

## SCIENTIFIC LIFE AND REGIONAL INNOVATION IN DEBRECEN

© Márta MOHÁCSI  
(Kölcsey Ferenc Reformed Teachers' Training College, Debrecen,  
Hungary)

[mmohacsi@freemail.hu](mailto:mmohacsi@freemail.hu)

*The traditional role and the expectations of higher education institutions have been altered. The development process already completed in Western-Europe has dragged on in Hungary. However, the powerful change of the economy, the dramatic increase in training costs, the limitations of subsidies, the speedy decline in social appraisal, the problems of financing and the higher education challenges of EU membership equally call for rapid changes. For higher education there is no way out but establishing a rational, continuous discourse with the characters of the receiving environment, the region and the formation of an ideal balance of training-research applications. Business organizations ought to make more effort to deal with the issues of training and further training, and higher education should be present as a provider of a service. The emphasis will be shifted from knowledge transfer to the acquisition of learning skills and methods, thus training institutions have to keep abreast of the development of information and communication technologies. There is a need for regional networks.*

**Keywords:** innovation, higher education, region

A new phenomenon appeared in the countries of Western-Europe in the past decade: competitiveness, innovation and its measurement as they were traditionally interpreted in economics have been replaced by effectiveness, a new way of thinking focusing on the indexes of a region. In today's integrating Europe the role of universities has been upgraded in improving knowledge economy and society as the increase of knowledge society highly depends on the production, transfer, spread (education, training) and application (new industrial processes and services) of new knowledge. The special situation of universities is shown in the fact that they simultaneously participate in the accomplishment of a manifold process: a) research and development; b) students' education and researchers' training; c) the utilization of research findings (industrial relations, spin-off companies, regional and local development).

### Objectives

In terms of higher education, scientific cooperation and the development of the region, the institutions of high-level universities and collages, of which scopes exceed beyond the region, are clearly determining. The resources of

the scientific-intellectual basis, though deeply rooted, are not fully exploited in favour of local development in the region. Higher educational institutions are priority bases in the research-development potentials of the region; therefore the R+D sector is highly concentrated spatially. The major part of its capacity is linked to Debrecen; besides this town, merely the other two county towns have considerable R+D activities. The primary task in this area is to enhance cooperation among the R+D institutions of the region and to enhance its direct economic relations.

When higher education in Debrecen, the spiritual radiation of its scientific activities and their operational areas in the regions are organized, when the system of relations in regional development are analyzed, priority is to be given to the large region, in which the system of relations and effect mechanisms related to the academic world and regional development are manifested in the most direct ways and agriculture itself is a key factor in various fields of economic-scientific life. Higher education institutions can absorb demands of the region through institutional relationships like further training institutes, entrepreneurial centres, consultation services, joint development applications and research commissions. Obviously these organizational units, experts and procedures can only be operated by institutions beyond a certain size. The interpretation of the internal demands of a region and the elaboration of competent responses are equally important: without institutions with several faculties which are capable of interdisciplinary work it is an unfeasible mission (Talyigás, 1998).

The University of Debrecen adapts flexibly to the demands and challenges of society, provides connects the players of scientific and business life and maintains close relations with neighbouring countries as well.

## Innovation potentials

A scientific description on the expansion of innovations is linked with the name of Hagerstrand, who recognised that the expansion of news and novelties is closely connected to information transfer. The flow of information builds up the hierarchy of the information network. The existence of several structures also entails the expansion of various innovation mechanisms (Hagerstrand, 1952).

The regional clusters and areas of innovation play a primary role in the development of regional economy; the measurement and evaluation of innovation capacities in regions gain increasingly significant roles in the motivation, development and growth of intra-regional economy, as the success of development policies and strategies largely depend on the regional localization of resources in the regions (Grósz & Rechnitzer, 2005a).

On regional level, for the creation of key mechanisms stimulating research and development, *the regional localization of scientific technological resources and worldwide tendencies* are to be taken into consideration. However, in terms of regional development, regions shall recognize the role of research and development centres.

A new theoretical framework is to be established, which provides the background for science, technology, motivates innovation on regional level and contributes to the improvement of life quality and the positive development of social systems (Gonda 1995).

Accordingly, the theoretical framework (*Table 1.*) to enhance the cohesion of technologies and to increase regional innovation includes three sub-systems:

- site theories of science and technology (TéT), which comprise social factors typical of the given region, influencing research and development activities (e.g. culture of production, flexibility);
- theories by the research-development management
- theories which explain the social systems of innovations.

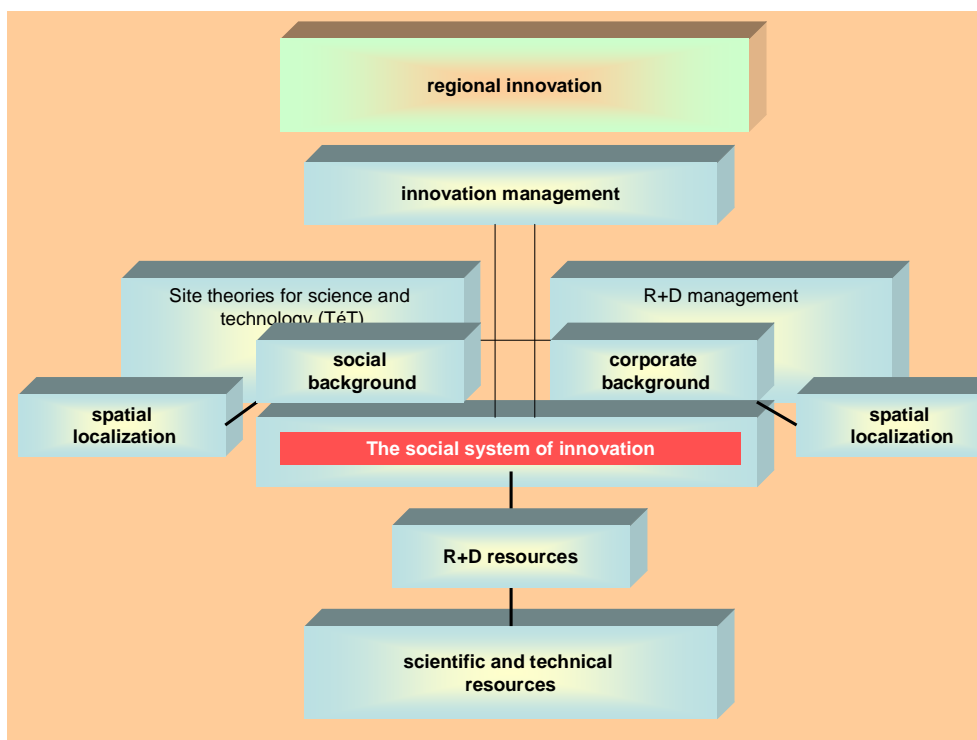
The significance of innovation and motivation for innovation can have several reasons in relation to regional policies. The most common ones are the following (Grósz & Rechnitzer, 2005b):

- the correlation of innovation, research-development input and regional development is clearly positive,
- the so-called “cohesion gap” can be effectively reduced by more intensive research-development and innovation activities,
- input for research-development and innovation in lagging behind regions is low,
- if backward regions cannot improve their regional innovation systems, regional differences within the EU will become increasingly marked in spite of state supports.

If the determinants of regional innovation potentials are treated as a single system, we can get to the concept of regional innovation systems through the analogy of national innovation systems (Inzelt 1998; OECD 1997).

Therefore, all those regional players and factors can be included in the system of regional innovation, which determine, support or perhaps inhibit the creation and expansion of innovations.

*Table 1. Theoretical framework for the enhancement of regional innovation*



Source: Author’s own adaptation based on Grósz & Rechnitzer (2005)

## The retracted and broader regions of academic world

When higher education in Debrecen, the spiritual radiation of its scientific activities and their operational areas in the regions are organized, when the system of relations in regional development are analyzed, priority is to be given to the large region, in which the system of relations and effect mechanisms related to the academic world and regional development are manifested in the most direct ways and agriculture itself is a key factor in various fields of economic-scientific life (Nagy J., 2006).

This region is the North Great Plain Region (hereafter: Region) in the north-eastern part of Hungary; its centre is Debrecen, where most of the intellectual capacities of the Region are concentrated. The area of the Region is 6845.ml<sup>2</sup> (17.729 km<sup>2</sup>), amounting to 19.1% of Hungary's total area. Its population is 1.554.177 people (15.3% of Hungary's population), and this is slightly decreasing. In multiregional terms the region is open: as the Ukrainian and Romanian borders are in its vicinity, cross-border, multilateral relations are highly significant in the region. In the three counties of the Region relatively few, 389 settlements can be found (82 in Hajdú-Bihar, 78 in Jász-Nagykun-Szolnok, 229 in Szabolcs-Szatmár-Bereg County) (Baranyi, 2003).

All the three counties have entered into several international agreements of cooperation. Hajdú-Bihar and Szabolcs-Szatmár Counties, i.e. Debrecen and Nyíregyháza towns of county ranks are full members of the Carpathian Euro region; Jász-Nagykun-Szolnok County is an observer in the operation of this organization, but a member of the Duna-Körös-Maros-Tisza Euro region (Rechnitzer & Lengyel, 2000).

In terms of higher education, scientific cooperation and the development of the region, the institutions of high-level universities and collages, of which scopes exceed beyond the region, are clearly determining. The resources of the scientific-intellectual basis, though deeply rooted, are not fully exploited in favour of local development in the region. Higher educational institutions are priority bases in the research-development potentials of the region; therefore the R+D sector is highly concentrated spatially. The major part of its capacity is linked to Debrecen; besides this town, merely the other two county towns have considerable R+D activities. The primary task in this area is to enhance cooperation among the R+D institutions of the region and to enhance its direct economic relations.

## Employers' expectations, opinion

Establishments of different size are identical in making best use of the knowledge obtained in the Centre by the application of research and development. Science gained at the university is most beneficial in extension and finance. Knowledge obtained is made good use of to different extent depending on the firms' or institutes' size in the following fields of use (*Table2.*).

*Table 2. Areas of benefiting from knowledge based on the size of the organization*

Innovative use of knowledge	Size of the organization					
	2-9 persons	10-49 persons	50-99 persons	100-199 persons	200-499 persons	above 500 persons
In economic areas	6	19	6	8	4	0
In management systems	3	3	8	2	1	0
With the application of research and development	11	28	15	9	4	1
In applications and projects	1	5	4	3	0	1
In vocational practice	5	6	6	3	1	0
In extension	9	16	6	8	3	1

Source: Author's own construction based on empirical examinations, 2008.

Examining the organizations on the basis of activity classification one can observe that science and skills acquired at the Centre are most profitable in research and development, extension and finance (*Table 3.*).

*Table 3. Areas of benefiting from knowledge based on the activity profile of the organizations*

Innovative use of knowledge	Activity profile				
	Animal husbandry	Trade	Public administration	Plant production	Services
In economic areas	11	13	2	12	5
In management systems	6	3	0	4	4
With the application of research and development	12	14	1	26	15
In applications and projects	0	5	0	7	2
In vocational practice	3	6	1	5	6
In extension	13	12	2	6	10

Source: Author's own construction based on empirical examinations, 2008.

Business enterprises of different ownership forms can mostly profit from the acquired knowledge in the Centre in using the results of research and development, in economic and financial fields of work and in agricultural extension services. Intensive use of knowledge acquired in vocational practice is only typical in Hungarian owned enterprises under Hungarian circumstances (*Table 4.*).

Table 4. Areas of benefiting from knowledge based on the ownership form of the organizations

	Ownership form						
	Sole proprietorship	Hungarian owned enterprise	Foreign owned enterprise	Joint ownership form	Government owned company	Public administration institution	Non-profit organization
In economic areas	5	23	0	15	0	0	0
In management systems	0	11	0	5	0	0	1
With the application of research and development	2	50	0	11	0	4	1
In applications and projects	0	9	0	4	0	0	1
In vocational practice	2	16	0	3	0	0	0
In extension	2	27	1	12	1	0	0

Source: Author's own construction based on empirical examinations, 2008.

I investigated the utilization of innovative knowledge on the basis of six dimensions. Based on the examinations I established that different areas of innovative knowledge are prioritized in organizations of different size, ownership form and activity profile.

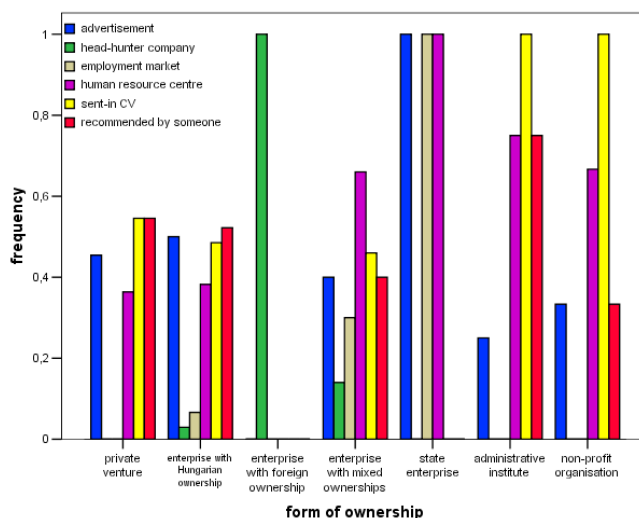
The university prepares the students to start with equal chances in the labour market regardless of the geographical location, ownership form and staff number of the organization. In my investigation I intended to find out whether there are differences in staff selection between organizations of various ownership form, size and geographical location.

The university prepares the students to start with equal chances in the labour market regardless of the geographical location, ownership form and staff number of the organization. In my investigation I intended to find out whether there are differences in staff selection between organizations of various ownership form, size and geographical location. Based on the Chi square test I came to the conclusion that organizations of different ownership form employ different recruitment procedures. A significant difference has been found in the case of headhunting agencies, job fairs and employment centres. Wholly foreign owned enterprises mostly employ the services of headhunting firms.

The method is present in the recruitment of headhunting firms, joint ownership form companies and to a lesser extent in the case of Hungarian owned organizations also. Sole proprietors, government owned companies, public administration institutions and non-profit organizations do not turn to headhunting agencies or job fairs. Job fair services are chiefly employed by government owned companies and to a lesser degree joint and Hungarian owned enterprises. Foreign business organizations, public administration or non-profit institutions do not apply job fair services. Recruitment through the Employment Centre occurs in different degrees in all organizational forms. The only exception is the group of foreign owned companies: they neglect this way of recruitment completely. Government owned companies give equal chances to three forms of recruitment (newspaper advertisement, job fair, employment centres). All the six staffing methods appear in the Hungarian owned enterprises and the joint ventures. (Figure 1.). Public

administration and non-profit institutions both apply four methods for staff selection. The term frequency refers to the hundredth of relative frequency.

Figure 1. Employee selection methods typical of ownership categories



Source: Based on empirical research SPSS, 2008.

Employers of different ownership form prefer different recruitment methods, which is presented in more details in the following table showing the distribution of the sample also (Table 5.).

Table 5. Frequency table of staff recruitment methods by ownership categories

	Ownership form of the organization					
	Sole proprietorship	Hungarian owned enterprise	Foreign owned enterprise	Joint ownership enterprise	State owned companies	Public administration institutes
Newspaper advertisement	5	68		20	1	1
Headhunting agency		4	1	7		
Job fair		9		15	1	
Employment centre	4	52		33	1	3
Submitted CV	6	66		23		4
Recommendation	6	71		20		3

Source: Author's own construction based on empirical examinations, 2008.

Applying the Chi square test I analysed the relation between the frequency distribution of recruitment methods belonging to different ownership forms and the distribution to be expected theoretically (Table 6.) and received the following relationships. If  $p < 0.05$ , the result is significant i.e. there is a difference between the recruitment methods.

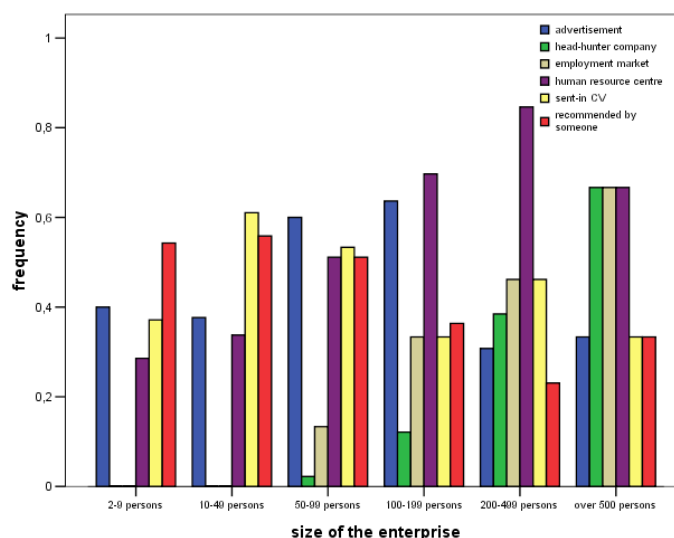
Table 6. Khi square test by ownership categories

	Khi square value	Two tailed significance level
Newspaper advertisement	4.494	0.610
Headhunting agency	25.495	0.000
Job fair	28.721	0.000
Employment centre	15.653	0.016
Submitted CV	9.510	0.147
Recommendation	5.613	0.468

Source: Author's own construction based on empirical examinations, 2008.

When employers decide about the acceptance of an applicant based on personal recommendations or submitted curriculum vitae, there is no significant difference between organizations of different staff number. Thus these two methods give equal chances to applicants regardless of the size of the organization. Out of the six categories based on staff number newspaper advertisements are predominantly used by employers having 50 and 200 employees, headhunting agencies are chiefly hired by organizations above 500 employees and to lesser extent by establishments between 200-500 employees, and job fairs are called in by the employers in the same proportion. Services of the Employment Centre are used by institutes and ventures of all categories but principally by organizations between 100 and 500 staff number (Figure 2.).

Figure 2. Employee selection methods typical of different organizational sizes



Source: Based on empirical examinations SPSS, 2008.

Establishments of different size make use of different recruitment processes. Table 7. presents the most common ways of selection.

Table 7. Frequency table of staff selection methods by organizational size

	Size of the organization					
	2-9 employees	10-49 employees	50-99 employees	100-199 employees	200-499 employees	Above 500 employees
Newspaper advertisement	14	29	27	21	4	1
Headhunting agency			1	4	5	2
Job fair			6	11	6	2
Employment centre	10	26	23	23	11	2
Submitted CV	13	47	24	11	6	1
Recommendation	19	43	23	12	3	1

Source: Author's own construction based on empirical examinations.

With respect to recruitment techniques significant difference ( $p < 0.05$ ) has been found between organizations of different size (Table 8.).

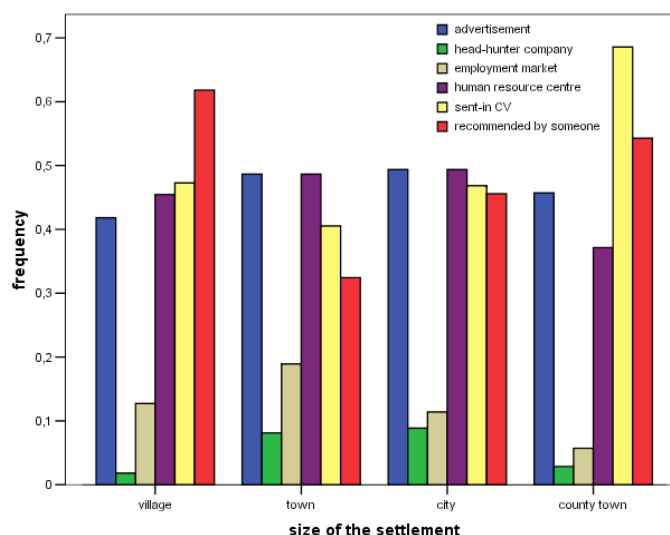
Table 8. Khi square test by organizational size

	Khi square value	Two tailed significance level
Newspaper advertisement	11.702	0.039
Headhunting agency	55.860	0.000
Job fair	51.910	0.000
Employment centre	25.162	0.000
Submitted CV	10.326	0.067
Recommendation	7.814	0.167

Source: Author's own construction based on empirical examinations, 2008.

Regarding the ways of recruitment a significant difference has been found by settlement size since personal recommendations possess the best chance for finding a job in small settlements and partly in county centres also. As regards the other recruitment methods no significance ( $p < 0.05$ ) has been identified from among the different geographical locations of the organizations (Figure 3.).

Figure 3. Employee selection methods typical of types of settlements



Source: Based on empirical examinations SPSS, 2008.

In the frequency table showing the recruitment methods of organizations operating in different settlement categories significant difference between the measured and the expectable data has only been found in the case of personal recommendations (*Table 9.*)

*Table 9. Frequency table of staff selection methods by settlement size*

	Settlement size			
	Village	Small town	Big town	County centre
Newspaper advertisement	23	18	39	16
Headhunting agency	1	3	7	1
Job fair	7	7	9	2
Employment centre	25	18	39	13
Submitted CV	26	15	37	24
Recommendation	34	12	36	19

Source: Author's own construction based on empirical examinations, 2008.

On the basis of the Khi square test performed to verify the frequency of recruitment techniques examined by settlement types it can be established that significant difference between the settlement types has been proven in the case of personal recommendations (*Table 10.*)

*Table 10. Khi square test by settlement size*

	Khi square value	Two tailed significance level
Newspaper advertisement	0.822	0.844
Headhunting agency	3.850	0.278
Job fair	3.009	0.390
Employment centre	1.575	0.665
Submitted CV	6.614	0.085
Recommendation	8.443	0.038

Source: Author's own construction based on empirical examinations, 2008.

Statements raised in my hypothesis have been justified as I established significant differences ( $p < 0.05$ ) in the application of recruitment methods: regarding ownership form in three cases, concerning organizational size in four cases and by settlement size in one case. All these have been supported by bar graphs, frequency tables and Khi square tests.

## Conclusion

The relationships of companies with universities and research institutions have played an outstanding role in development projects. In addition, increasingly knowledge-intensive developments will boost the importance of cooperation with universities and research institutions. The attainment an enterprise or a country can reach in innovation and the level of problems it is able to solve depend on the quantity and quality of knowledge it has acquired in the past. Companies have the ability to learn, to gain new knowledge, and since they follow various and differing learning routes skills built on the obtained knowledge will also be different, which lays the grounds for lasting differences between enterprises. In accordance with national and international surveys it can be stated that big companies pursue

innovation activities of larger scale, but regarding the expenditure the results of small ventures are better. As a summary it can be declared that research, development and innovation played an outstanding role in the competitiveness of enterprises. However, familiarity with the markets, marketing, sales, productivity, the costs factor and the quality of products are also important. Understanding and accepting this and approving that this shows adequate adaptation to new challenges, the basis of long term competitiveness can only be provided by a more serious role of development activity. The macro-statistical figures of the period after the millennia reveal positive tendencies, e.g. the increase of corporate R+D locations. Foreign experience shows that R+D inputs can only be materialised with a much more active corporate innovation activity (Nyíri, 1996).

## Summary

For the definition of innovation I adopted the core notion of the Frascati Manual, compiled by the OECD (1993). R&D is a priority in this manual.

The Debrecen University is the largest, integrated institution of higher education with a wide range of training courses in the North-Great Plain Region. The traditional roles of higher education institutions and requirements for them have undergone a transformation. The notion of innovation has emerged in higher education, as competitiveness originating in a knowledge-based economy is a key motivator for the university.

As regards higher education, scientific cooperation and regional development, high-level educational institutions of universities and high-schools are of vital importance, with their scope far exceeding the region. The scientific and intellectual base is closely connected to the region; however, it is not fully exploited for the establishment of local development.

The Debrecen University and its Centres, as research institutions and key drivers of economic development, trigger cooperation among the competitive sector, local and central governments in the framework of regional and cross-border programs of research, education and development. Its objective is to further enhance its existing role of the region in social-cultural development.

## References

- BARANYI B (2003): *Az Észak-alföldi Régió bemutatkozik*. In: Csiszér Zoltán (Ed.): Észak-alföldi Régió. Csiszér Kiadó, Debrecen.
- GONDA K. (1995): *Results of Recent Research in Japan on Regional Science and Technology Policy*. In Reid, A. & D'amario, R. & Louge, H. (Eds.): Proceedings of the Fifth STRIDE Conference, 8-10 June 1995. European Community, DG XII. Brussels.
- GRÓSZ A. & RECHNITZER J. (2005a): *Régiók és nagyvárosok innovációs potenciálja Magyarországon*. MTA RKK Pécs-Győr, p. 25.
- GRÓSZ A. & RECHNITZER J. (2005b): *Régiók és nagyvárosok innovációs potenciálja Magyarországon*. MTA RKK Pécs-Győr, p. 28.
- HAGERSTRAND T. (1952) *The Propagation of Innovation Waves*. Lund Studies in Geography, Lund (Sweden).
- INZELT A. (1998): *Nemzeti innovációs rendszerek*. In: Inzelt A. (Ed.) Bevezetés az innováció menedzsmentbe. Műszaki könyvkiadó & Magyar Minőség Társaság, Budapest, pp. 33-57.
- NAGY J. (2006): *Tudományos együttműködés a regionális versenyképesség erősítésében*. In: Jávör A. & Borsos J. (Eds.): Az agrárinnovációtól a társadalmi asszimetriáig. Debreceni Egyetem Agrár és Vidékfejlesztési Kar, Debrecen.

NYÍRI L. (1996): Leszakadás vagy követés a tudásintenzív fejlődésben. A hazai K+F az OECD folyamatok tükrében. *Közgazdasági Szemle*, XLIII. 6. pp. 564-576.

OECD (1997) National Innovation Systems. OECD, Paris.

RECHNITZER J. & LENGYEL I. (2000): *A városok versenyképességéről*. In: Horváth Gy. & Rechnitzer J. (Eds.): Magyarország területi szerkezete és folyamatai az ezredfordulón. MTA Regionális Kutatások Központja, Pécs.

TALYIGÁS J. (1998): *Integráció és információ*. Magyar Országgyűlés, Budapest.