REGIONAL DIMENSIONS OF INNOVATION POLICY – LESSONS FROM A NEW EU MEMBER COUNTRY

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1. EXECUTIVE SUMMARY

The Innovation Challenge of the 21st Century

There is no development without innovation.

A competitive society is one that has an ability to adapt to new challenges, to learn and to apply knowledge. A competitive economy is characterized by risk-taking and innovation, realised through new enterprises, new investments and the creation of new, competitive products, services and processes. States should provide support for these processes with conscious, predictable and coordinated policies.

Technology and innovation performance have become a key element of economic growth in developed countries over the past two decades. This general trend, however, was not, or hardly reflected in the economic policy of Central and East European countries (including Hungary), where economic trends accompanying the transition to democracy favoured more comfortable solutions or ones that seemed to be comfortable.

But technological development is not only a tool of economy. It should help improving the quality of life, or in other words, the "quality of society". That is not possible without a growth in competitive economy which is a necessary, but not the only, condition of increasing prosperity. Indeed, it is only one of the methods of achieving prosperity. Future-affecting decisions can be judged on grounds of their degree of helping the fair distribution of growth-generated excess resources, thus promoting human development.

To determine the quality of life, the HDI (Human Development Index) is used. Its three main indicators can not be separated from the innovation performance of a given society. Research and development as well as innovation need to be strengthened to improve gross national product per capita, educational performance (literacy and the proportion of educational levels) and life expectancy (or, in a different approach, healthy life expectancy) in a country.

It would be impossible to tell the future global direction of research and experimental development, that is, the *main trends for research*. Therefore, when drawing up strategies, we set out to answer the *how* instead of the *what*.

The knowledge-driven economy affects the innovation process and the approach to innovation. The old fashioned idea that innovation is based upon research and interaction between companies and other actors is replaced by the current social network theory of innovation. In the knowledge-driven economy, innovation has become the key for competitiveness. With this growth in importance, organisations large and small have begun to

re-evaluate their products, their services, even their corporate culture in the attempt to maintain their competitiveness in the global markets of today. At the same time, organisations in both the public and private sector have launched initiatives to develop the methodologies and tools to support entrepreneurship and the management of innovation in business. Higher education establishments, business schools and consulting companies are developing appropriate methodologies and tools, while public authorities are designing and setting up education and training schemes aimed to disseminate best practice among businesses of all kinds.

Yet innovation takes many forms. In addition to traditional technological innovation, there is innovation through new business models, new ways of organising work, and innovation in design or marketing. Managing and exploiting to best effect all these different kinds of innovation represents a major challenge to businesses today.

2. HUNGARY IN A WORLD DRIVEN BY INNOVATION

Hungary's aim should be to take up international participation on levels and areas that produce the highest added values. Hungary should develop in a direction where it can be competitive not because of cheap labour but by producing and marketing intellectual added values, while offering growing salaries. Special emphasis should be placed on sectors showing the highest growth potential and best market opportunities. Hungarian economy should be set on a development track based on knowledge and innovation. In order to improve the innovation capacity of the economy, the national innovation system should be enterprise-friendly and economy-oriented. Beside a maximum utilization of national resources, that is facilitated by the first and second National Development Plans, under which an unprecedented amount of development resources will be offered until 2013.

The present and past administration have implemented numerous positive measures, including the Act on the Research and Technology Innovation Fund, and the Act on Research and Development and Technological Innovation. The importance of these two acts lies with the fact that – for the first time since the transition to democracy in 1990 – these measures make R&D and innovation policy free of the traps of the annual budget-fights and they enable long-term financing and planning in the sector.

The aforementioned measures, on their own, are far from being sufficient to increase Hungary's competitiveness at the required rate. Indeed, in the past fifteen years the R&D sector was characterized by a constant lag behind government objectives, thus the present situation is more than alarming. The R&D sector struggles with the legacy of the transition

period, which was characterized by spontaneous transformations, hasty implementation and abolishment of superficial measures and a total lack of continuity and transparency. The situation is even graver if we consider the fact that since 1990 the sector's institutional framework has constantly been changing, which unequivocally hindered the integration of R&D policy into the mainstream administration, its effective implementation and the sector's participation in the decision-making mechanisms of governments.

Let us look at where we started from. Compared to local and international conditions, science in Hungary had achieved considerable results and received considerable support until 1987. This support was amply represented by the prestige of science and the volume of public funding provided to science. Unlike in the developed world, however, this relative generosity had almost no effect on the economy. Since innovation was not fuelled by demand, scientific results were only represented by high citation indeces and relatively good research conditions and high standard sin research institutes compared to other satellite countries. During the transition period, however, the establishment of global market conditions did not create a demand for marketable innovation, but led to a gradual downsizing of the previous strengths. Knowledge as an asset was pushed into the background. Following the collapse of the national industrial sector, technology-based professional knowledge was mainly converted to brokering, trade, and the representation of multinational companies entering the market.

That was in part caused by a lack of mechanisms that would have transformed the societal role of intellectual life, knowledge and scientific work according to the modern requirements. All this put scientific research into dire straights. The gravity of the situation was well represented by the fact that between 1991 and 1996, more than 80% of research and development resources were lost (the latter suffering the greater loss). Big industrial companies lost their previous markets and could not successfully enter new ones. That was partly caused by the iron curtain created during the cold war and its rise during the transition period, as the embargo policies of the developed world forced Hungarian industry into a development dead end. Modern technologies and materials were inaccessible for developers because of the embargo, so they had to apply inventive constructions and more complex solutions to develop the same equipment. This sort of replacement worked mainly on the markets of the satellite countries and only until the markets were liberalised. Following market-liberalisation, these constructions became old-fashioned, complicated, and, for the most part, unmarketable. Ruined industrial companies as well as the industrial research network behind them were unable to come up with new development and innovative solutions, so they became bankrupt with dramatic speed. Most of them were liquidated by the

second half of the 1990's, and the majority of research and development professionals formed individual survival strategies.

Representatives of technological and natural sciences blowed the whistle, but substantial change only started in 1997, with the beginning of the reform in higher education. In 1997-1998, the annual funding through the National Research and Development Programme exceeded the average of previous years by five times, and measures were introduced to reform quality oriented institutional and individual support (normative and project funding for R&D, Act on Hungarian Scientific Research Fund (OTKA), the introduction of the Szechenyi-professurate, etc).

Efforts to form a concept and promising funding structures mentioned above proved only transitory. The growth pace of research and development spending slowed down in 1998 and 1999, although the decrease was not driven by economic factors, as GDP grew dinamically from 1997. The government failed to realise the underlying dangers in time, as scientific achievements did not follow the negative financial trend. Among the most important indicators of scientific activities, the number of publications grew from 2500 to 3770 from 1990 to 1999, and the proportion of Hungarian scientific publications grew from 0.44% to 0.52% of all scientific publications in the world. Regarding citation, the National Science Indicators on Diskette (Philadelphia) registered an increase from 0.23% to 0.40% in the given period.

The Széchenyi Plan was launched in 2001 to improve the situation of science, setting for 2002 a goal of spending 1.5% of GDP on R&D. That goal was however missed and only 1.04 % was realised, mainly because of a lack of corporate innovation.

The efforts to save underfinanced research units (mainly universities, higher education institutions, institutes of the Hungarian Academy of Sciences) proved successful in the end: the HAS-network managed to avoid the fate of industrial institutes.

The Situation of the National Innovation System

The elaboration and implementation of a modern national system for research and technology policy have been going on for five years now. The main goal is to make R&D and innovation boost companies' competitiveness as directly as possible, which is not primarily a question of financing. It is much rather a question of our national innovation system, an effective transfer of knowledge, the willingness and skill of Hungarian companies for innovation, and society's awareness of the role and importance of innovation. An important task is to create a regional innovation system. In the European Union, the advancement of the competitiveness of regions

has been regarded as the main objective of regional policies for years, and as one of the most important means to create harmonic development and cohesion. The significant improvement of innovation capacity is one of the key elements in the development of the regions, to which the creation of an effective regional network of innovation institutions is crucial. That is an entirely new element in the range of national R&D institutions, the introduction of which is justified by two main points. The first is the necessity to make Hungarian R&D less centered on Budapest and to provide possibilities to develop for other regions. The second is using the development resources provided by the EU effectively. An institutional network will of course not do by itself, creative and innovative people are also needed to make good use of the possibilities provided by the institutional background. In order to mobilize the creative and enterpreneurial spririt, however, a much more courageous decentralization is necessary.

The Development of Scientific Research

Since 2000, the number of R&D units has grown by a total 22.3%, from 2020 to 2516. More specifically, the number of R&D institutes has grown by 38.8%, the number of higher education research units by 14.6% and corporate R&D units by 41%.

Table 1: Number of R&D units and R&D employment (FTE) by sector

	2000	2001	2002	2003	2004	2005
R&D institutes and other research units*	121	133	143	168	175	201
Scientists and engineers (heads)	4,653	4,657	4,622	4,741	4,693	4,959
R&D units at higher education institutes	1,421	1,574	1,613	1,628	1,697	1,566
Scientists and engineers (heads)	5,852	5,938	5,999	5,957	5,902	5,911
R&D units of business enterprises	478	630	670	674	669	749
Scientists and engineers (heads)	3,901	4,071	4,344	4,482	4,309	5,008
Total	2,020	2,337	2,426	2,470	2,541	2,516
Scientists and engineers (heads)	14,406	14,666	14,965	15,180	14,904	15,878

Source: Central Statistical Office

- R&D institutes and other research units include MTA Research institutes, other public research organisations, and units operated e.g. at clinics, libraries and archives, as well as private non-profit research organisations, e.g. foundations.

Table 2: R&D employment, 1988-2005 (FTE)

	1988	1992	1995	1998	2001	2004	2005
Total R&D personnel	45,069	24,192	19,585	20,135	22,942	22,826	23,239
of which RSE staff	21,427	12,311	10,499	11,310	14,666	15,180	15,878

Source: CSO

The government created a new institutional system in 2004 to implement the Barcelona objectives and to promote long term stability and corporate R&D spending. The most important element of this system is the Research and Technology Innovation Fund managed by the National Office for Research and Technology. Apart from micro and small enterprises, all companies have to pay 0.25% of their corrected net income into the fund. From 2006 the contribution will be adjusted to 0.3%.
Since the year of 2000, the number of patent-applications has dropped by 1.5% to 4810, including a 6.7% drop in Hungarian applications to 756 compared to 2000. The number of patents granted has also decreased to 1379, a 15.2% drop between 2000 and 2003.

The weakest point of our innovation system is the potential shortage of human resources for R&D and innovation. The ratio of science and engineering graduates among people aged between 20 and 29 years is 4.8‰; it is only 39% of the EU25 average. The share of working age population with tertiary education is below the EU25 average: 16.7% vs. 21.9%, but Hungary is "catching up" in this field.
In life-long learning the participation of hungarian population is lqw: 4.6% (HU) of the population aged 24-65 years, as opposed to 9.9% (EU25) in 2004.

Corporate Innovation

In this area, innovation does not receive direct public R&D spending; it is mainly carried out through importing materials, spare parts, investment, and intangible assets. While in public R&D spending, Hungary is only slightly behind the average of the EU 15, high-tech seed and venture capital is very scarce. The latter is the best indicator of a country's ability to integrate new knowledge into its everyday routine, whether that knowledge stems from national or international R&D activites.

Hungarian researchers and research institutes boast great results in international R&D cooperation networks, whereas the role of SME's is occasional and insignificant. The new knowledge and technology created by international projects is hardly utilized in Hungary. It is mostly foreign companies that make good use of the knowledge of Hungarian researchers, and Hungary's share from the benefits of intellectual products is not proportionate to its investments.

The activity of the majority of SME's in R&D and innovation is very weak. According to a 2003 survey by the Hungarian Innovation Association, 2000-2500 companies are involved in

innovation and receiving new knowledge (other estimates put that figure at 4000). There are few considerable spin-off enterprises and technological incubation is still underdeveloped. The seed capital-model is not functioning and there are no mechanisms to connect venture capital and innovative enterprises. There is a missing cultural link, which would be ensured by the evaluation of technological and business opportunities and risks, a link that would connect innovators complaining about a lack of resources and investors complaining about a lack of projects. The lack of that link hinders the development of technology-intensive SME's.

Table 3: Share of innovative enterprises indicating co-operation with specified partners (percentage of all innovative enterprises)

	1999-2001	2002-2004
Other enterprises within the enterprise group	5.1	9.6
Suppliers of equipment, materials, components, or software	26.8	26.6
Clients or customers	24.8	20
Competitors or other enterprises in sector	10.9	14.2
Consultants*	14.6	13.9
Private R&D organisations	13.7	
Higher education organisations	21.6	14.6
Government or public research institutes	8.6	6.4

Source: CSO
* Co-operation with consultancy firms and private R&D organisations has been merged in CIS4.

The Main Factors Hindering Innovation in SME's

Insufficient corporate innovation in Hungary is rooted in conflicting individual and company interests, limited financial resources and the dysfunctionalily of the structural framework. The main factors hindering innovation in Hungarian SME's are the following:

- SME's do not have at their disposal the crucial financial resources necessary for successful R&D activities
- Before the Innovation Fund was created, only 5% of R&D budget resources went directly to enterprises, with 95% ending up in state-financed research units. In theory, that 95% should be utilized by the economy, something we do not see at all or only on a small scale
- The administration and accounting system for public financial contributions is rigid and complicated.

- The institutional background of innovation in Hungarian regions is complicated, un-coordinated, with many overlaps, and in many cases there is a lack of cooperation between organizations operating in the same field.
- The Hungarian banking system cannot manage intellectual added value assets linked to intellectual property, which are becoming a determining factor in the economy. Therefore it is especially difficult to finance the growth of enterprises engaged in knowledge-intensive activities, typically struggling with a lack of capital.
- Venture capitalists in Hungary are unwilling to invest into innovative enterprises (which are in many cases start-up companies).

3. INNOVATION IN THE REGIONS

"Hungary is a small, centralised country: the capital, Budapest is the political, economic, educational, cultural, and transport hub. A very high share of GDP is produced in Budapest, and thus the weight of the region of Central Hungary, consisting of Budapest and the surrounding Pest County, is excessively strong: 44.6% of the GDP.

The country is composed of 19 counties, which do not have any decision-making power on higher education or STI policies. They are too small to act as catalysts of regional development. For that reason, these counties have been organised into seven statistical-planning regions. Although as a part of the administration's reform, they would get decision-making competences, but during the legislation process it failed due to the resistance of the main opposition party. So these seven regions are recipients of development funds, but do not have local governments. In the new government structure, the Ministry of Local Government and Regional Development has been made responsible for the supervision of regional and rural development tasks in order to centralise and more efficiently co-ordinate these tasks. Further ministries and government agencies are also active in this field to a varying extent, e.g. the Ministry of Economy and Transport, and the National Office for Research and Technology.

Seven Regional Development Councils (RDCs), and their operational and co-ordinating organisations, Regional Development Agencies (RDA), have also been set up, as stipulated by the Law on regional development and planning, to devise and implement regional development strategies, including a "chapter" on innovation issues. In more detail, their responsibilities include regional development, co-ordination of economic development, and reconciliation of central and regional interests.

RDCs have two principle sources of funding for research and technology development: a contribution from the central government budget, as well as 25% of the Research and Technological Innovation Fund, to be spent on promoting RTDI activities at the regional level." (TC CR 2006.) The Research and Technological Innovation Fund supports currently two important schemes aiming at regional innovation systems: the regional knowledge centres at universities and the Regional Innovation Agencies (RIA).

"A major task for the seven RDCs in 2006 was to finalise the regional development strategies and the related Operative Programmes for 2007-2013, i.e. to be implemented during the second National Development Plan, co-financed by EU and national sources.

As for regional disparities, two Hungarian regions (Northern Hungary and Northern Great Plain) are among the ten poorest ones in the EU, while GDP per capita in Central Hungary is just 4% below the EU25 average. Major foreign-owned firms, however, are located outside the central region, too, and they are buying parts and components from local suppliers in their vicinity, as well as establishing links with nearby higher education institutes. For example, 11 of 19 of the existing Co-operative Research Centres (HU_49, replaced by HU_55 since 2004) are located at the Universities of Debrecen, Gödöllő, Győr, Miskolc, Pécs, Sopron, Szeged and Veszprém. Thus, one can speak of emerging regional RTDI clusters" (TC CR 2006.).

There is a great discrepancy among the innovation and research capacities of Hungarian regions, stemming mostly from the separate locations of investments and university cities such as Debrecen, Miskolc, Szeged, Pécs, Győr or Veszprém.

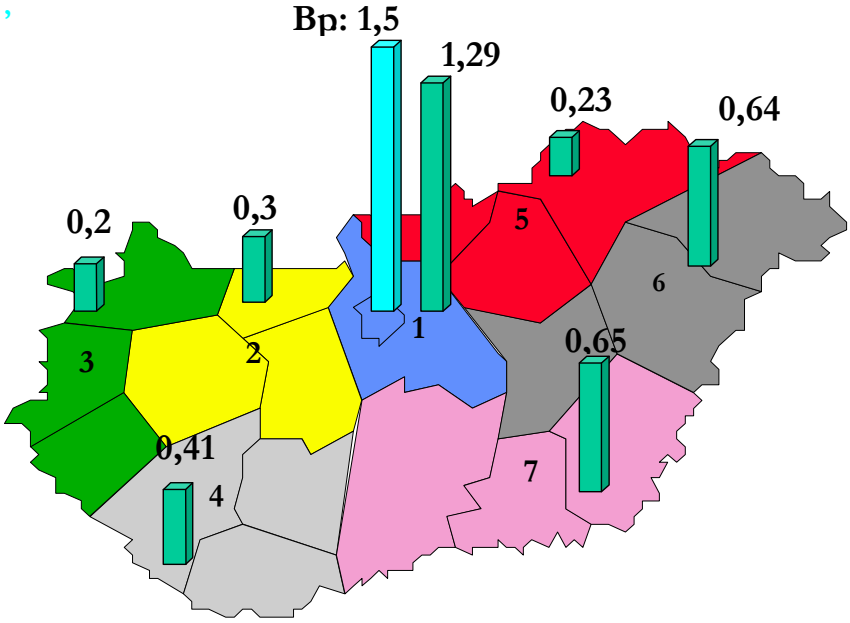

Figure 1. R&D spending in % of GDP

The Northwestern region of Hungary has successfully attracted direct investment. Thanks to imported technologies, the innovation situation in the region is favourable, but there is still little homegrown innovation because of insufficient R&D capacities. The capital and the larger university cities in the Eastern region (which has low innovation capacity) do have important research centres, but with the exception of Budapest, these institutions have not yet been successful at becoming the innovation centres of the given region. The central role of Budapest is also highlighted by the geographical distribution of the number of researchers, as 61.6% of researchers and developers work in Budapest. (Figure 1)

The deficiencies of the Hungarian innovation system have a negative impact on the competetiveness of the national economy. National and regional institutional framework and network structures (such as innovation centres, technology transfer centres, technology incubation houses) that link R&D institutions and companies are missing or underdeveloped, and there is little exchange of professionals between public research units and companies.

In recent years, integrating action based on wide-range cooperation has taken place, such as the National Research and Development Programmes or the Cooperative Research Centres. Hungary's funding system is increasingly focusing on supporting cooperative research activities. Priority should be given to promoting SME-participation in such programmes, while their financial resources should be increased in order to create a „critical mass" of SME's that would strengthen efficiency. Along with increased spending, monitoring and evaluation systems should be operated to supervise the appropriate, expedient and effective use of financial resources.

Regional Knowledge Centers - Péter Pázmány Programme

The main goal of the Péter Pázmány Programme is to establish Regional Knowledge Centers (RKC) to exploit research and development results in close cooperation with the industrial sector.

The aim of the programme is to establish professional and regional centers of excellence in cooperation with companies and other research organizations to manage innovative projects, focused on research and development at an international level. These research centers effectively cooperate with the industrial sector, stimulate the technological and economical development of the regions.

The task of the supported Knowledge Centers is to transfer R&D results to marketable new products and technologies.

National Office for Research and Technology announced a call for proposals in October 2004 for the first time to establish and support the operation of Regional University Knowledge Centers .

Table 4. Supported Regional Knowledge Centers 2006

University	Region	Title of the project
University of Pannonia	Central - Transdanubia	Information Security Research and Development Centre(ISR&DC)
Corvinus University of Budapest	Central - Hungary	Research and Development in the Foodchain Regional Science Center
College of Nyíregyháza	Northern - Great Plain	FOOD-ENERG Regional Knowledge Center
Eötvös Lóránd Science University	Central - Hungary	Cellcommunication Knowledge Centre
College of Dunaújváros	Central - Hungary, Central - Transdanubia	Dunaújváros Regional Material Science and Logistics Knowledge Centre
Budapest Tech. Politechn. Inst.	Central - Hungary	Transportation Informatics and Telematics Knowledge Center

Supported Regional Knowledge Centers 2005

University	Region	Title of the project
Budapest University of Technology and Economics	Central - Hungary	IT Innovation and Knowledge Center
University of Szeged	Southern - Great Plain	Environmental- and Nanotechnology RSC: development of integrated systems for the improvement of the quality of human life
University of Pécs	Southern - Transdanubia	MEDIPOLIS South-Transdanubian University Innovation Knowledge Center for Developing Life Quality Improving Medicines and Methods of Treatment
Széchenyi István Egyetem	Western - Transdanubia	University-based Regional University Knowledge Center for Vehicle Industry
Eötvös Lóránd Science University	Central - Hungary	E-Science Regional University Knowledge Center
Szenti István University	Central - Hungary	Regional University Center of Excellence in Environmental Industry Based on Natural Resources
Eszterházy Károly College	Northern - Hungary	EGERFOOD - Consumer focusing complex traceability systems, new food safety parameters and devices with new info-

		communication system

Supported Regional Knowledge Centers 2004

University	Region	Title of the project
University of Debrecen	Northern - Great Plain	High-technologies around the University of Debrecen
University of Szeged	Southern - Great Plain	Szeged Neurobiological Knowledge Center (DNT)
Semmelweis University	Central - Hungary	Szentágothai János Regional University Knowledge Center
Budapest University of Technology and Economics	Central - Hungary	Advanced Vehicles and Vehicle Control Knowledge Center
University of Miskolc	Northern - Hungary	Knowledge Intensive Mechatronical and Logistical Systems Regional University Knowledge Center
University of Western-Hungary	Western - Transdanubia	Regional Knowledge Center of Forest and Wood Utilization

"Regional Innovation Agencies (RIAs) were set up in 2005 to co-ordinate and organise the regional innovation processes, offer innovation services, and integrate these into an overarching system. The RIAs operate as networks, based on partnership of the interested partners. These Agencies have to improve co-operation between the different organisations, co-ordinate funds available for innovation, generate additional funding, and promote the creation of national and international innovation networks." (TC CR 2006.) The main strategic goal of RIAs is to develop:

- innovation-friendly environment in regions;

to strengthen

- regional innovation clusters;
- regions' competitiveness by supporting R&D and innovation project;
- firms' competitiveness, especially that of SMEs operating in regions;
- to facilitate regional cohesion;
- to provide a complex array of innovation services in the region.

“A new scheme, called “Baross Gábor Programme, Supporting regional innovation networks” was launched in 2005. It is devised at a national level, but it addresses the challenges of the different regions. Actually, it is composed of seven, rather different regional calls, each tailored to the needs of a given region. Furthermore, the planning process is driven by the RIAs: they formulate their own programmes according to the specific needs and priorities of their regions.” (TC CR 2006.)

The main elements of the program:

Foundation of Regional Innovation Agency network. Since the end of 2004 the network helps the cooperation between R&D and entrepreneurs, providing information, with establishment of the innovation network and further with supporting the use of innovational services.

The Innocheck program, which aims to support the innovation initiatives of small and micro-sized enterprises, through the enlargement of regional innovation tools via the introduction of the support system of innovation services. “The main goal of this scheme is to promote the demand for innovation services by providing a voucher to micro- and small enterprises that need these services.” (TC CR 2006., Annex)

The Regional Innovation Development Program-package, established on the proposal of the Regional Development Committee (RFT) serves the innovation goals of the decentralized regional division of the Research and Technology Fund. Generally, the following main themes are targeted by the specific regional sub-programmes of this scheme:

- support for technology and knowledge transfer
- support for product and service innovation
- creation of regional innovation clusters
- support for SMEs and spin-off companies
- development of R&D and innovation infrastructure.

“The regional distribution of scientists and engineers, as well as that of the R&D expenditures is skewed to such an extent, that the difference among the six remaining regions is dwarfed by the huge gap between Central Hungary and any other region. Central Hungary is the only region with a higher share in the total R&D resources than that in GDP, which means an even greater concentration in R&D.” (TC CR 2006., Table 3)

Table 2: Regional distribution of GDP, R&D employment and expenditures, 2005

	GDP*	R&D expenditures	R&D employment (FTE)	… of which RSE personnel (FTE)
Central Hungary	44.6%	69.4%	63.4%	65.1%
Northern Great Plain	10.0%	9.0%	8.4%	8.0%
Southern Great Plain	9.3%	7.3%	9.1%	8.2%
Central Transdanubia	10.5%	4.8%	5.0%	5.1%
Western Transdanubia	10.3%	3.4%	4.2%	4.2%
Southern Transdanubia	6.9%	3.2%	5.8%	5.3%
Northern Hungary	8.4%	2.9%	4.1%	4.1%
Total	100.0%	100.0%	100.0%	100.0%

Source: CSO
* 2004

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