation type	Medical	Business	Science	Other	Total
Personally known	5	30	8	29	72
Informal individual cooperation	2	10	5	24	41
Formal individual cooperation	4	9	0	15	28
Formal institutional cooperation	0	3	0	9	12
Total	11	52	13	77	153

It is no surprise that personal acquaintance with faculty staff is the most widespread phenomenon (72). There is much less personal co-operation, either formal or informal, and there are only twelve instances of formal co-operation recorded between university institutions and business.

In terms of faculties, the Faculty of Business and Economics (FBE) leads in terms of the frequency of co-operation. However, the range of these businesses is mainly due to FBE connections, and so this finding is biased. Moreover, the FBE plays only a minor function in innovation, as its role in innovation activity is mainly in helping to write innovation funding applications and in providing individual consultations associated with market penetration or organisational changes. It appears that the two other faculties individually highlighted, (Medicine and Natural Sciences) have minimal outside connections with smaller-sized firms - which supports our earlier assertions. A detailed description of types of business and university connections is shown in Table 2.

Table 12: Types of connection between business and the university

	Did not use	Dissatisfied	Partially satisfied	Satisfied	Would like to use
Employing students prior to completion of study	112	0	8	19	21
Educational programmes	118	1	8	17	16
Cooperation with individuals	123	0	4	21	12
Writing funding applications	126	1	2	9	22
Conferences, workshops (university organised)	137	2	3	9	9
Consulting	139	0	3	12	6
Preparing business plans	139	1	2	3	14
Common projects	143	0	1	6	10
Cooperation with research institutions	144	0	3	8	5
Internal special training	148	2	1	4	5
Seminars	152	1	1	3	3
Technical expert reports	152	0	0	6	2
Economic and legal expert reports	152	0	1	2	5
Technology leasing	153	2	0	2	3

The above table records the frequency of university and business connections as well as the level of satisfaction with the service provided by the university. Around 17% of the sample businesses employed students prior to the completion of their studies, and some 16% of the firms' employees have participated in an educational programme offered by the University of Pécs. Reinforcing the earlier results regarding the types of co-operation (Table 11), co-operation with individual university members and staff ranks as the third most important connection. 12 firms asked the university to prepare funding applications, the employees of 14 firms participated in university-organised workshops or conferences, 15 used the university as consultant, and 11 reported that they had co-operated with university research institutions. All other types of connection such as expert reports, common projects, special training and the leasing of technology have only been of marginal importance. Most of these types of service and the frequency of use suggest that firms still consider the university as an educational institution and less as a potential supplier of useful business-related services or innovation. Table 12 also shows that most businesses which have co-operated with the university are satisfied, at least partially, with the quality of service.

Table 12 also records the types of co-operation which businesses plan for the future. Besides traditional education programmes and the employment of student before graduation, there are some noteworthy possibilities for future co-operation. The writing of funding applications, business plans and participation in common projects provide new opportunities for the university, and especially for the business-related faculties, but, unfortunately, research co-operation and other, more innovative, specific requirements such as providing expert services and technology on a leasing basis are likely to be demanded only rarely by firms.

As this analysis shows, there are several factors which can contribute to the low intensity of innovation activity in the SME sector of Transdanubia. Below, in Table 13, we record the most important obstacles to innovation as seen from the standpoint of business.

Table 13: The most important obstacles to innovation

	Percentage of "Yes" answers
Difficulties in introducing a new product	45,8
Difficulties in applying new technology	41,6
Co-operation problems with partners	34,9
Problems with human resources	29,5
Problems in project management	20,5
Unclear aims at the beginning of the project	18,7
Inadequate coordination of expertise	15,7
Motivation problems of the project participants	15,7
Lack of development in product-related services	15,7
Urgent need to change technology	13,3
Internal co-operation problems	12,7
Unresolved legal problems	12,7
Unclear product identification	8,4

Firms rank marketing problems as the most difficult in selling new products, but similar practical problems can be seen in the application of new technology. Hence businesses consider that the main problem of innovation lies in their ability (or otherwise) to sell the new product or apply the new technology. As a corollary, even if product innovation has been

successful, selling it is still more difficult. About one-third of the businesses hold that co-operation with outside partners is a problematic issue, and about 30% complain about the quality of their employees. While firms are generally tend to be satisfied with the quality of their labour-force, the lack of human resources is an important barrier to successful innovation. One in every five businesses has had probably negative experience in managing the innovation project. Unclear aims from the outset of the innovation project are judged to be an important problem by almost 19% of firms. All the other obstacles are ranked as of lesser importance by the majority of the sample.

As we can see, co-operation with outside partners is problematic. Since we are interested mainly in university and business co-operation, we asked the businesses about the most problematic points of these types of collaboration. Table 14 show the most important problems from the university side (in the opinion of the businesses) and from the business side, respectively.

Table 14: The reasons for the low level of co-operation from the university and of business side (business view)

	Percentage of "Yes" answers
Obstacles from the university side	
Unknown offer	67,5
No interest in cooperation	23,0
Unknown way of knowledge transfer	23,0
Not useful service	14,3
Reaction time is long	8,7
They offer nothing	8,7
Service is too expensive	6,8
Do not have the necessary technology	4,3
Obstacles from the business side	
No interest	53,4
No need for university level knowledge	25,5
Lack of finance	24,8
Usefulness of university knowledge	19,3
Lack of resources for co-operation	18,6

According to Table 14, two-third of the sample firms have no concept of what the university could offer them. Around a quarter of the firms believe that the university is not interested in co-operation at all, and roughly the same number blame inadequate transfer mechanisms. However, a basically positive attitude towards the university can also be seen, and only a tiny proportion of the firms consider that the university does nothing useful, offers nothing or is slow to react.

A lack of interest seems to be the most important obstacle to co-operation from the business side. The second most important barrier is that businesses think that they do not need the university level of knowledge - probably because of the low level or incidence of practical application. The lack of financial and other resources is not regarded as an important obstacle to business and university cooperation.

6 Conclusion

Many economists, regionalists and innovation scientists have long been looking for ways in which to develop a country or a region, but the perfect prescription and medicine are still unknown. However, we do know that innovation, knowledge spill-over and entrepreneurship are key factors in regional competitiveness, growth and development. This study has focused on these three issues by examining the innovation activity of South-Transdanubia's small business sector and the connections between local SME businesses and the university.

The innovation potential of South-Transdanubian SMEs was measured by relying on a questionnaire based new version of the Oslo Manual which incorporates product, process, organisational and market innovations. Based on an analysis of the 201 questionnaires, 30% of the firms in the sample did not innovate at all in the period 2003-2005. This finding is very similar to previous innovation research outcomes from Baranya County, implying that there has been no improvement in the field of innovation in the South-Transdanubian region over the last seven years. While product and market innovations were the most popular forms of innovation, different sizes of business determine variations in innovation frequency - as well as in innovation expenditure and the success rate of innovation. Business size is an important, distinctive factor in innovation. Smaller-sized businesses innovate less frequently, spend less on innovation, rarely undertake R&D, do not educate and train their human resources and have less information concerning innovation than larger firms.

Innovation collaboration among different participants in the innovation process is vital in terms of success. South-Transdanubian small businesses mainly co-operate with other domestic firms. While 40% of the regional SMEs have had, or would like to, co-operate with the university, connections that target innovation directly are rare. An alarming sign is that only 4.4% of the firms sampled view the university as an important source of technology. Most of the businesses in our sample still consider the university as a traditional centre of education. In addition to employing students before graduation and sending their employees to university, businesses expect the university to help them to write funding applications and business plans. Less than a third of the firms indicate plans for innovation-type collaboration. At the same time, university research units are successful in new product planning, preparation and development. Joint projects are the area which both businesses and university research centres list as an important field of future co-operation.

The most significant impediment to stronger co-operation between university and business is their limited information about each other. Most firms have little idea of what the university does besides teaching, whilst university researchers and staff have no more than vague ideas about business needs and the potential business application of their research.

Our first policy suggestion is about the improvement of innovation services offered by the university. Over the years, we have the experience that bridging institution experts can see the same firms appearing in all projects; new names appear only rarely. Collecting individual pieces of information about businesses could help to identify their needs, and it would also be worthwhile offering a complete package to businesses which includes not only one offer, such as new product development, but which also contains more detailed proposals for helping to write business plans, for devising methods for market penetration or for reorganizing their expanding business. The university should approach businesses which display a positive attitude toward innovation, who have human resources able to communicate with the

university and to absorb innovation, businesses which are willing to invest their own resources to finance innovation. Also required are closer connections between innovative university research units and faculties which offer business-related services, consultancy, and legal assistance. Businesses which have had some connections with the university should also be approached by offering other university-related services. Information about Innovation Relay Centres and their activity should be drastically improved.

It is very hard to offer general suggestions and recommendations to firms, since they differ significantly. Changes in size, attitudes to growth, the quality of human resources and innovation absorptive capacities are the main distinctive factors in the SME sector. A large number of businesses, especially from the smallest size of 0-5 employees, have the lowest level of interest in cooperating with the university. The owners of small companies should understand that, without innovation, not only growth but also the very existence of the business is in danger. If they lack innovative ideas, then they should, we suggest, approach the university for assistance. To those businesses which innovate only rarely and work with minimum innovation expenditure budgets, we suggest that they improve their efforts to innovate and increase their spending on innovation - so as to increase their chances of success. Additionally, improved cooperation in innovation with other business and non-profit organisations is also recommended. The University of Pécs is a unique institution in the region which can offer a wide variety of assistance in innovation - from writing funding applications and business plans, to providing product development potential as well as individual consultancy for organisational changes, market penetration and legal support. A complex package from the university can also be useful to highly innovative firms. For those firms who have already used university-related services and who are satisfied with the quality, we recommend exploring other forms of assistance.

Since the main problem of co-operation between the University of Pécs and the business sector is a lack of information and knowledge, many more opportunities such as conferences and workshops are necessary to improve the understanding of each other's interests and needs. These occasions should be much more heavily publicised in the media, and the results should also be disseminated, not only to business but also to the wider public.

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