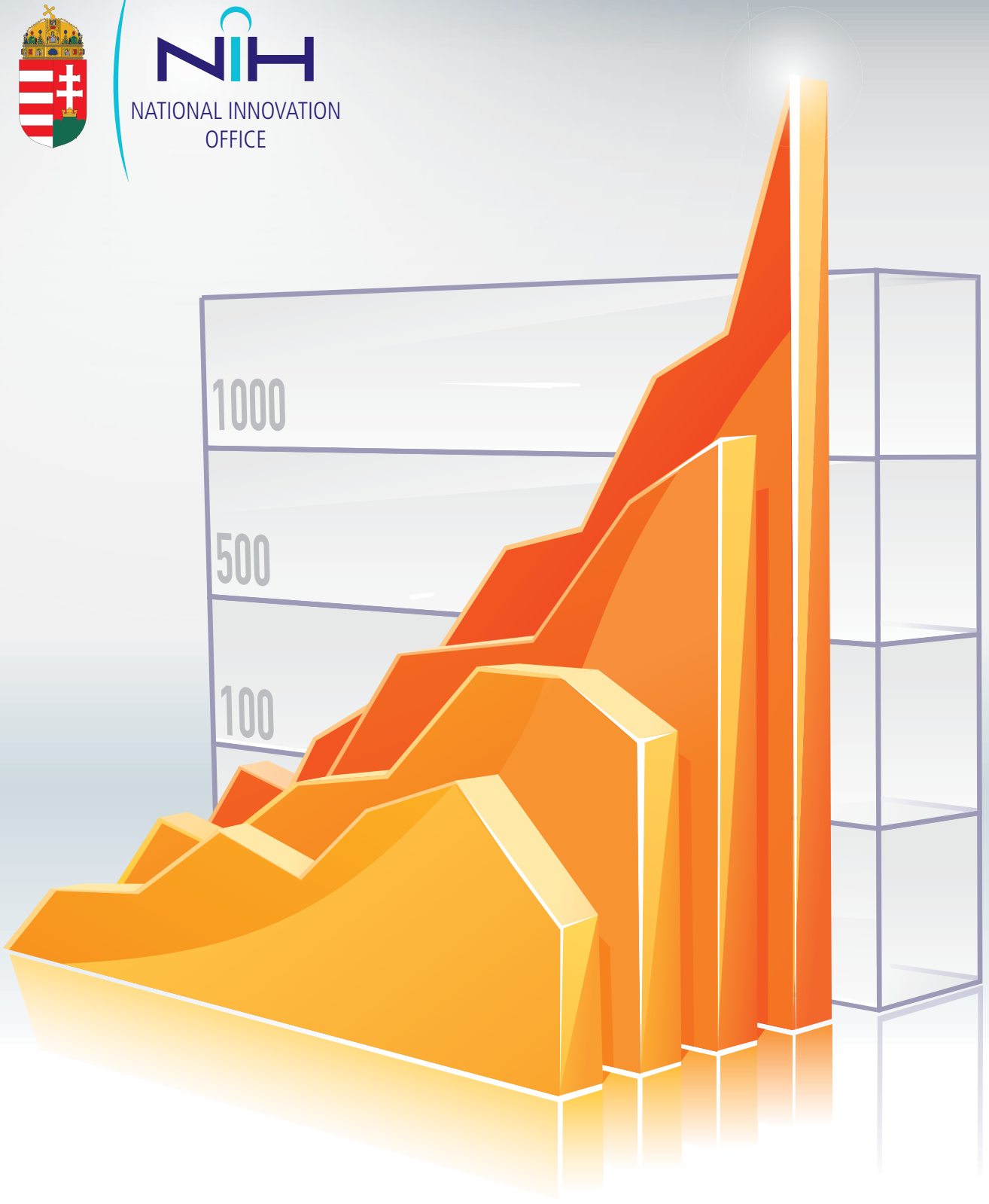
NATIONAL INNOVATION OFFICE



STATUS REPORT ON ENTERPRISE RDI 2012

This publication is a joint effort by the Innovation and R&D Division of the Ministry of National Economy, the National Innovation Office, the Hungarian Central Statistical Office and Deloitte Zrt.

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PREFACE

One of the key global socio-economic processes of the 21st century is the development of a knowledge-based society. Only those countries and regions can remain competitive that reconfigure their production structure to high value-added products and services.

It is a knowledge-based economy, research and development, and innovation that can guarantee Hungary's economic development and its strong international reputation. The effects of the current world economic crisis are being felt in Hungary and cannot be overcome without economic development, progressive research, promising development projects and successful innovation.

As a background institution of the Ministry for National Economy, the National Innovation Office cooperates closely with the ministry in strategic planning as well as in the implementation, tracking and evaluation of RTDI strategy. We support innovative efforts, seek to assist management of the RTDI processes of SMEs, facilitate the incubation of businesses and play a key role in all the processes that drive and promote research, technological development and innovation and have a forward-looking impact in Hungary.

The basic concept of the Scientific and Technological Observatory of the National Innovation Office is that the RTDI sector must act as the engine of the Hungarian economy to show a way out of the economic crisis. Its key elements are promotion of the creation of business networks and up-to-date knowledge of the status and processes of the RTDI sector. For this particular purpose, we have established a unified database that incorporates stakeholders in the RTDI sector. In addition to statistics, it focuses on RTDI-related issues with relevance to economic policy in order that we can provide the Government and economic players with data and analyses.

The first important product of the Observatory for the government sector is this enterprise RTDI report. The Observatory's conclusions can be channelled into the process of developing next year's budget, determining the guiding principles of tax policy and planning calls for proposals.

In addition to timeline data analysis and benchmarking, the Observatory plans to assess future plans of businesses and innovation willingness in its own survey and to provide useful services, data, connections and ideas to all stakeholders in the RTDI field, thereby helping them in their work.

The Observatory also plans to issue thematic reports on specific industries. With a body of statistical data and its own survey records, it will be able to respond to the current issues of the given areas. When determining these, we will take into account Hungary's industries that are relevant in terms of RTDI and which are also included in the New Széchenyi Plan, and we will take into consideration the cluster system of the OECD scientific area.

The publication "Status Report on Enterprise RTDI" is the first in the line of future publications and also serves as a reference point for further RTDI reports. We hope that the report, its basic data and the activities of the National Innovation Office and the Observatory will be complemented by more sector-specific data and statistics in the future.

I hope you will find this publication useful.

Dr. György Mészáros
President, National Innovation Office

1. INTRODUCTION

The first publication of the S&T Observatory, an organizational unit of the National Innovation Office,[1] provides an overview of the current state of Hungarian research and development and innovation, as well as key correlations and trends in the enterprise sector. In addition to discussing correlations that are important at the level of the national economy, the Observatory also uses case studies to draw attention to typical Hungarian enterprise RTDI[2] phenomena and business paths. These case studies are clearly separated from the main body of the text within the publication.

Our publication takes into account strategic aspects of the national economy's RTDI to lay down the foundations for the work of the S&T Observatory, whose effective involvement will help to ensure fact-based policy making in this complex field.

The overview focuses on domestic processes and offers only a limited outlook on the international situation and regional correlations.[3] That of course does not mean that international and regional forces, trends and comparisons are not important in terms of RTDI processes, nor that policy fails to pay special attention to international correlations. Where needed, relevant references are made in the report. The Observatory has future plans to publish internationally and regionally focused analyses from different approaches, which may even make use of feedback received in relation to this publication.

By organizing information related to enterprise RTDI, the report serves primarily as an analytical basis for additional and more detailed professional study and also as a thought-provoking situation analysis that attempts to satisfy the needs of three target groups:

- The first group consists of public administration professionals, who in their efforts to increase competitiveness, increasingly need to support enterprise RTDI both at home and abroad, extending to the national economy and society as a whole.
- The second group is that of educators and researchers with an interest in the topic, for whom this data processing may yield correlations so far unknown or that have not been paid due attention in the past.
- The third group involves professionals in enterprises interested in the broader context of enterprise RTDI and keen to position themselves in the narrower company group.

The first section of the report provides an overview of the input required for enterprise research and development (primarily financial and human resources). The subsequent section analyzes the results of innovation, and also look at factors hindering innovation. Last but not least, the report also summarizes some correlations related to growth and job creation.

The analysis primarily relies on the official data provided by the Hungarian Central Statistical Office– the R&D data survey and the Community Innovation Survey (CIS) – to provide the statistical background (mirror statistics) for the future work of the S&T Observatory based on its own recorded data. We also used the results of deep interviews conducted in 26 enterprises.

Finally, we would like to point out that the report lays the groundwork for further research and is far from being a comprehensive overview. Instead, it should be seen as the first step on the long road ahead.

[1] The S&T Observatory, as a division of the National Innovation Office monitors and measures S&T processes.

[2] RDI (also referred to as RTDI) stands for "research, [technological] development and innovation.

[3] We primarily used French, German, Austrian, Swedish, Portugal, Czech, Polish and Slovakian statistical data to provide a basis for comparison with more developed countries including the core countries of European integration, the key players of the Scandinavian region in terms of economic strength, and Austria for cultural and historical reasons. From among countries catching up with the more developed countries, we considered it important to highlight the members of the original Visegrád Group as well as Portugal from the region of Southern Europe. Comparison with overseas markets (e.g. USA, Japan, Korea, Singapore) is beyond the scope of this report.

2. WHY ARE BUSINESSES INVOLVED IN RTDI IMPORTANT?

Based on changes in the key components of the GDP, restoring the macro-economic balance requires sacrifices: public consumption is declining, as are investments. This is clearly indicated by the positive balance of payment, which is often judged favourably in terms of restoring balance. In fact, economic modernization has come to a halt because investments are import intensive in a developing economy that is low on capital.

THE INVESTMENT DYNAMIC IS SLOWING AND THE COMPETITIVE ADVANTAGE BASED ON WAGE COSTS IS DECREASING: BREAKOUT POINTS, TO WHICH RTDI CAN CONTRIBUTE IN THE LONG RUN, ARE NEEDED

Development, renewal and modernization (i.e. innovation[4]) can hardly be achieved without investments becoming more dynamic. There is great need of investments for innovation, but innovations also need to be made more dynamic (updating the range of products, services and supply, renewal of the public sector etc.). Competitive advantages based on wage costs seem to be declining, which is related to slowing investment dynamics and indirectly to the economy's weakening ability for renewal.[5]

Research, development[6] and innovation (RTDI) investments and development of the education sector can be expected to reinforce the ability for renewal at

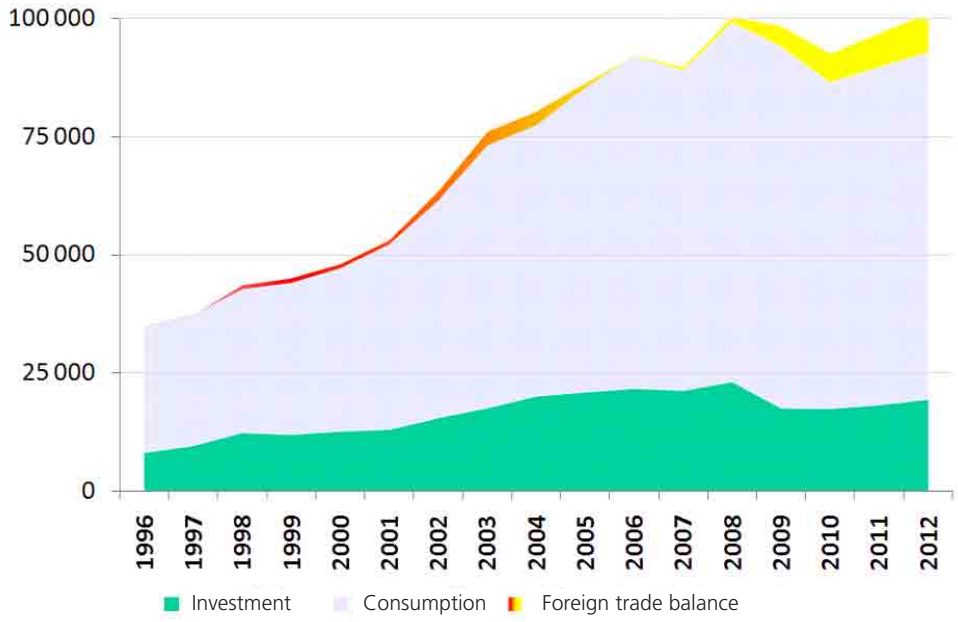


Figure 1. Components of the per capita GDP (current price, EUR million)
Note: The foreign trade balance was negative prior to 2006
Source: Figure based on Eurostat data

[4] Innovation means applying new knowledge/information, putting it into practice, introducing it to the market and creating value. Typical forms of innovation include (the sale of) new products/services, (employing) new technology/production procedures, (employing) new processes/organizational methods, (introducing) new business models, and (applying) new marketing methods. This new knowledge may be new to the company, to the industry, to local (e.g. regional/national) markets or even new on a global scale. In each case it can be considered as innovation. Innovation may become reality for all economic players, i.e. public sector innovations, for example, also exist. Treating RTDI as a unified concept is justified by the dynamics of the various knowledge processes.

[5] According to the theory of endogenous growth, 50-80% of economic growth may be traced back to innovation and new knowledge (see e.g. Helpman (2004)).

[6] R&D is a concept that differs from innovation: it means systematic research activity designed to establish new knowledge/information, including about man, culture and society. In essence R&D involves creation, novelty, application of scientific methods and establishing new knowledge. However, unlike with innovation, application of this new knowledge is not a criterion. Working while applying scientific methods represents yet another difference compared to R&D. In other words, innovation is possible without using scientific methods and research can be performed without a view to its application, just as we also know of numerous innovations with considerable R&D histories.

the level of the national economy. The evaluation of the current state of affairs by the European Commission on implementing the "Innovation Union"[7] in December 2011 concludes that Members States generally investing more in research and development and education have been more successful in riding out the recent economic crisis and laying the groundwork for long-term development based on innovation.

Framework conditions and the importance of tacit knowledge

The innovation processes of the economy and society, including corporate RTDI, are fundamentally determined by their so-called framework conditions. The most important such framework conditions include the macroeconomic environment, international processes (in particular the flow of foreign direct capital), the structure of the economy, competitive conditions, the legal environment (both economic legal conditions and the legal framework for the protection of intellectual property), the training/education system and its quality, mobility, key elements of the business environment (administration, application of economic laws), entrepreneurial skills and digital literacy. These framework conditions and innovation processes have significant tacit knowledge elements, spread through social channels. Their significance is recognized by numerous organizations researching innovation practice such as the OECD and the World Bank. Detailed analysis of framework conditions and tacit knowledge goes beyond the scope of this report.

R&D EXPENDITURES ARE LOW. OTHER COUNTRIES HAVE INCREASED THEIR R&D SPENDING AT A GREATER RATE

Despite the growth observed in Hungary in recent years, research and development expenditures are well below the average of the EU countries. Although Poland and Slovakia, following a different growth model, have been able to realize a higher growth level despite their lower R&D expenditure, it would be erroneous to jump to the conclusion that long-term growth is possible without RTDI activities.[8] It is significant, however, that enterprise innovation can flourish in the entire innovation system, whose processes are influenced by framework conditions.

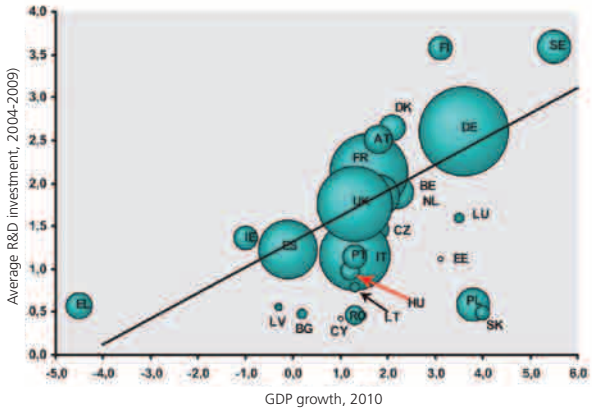


Figure 2. Research and development investment and economic recovery
Source: COM(2011) 849: State of the Innovative Union 2011.

The 2011 Innovation Union Scoreboard[9] lists Hungary in 22nd place out of a total of 34 countries, which puts it in the group of moderate innovators.[10] The Scoreboard states that Hungary's strengths lie in human resources and economic effects, while its weaknesses are the failure to meet the requirements for open, excellent and attractive research systems, finance and support, innovation-based relationships (linkages), entrepreneurship, intellectual assets and number of innovative businesses, all of which are interconnected. In terms of the dynamics of the individual factors, a significant increase in the number of community trade marks and product sales can be observed; however, venture capital data show a strong decline (also stated in Karsai (2011)). The increase in human resources, the R&D expenditure of businesses and economic effects are more dynamic than the average.

[7] Source: COM(2011) 849: State of the Innovative Union 2011 ".
[8] This argument is supported by not only clear long-term trends but also the high-priority innovation objectives of countries with poor RTDI financing indicators and the clear expectations of the EU, not to mention the efforts made by North America, Japan, South Korea, China, India etc., which are not discussed here.
[9] Innovation Union Scoreboard, 2011, INNO METRICS, 7 February 2012
[10] See Annex.

HUNGARY'S COMPETITIVENESS, LONG-TERM ABILITY TO CREATE JOBS AND FUTURE LIVING STANDARD DEPEND ON WHETHER THE COUNTRY IS ABLE TO UPDATE AND INNOVATE PRODUCTS, SERVICES, ECONOMIC AND SOCIAL PROCESSES

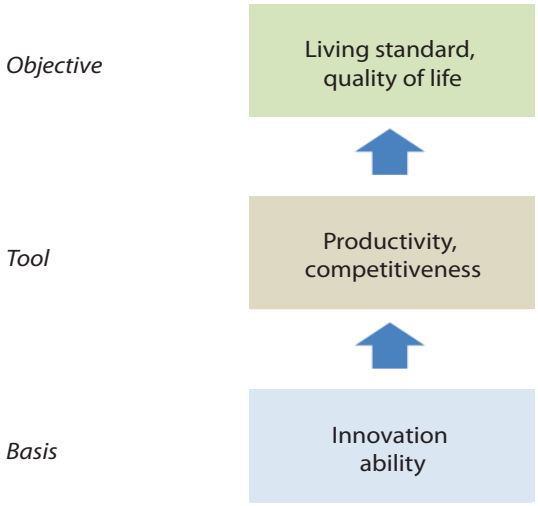


Figure 3. The logical structure of economic development
Source: Adaptation by Lengyel (2003) based on the original concept presented in Porter (2001)

A significant and favourable external condition for Hungarian enterprise research, development and innovation is the expectation of European decision-makers that the Member States should make more innovation efforts since smart, sustainable and inclusive growth is the focus of the Union's strategy for increasing competitiveness.[11]

The Europe 2020 Strategy also presented flagship initiatives in seven areas, one of which is the implementation of the Innovation Union to be completed by achieving a number of objectives relevant to the corporate RTDI environment:

1. investments by the EU and the Member States not only in RTDI but also in education and infocommunication technologies,
2. cooperation of RTDI stakeholders at EU and international levels,
3. more innovation, improved cooperation between the worlds of science and business,
4. development of administrative procedures supporting innovation (e.g. intellectual property rights and regulations on standards and public procurement),
5. innovation partnerships to manage key issues affecting society as a whole and acceleration of the related developmentsk and their market introduction,
6. reinforcement of social innovation.

THE INTERNATIONAL POLICY CONDITIONS FOR HUNGARIAN RTDI ARE FAVOURABLE AND ARE EXPECTED TO REMAIN SO

In order to allow policy to respond effectively to the innovation challenges that businesses face today, we also need to review what research and development capacities Hungarian companies have, what innovation results they have to show, where our enterprise RTDI strengths lie, what the weaknesses are, and how the Hungarian enterprise sector performs in comparison with that of other EU Member States. The report provides an overview of this issue with a focus on the years between 2000 and 2010.

[11] For example, in 2000 the Lisbon Strategy set the goal of R&D expenditure reaching 3% of GDP by 2010 on average, with the state contributing 1% and businesses another 2%. Even though that objective was not reached, the EU still sets 3% by 2020 as one of its main objectives in the field of RTDI.

3. PLAYERS AND INPUTS IN ENTERPRISE RESEARCH AND DEVELOPMENT

This section focuses primarily on the quantitative characteristics of the business enterprise sector involved in research and development[12] and attempts to answer the following questions: How many such companies are there in Hungary? What industries do they operate in? How many people dedicated to research and development do they employ? What do we know about their innovation expenditure? Although research and innovation cooperation is key to Hungarian innovation performance, this section does not cover cooperation between the business enterprise sector and publicly funded research centres (research institutes, universities) as it is discussed in section 4 (an in-depth investigation could be the subject of a separate report).

3.1. RESEARCH AND DEVELOPMENT COMPANIES

After slow development between 2001 and 2005, the number of companies involved in R&D increased sharply in 2005 and doubled in six years. From among the major geographical regions of the country, i.e. Central Hungary (Budapest and Pest County), Eastern Hungary (Northern Hungary, Northern Great Plain, Southern Great Plain), Western Hungary (Central Transdanubia, Southern Transdanubia, Western Transdanubia)[13] the highest growth rate can be observed in Eastern Hungary. One effect of that is that in terms of the number of companies together the western and eastern parts of the country have been able to narrow the gap between them and Central Hungary. Nonetheless, the central region of Hungary is still home to over half of the companies involved in research and development.[14]

THE NUMBER OF COMPANIES INVOLVED IN R&D HAS ALSO INCREASED IN THE CONVERGENCE REGIONS OVER THE PAST 10 YEARS, YET THE REGIONAL ECONOMIC DIFFERENCES HAVE NOT NARROWED EVEN IN EUROPEAN COMPARISON

According to the regional breakdown, the Southern Great Plain is second after Central Hungary in terms of the number of companies involved in R&D. Between 2001 and 2010, the rate of increase in the number of such companies was high both in the Southern Great Plain as well as the Northern Great Plain. In the Transdanubian region the increase was less marked, although balanced expansion could be observed there as well. Innovation clusters and knowledge centres have been established in the larger centres of higher education and their satellite areas, and in certain cases spin-off companies take the knowledge and R&D intensive activities further[15]. Such developments have probably played a part in this expansion. In the meantime, the economic backwardness of the regions has not decreased: based on the 2009 data, the per capita GDP in Northern Hungary, the Northern Great Plain, the Southern Great Plain and in Southern Transdanubia is only 40-45% of the European average and is at the bottom of the regional list.

[12] A business involved in research and developmnet falls within the entrepreneurial sector if it uses its own equipment, staff and organization to carry out research and development activities in addition to its main or basic business activity (producing or distributing products and services). This sector covers all businesses with legal personality (joint enterprises, limited liability companies, companies limited by shares, cooperatives) and without legal personality (partnerships, limited liability partnerships) and non-profit organizations as long as they meet the requirements above (Hungarian Central Statistical Office (2011), p. 104).

[13] This kind of classification could also be in parallel with a systemic division: Central Hungary is an independent (regional) innovation system, Western Hungary tends to connect more to the global chain and appear on the eastern edge of Western European innovation systems, and Eastern Hungary is mostly characterized by underdeveloped innovation micro-systems. The comparison of these three regions may even create the illusion of a favourable balancing process between the capital and the countryside. However, it must be noted that the differences are not favourable in terms of the northern and southern parts of the country. Borsi and Bajmócy (2009) contains detailed statistical analysis about regional innovation characteristics in international comparison as well as in sub-regional units.

[14] In certain regions there is less spread in the proportion of companies involved in R&D compared to the total sector, which means that the role R&D plays within the economic activity does not differ significantly among the various regions of the country. The proportion of innovative companies in the various regions is detailed in section 4.1.

[15] This is indicated, for instance, by the websites of larger universities.

Market creation with technological development

In addition to smaller start-up companies of recent years, there are some other older companies serving special, local interests. There is, for instance, a 22-year-old small enterprise in Southern Hungary that continuously tracks market needs in the field of traffic control technology. The competitive advantage of this company lies in its quick reaction to changing market needs and its pioneering role in technological development, and it always able to persuade its customers of the advantages of applying such developments.

Over 70% of the companies carrying out research and development activities are Hungarian-owned and their number nearly doubled between 2003-2010. The number of corporate research centres that are 100% or majority foreign owned also doubled over the same period, creating demand for Hungarian research and development human resources. At the same time, the number of research companies majority owned by the state or local governments fell by almost one-third.[16]

IN ADDITION TO THE GROWING NUMBER OF R&D COMPANIES IN THE PRIVATE SECTOR, THE NUMBER OF RESEARCH COMPANIES OWNED BY THE STATE AND LOCAL GOVERNMENTS HAS FALLEN SIGNIFICANTLY

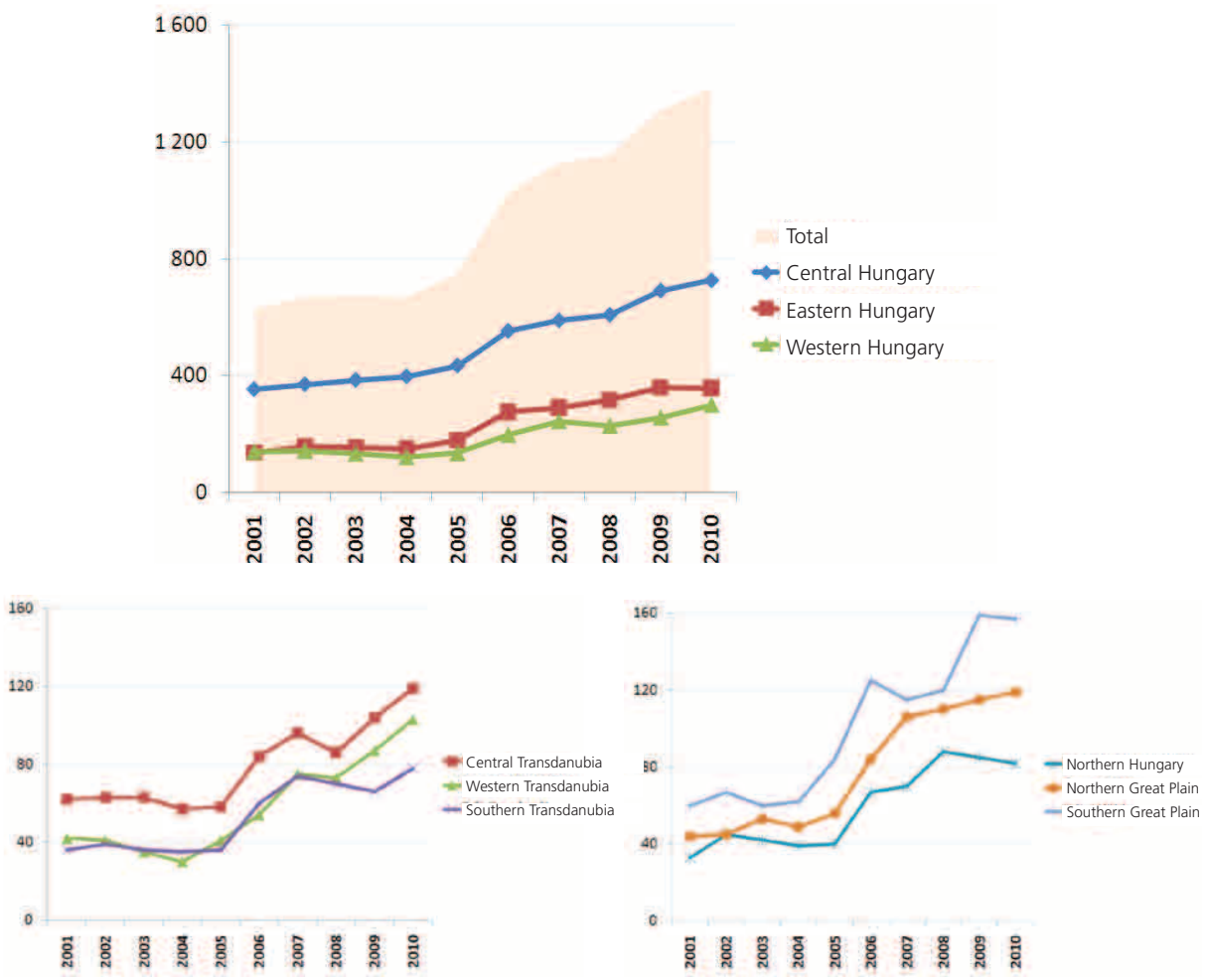


Figure 4. Number of companies involved in research and development by region
Source: Hungarian Central Statistical Office

[16] See also the tables in the Annex.

What attracts foreign direct capital to RTDI?

An electronics company that spends over 16% of its revenues on R&D at the level of the global company group founded its Hungarian unit over 10 years ago specifically because of the business profit tax discount, which was terminated with Hungary's accession to the EU. The local university was important to provide a steady flow of graduates and train the workforce. However, the importance of the industrial perspective was not an influencing factor. Initially, the owners wanted to bring only manufacturing to Hungary. By now, however, several activities producing higher added value have also been established, such as IT development, a more sizeable customer relations team and the redesign engineering team, none of which were included in the original concept. In addition to the availability of human resources, the company also highlights the importance of a favourable investment environment, socio-economic stability and the ability to calculate and plan for the long term to ensure the company's future presence in Hungary. One pharmaceutical company, similarly with a foreign background, refers to more embeddedness due to Hungarian traditions. In addition to local professionals as well as the regional and local knowledge base and university contacts, the weight of the Hungarian company within the company group is also determined by relationships with the suppliers and the infrastructure of the pharmaceutical industry outside the company.

The increase in the number of Hungarian owned research units is related to the fact that the increase in the number of R&D companies in Hungary is chiefly due to micro-enterprises employing 0–9 people, which steadily account for around 42-46% of companies engaging in R&D each year. The number of large enterprise research centres essentially remained at the same level, although a slight decrease in their number was observed over the past 2-3 years. A favourable trend in the period between 2001 and 2010 is that the number of small and medium-sized enterprises involved in R&D increased, by about 250 in the group of small enterprises and by 100 in the group of medium-sized enterprises, compared to ten years previously.[17] The increase in the number of research and development businesses clearly occurred in two waves (from 2005 to 2006 and from 2008 to 2009). It would be important to study the extent to which we can talk about the evolution of the R&D company sphere,

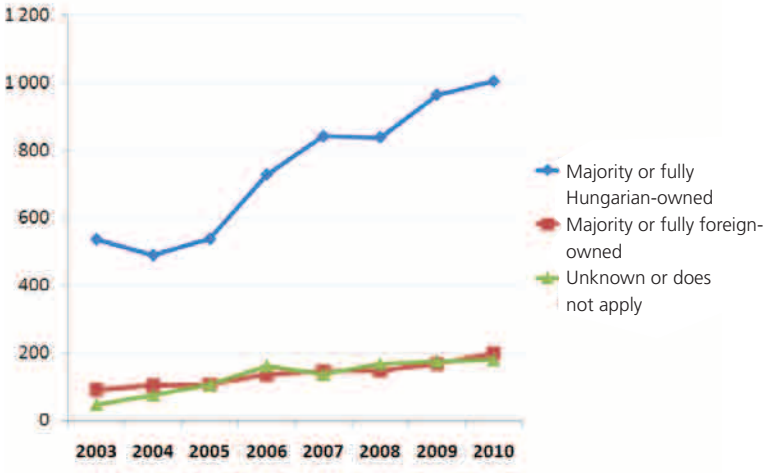


Figure 5. Number of business enterprise sector research units by ownership type
Source: Hungarian Central Statistical Office

[17] In line with the data recorded by the Hungarian Central Statistical Office, the classification by reported size only takes into account the size categories of companies; the study did not look at conditions concerning revenue and balance-sheet total. As a result, some companies of certain sizes are not entirely identical with those SME and non-SME companies as defined by Act XXXIV of 2004.

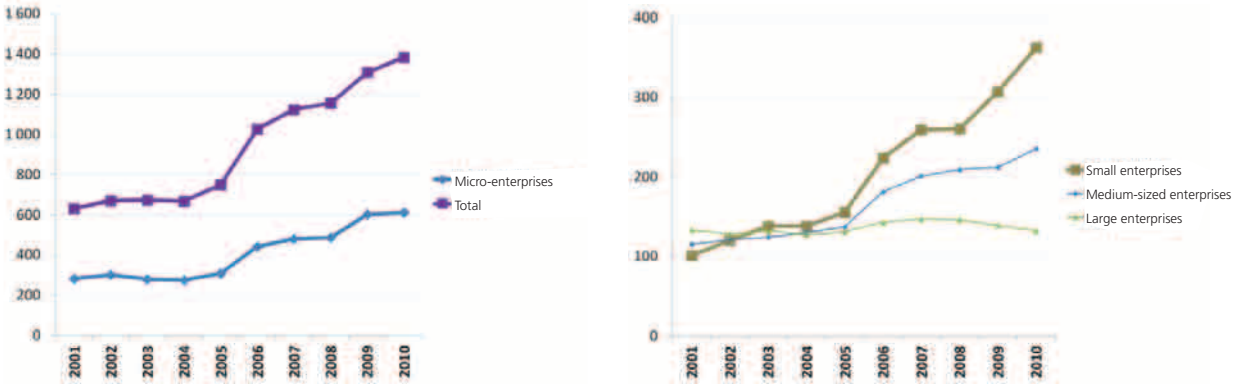


Figure 6. Number of business enterprise sector research units by size
Source: Hungarian Central Statistical Office

including an analysis of the differences between various industries. In the first case we are clearly talking about the influence of the innovation contribution and the resource-expanding impacts of the EU structural funds that came with EU membership. However, the second wave would deserve a separate study.

THE NUMBER OF SMALL ENTERPRISES INVOLVED IN R&D INCREASED SIGNIFICANTLY, WHILE GROWTH WAS MORE MODEST AMONG MEDIUM-SIZED BUSINESSES

3.2. HUMAN RESOURCES

Similarly to the number of companies involved in R&D, the number of researchers essentially stagnated between 2001 and 2004 and then began a steady and rhythmic growth: the headcount of employees working as researchers and developers in the entrepreneurial sector increased by 15% annually on average and produced 2.5-fold growth during the period as a whole.

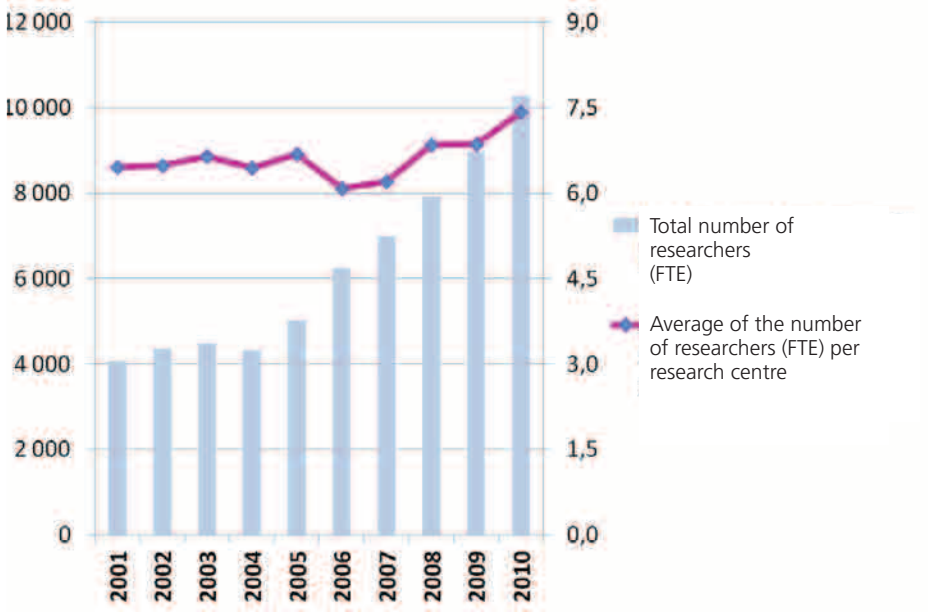


Figure 7. Number of research and development personnel
Note: FTE = full-time equivalent
Source: Hungarian Central Statistical Office

WHILE THE NUMBER OF ENTERPRISE RESEARCH AND DEVELOPMENT EMPLOYEES MORE THAN DOUBLED IN 10 YEARS, THE AVERAGE STAFF NUMBER PER RESEARCH UNIT BARELY CHANGED

The average number of research personnel per business enterprise sector research unit changed far less: from approximately 6.5 research positions per research centre between 2001 and 2005, followed by slow growth from 2006 to 2010, to 7.5 in 2010 on average. Although the number of research and development personnel grew faster than the number of companies carrying out R&D activities, overall the average research capacity of the entrepreneurial sector remained small,[18] which is related to the increase in the number of small enterprises involved in R&D activities.

With regards to the number of research and development personnel, the dominance of Central Hungary is even more striking: 70% of all corporate research and development personnel work in the central region of Hungary with a marked increase since 2005. Although the number of research and development personnel is much lower in the other regions than in Central Hungary, the growth rate is similarly dynamic: between 2004 and 2010 their number more than doubled. Eastern Hungary reported 2.8-fold growth while Western Hungary reported 2.6-fold growth.

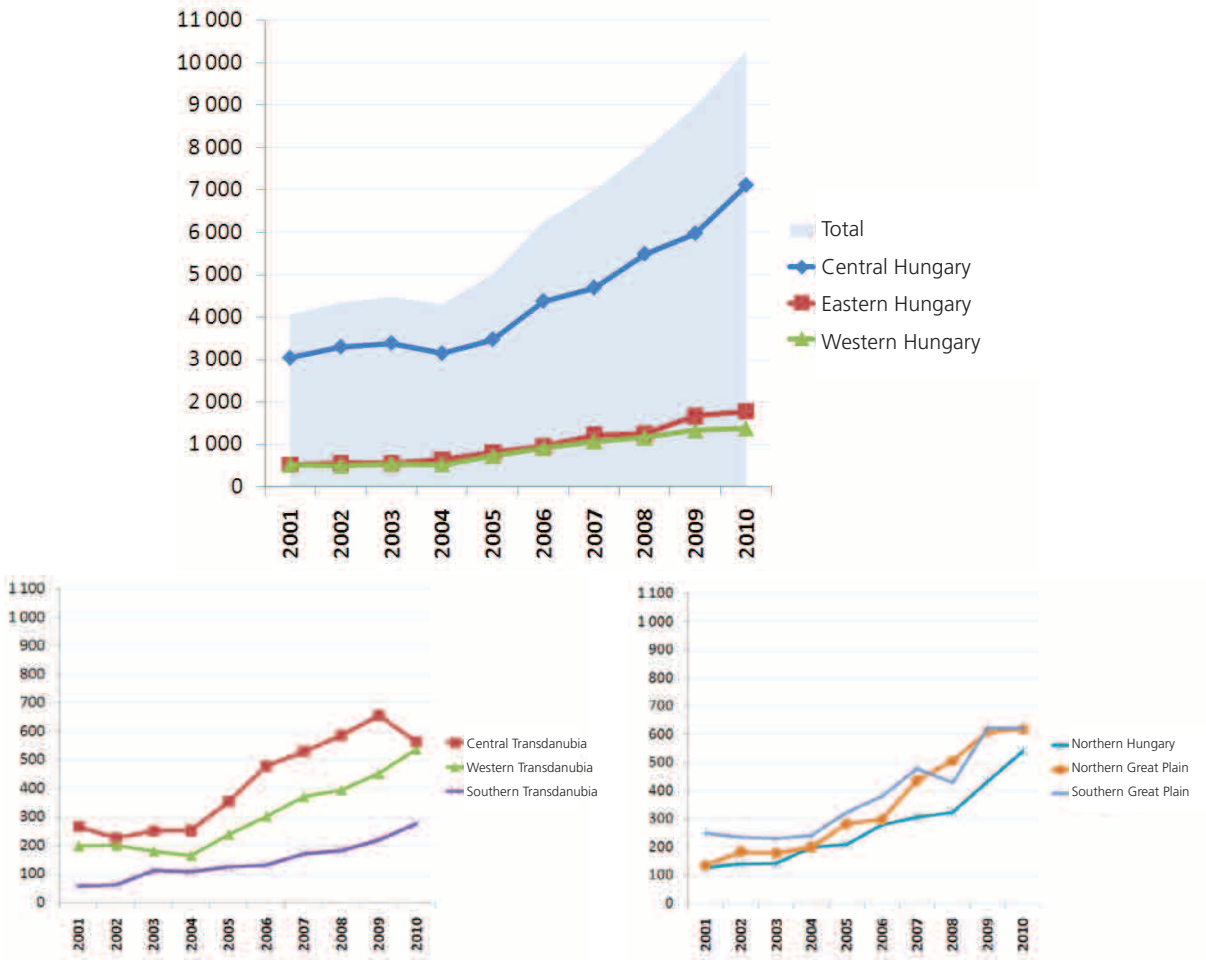


Figure 8. Number of research and development personnel (FTE) by region
Source: Hungarian Central Statistical Office

[18] Naturally it would be very interesting to study spread by company size, such as by deciles, as the so-called structural impact results in the average number of research personnel barely changing overall, while there is an increase in the average number of research personnel in all business categories.

The differences are also clearly visible in the average number of research personnel per enterprise research units: companies in Central Hungary employ almost twice as many researchers and this difference can be primarily attributed to the large enterprise sector, where the average number of research personnel almost doubled between 2001 and 2010.

THE ROLE OF CENTRAL HUNGARY AS THE DRIVING FORCE HAS NOT BEEN IN DOUBT OVER 10 YEARS AND WILL CONTINUE IN THE LONG RUN.

The business enterprise sectors employing the largest number of research and development personnel are, by tradition, the pharmaceutical industry, telecommunications, the vehicle manufacturing industry and computing services. Due to strong expansion since 2007, in 2010 close to as many research and development centres were in operation in computing services as in the pharmaceutical industry. Pharmaceutical companies have, of course, a higher concentration than computing services and they have an entirely different position in the value chains of their respective industries.[19] Nonetheless, it is a noteworthy development.

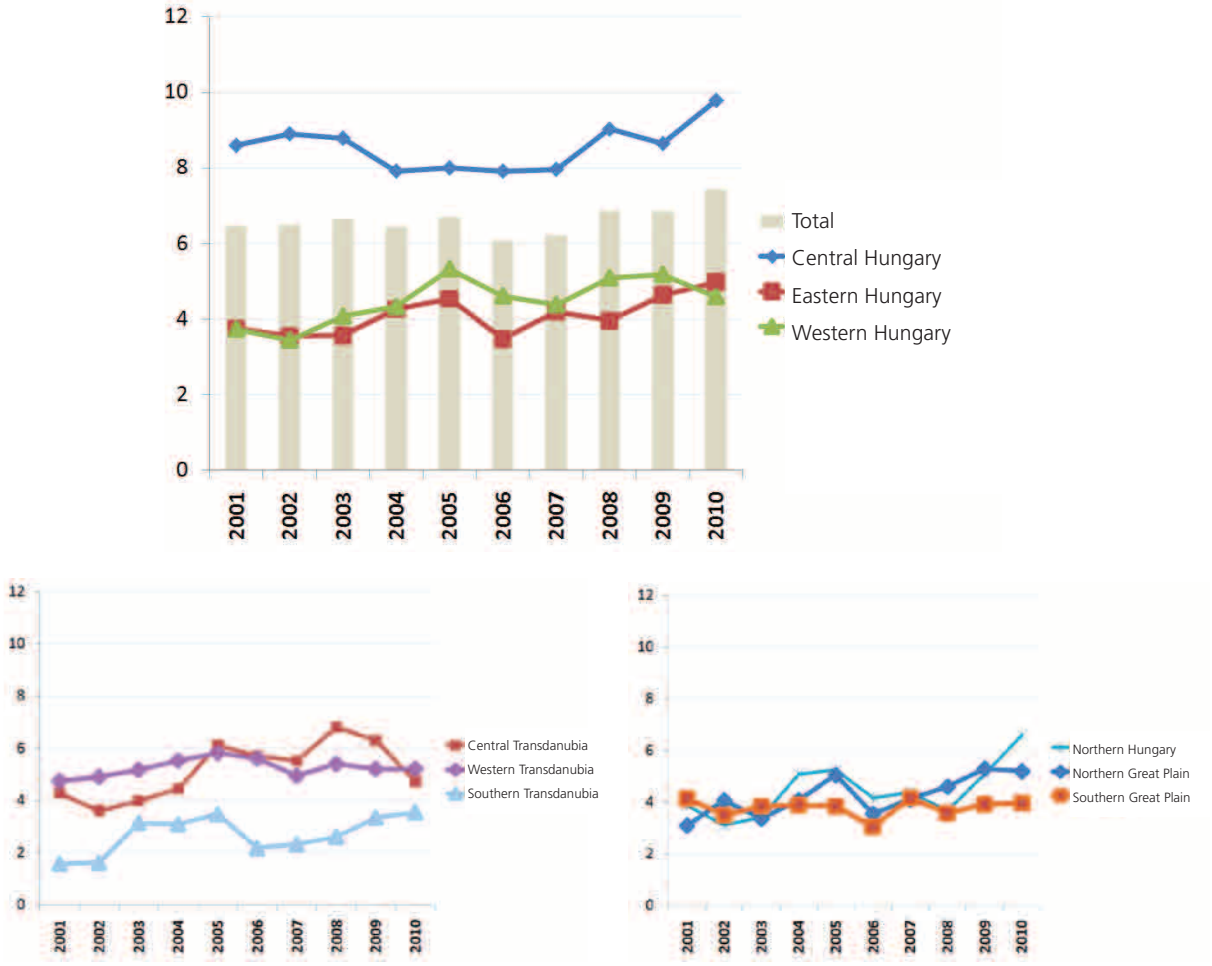


Figure 9. Average number of research and development personnel (FTE) in enterprise research units by regions
Source: Hungarian Central Statistical Office

[19] More specifically, traditional Hungarian pharmaceutical companies implement a much larger portion of their industry's value chain than computing service providers, which are present only in the primary elements or certain elements of the supporting activities of the value chains. And even if they are present in all areas (e.g. in a more complex VIR), they typically share only a small proportion of the created value. The theoretical basics of value chain analysis were established by Porter in the 1980s.

THE PHARMACEUTICAL INDUSTRY AND COMPUTING SERVICES EMPLOY THE HIGHEST NUMBER OF RESEARCH AND DEVELOPMENT PROFESSIONALS

The significance of human resources

A biotechnological company in Central Europe owes its success in large part to the high qualifications, reliability and problem-solving capabilities of its staff. The company performs well on the international markets (one-fifth of the company's revenue is generated by international sales), yet it is taking more time for it to break onto the U.S. market than planned. In this small enterprise of 12 people, the 4-person management is responsible for determining development objectives and strategy. The management uses market and client needs, industry trends and professional achievements to develop the company's short and medium-term strategy, which the entire team follows. One of the disadvantages that a somewhat larger small enterprise in Eastern Hungary mentions is that it is almost impossible to hire suitably trained candidates from the local university. Although the shortage of skilled professional is not an urgent issue as the company had been forced to lay off some staff members, when the time comes for expansion, it will recruit from Budapest.

Although 70% of corporate research centres are owned by companies with majority Hungarian ownership, only 40% of researchers work for such companies. Over half of corporate researchers work for companies with majority foreign ownership (and 40% of researchers are employed by research and development companies with 100% foreign ownership).

THE ROLE OF FOREIGN DIRECT CAPITAL IS DECISIVE NOT ONLY IN TERMS OF ECONOMIC PERFORMANCE BUT ALSO IN TERMS OF THOSE EMPLOYED IN THE RESEARCH AND DEVELOPMENT INDUSTRY

This relates to the duality typical of the economy: large enterprises with larger research and development divisions are primarily in foreign ownership and are typically located in the central region of Hungary. Among the companies with majority state or local government ownership, the number of research personnel fell to one-quarter of the original number between 2003 and 2010,[20] which may have adverse consequences for innovation of the public sector.

Most researchers are still employed by large enterprises. However, while in the early 2000s over 60% of corporate researchers at large enterprises, between 2008 and 2010 this figure dropped to only 46%. While the small enterprise sector only employed 1 in 10 researchers in 2001, it employed almost 1 in 5 in 2010 (in 10 years the number of researchers working

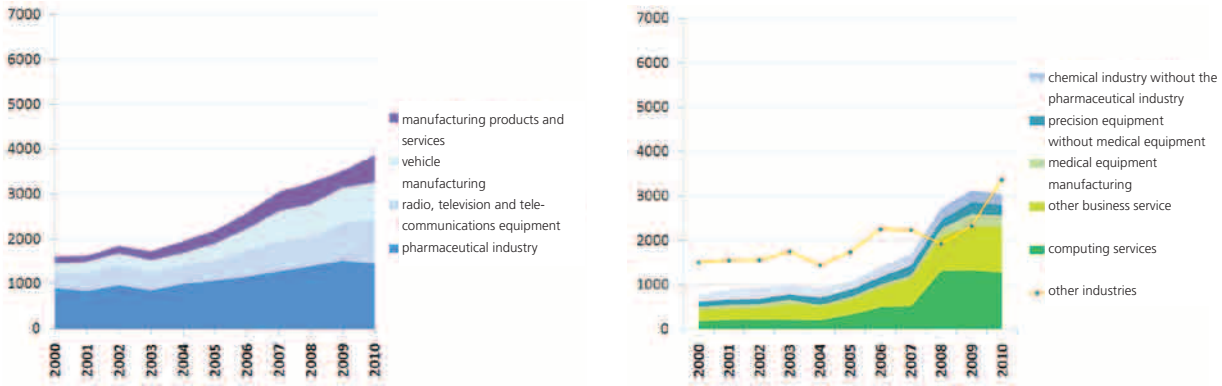


Figure 10. The number of research and development professionals (FTE) by industry
Note: Due to subsequent data revision, the data for 2007 are different from those of Eurostat.
Source: Hungarian Central Statistical Office

[20] See also the table in the Annex.

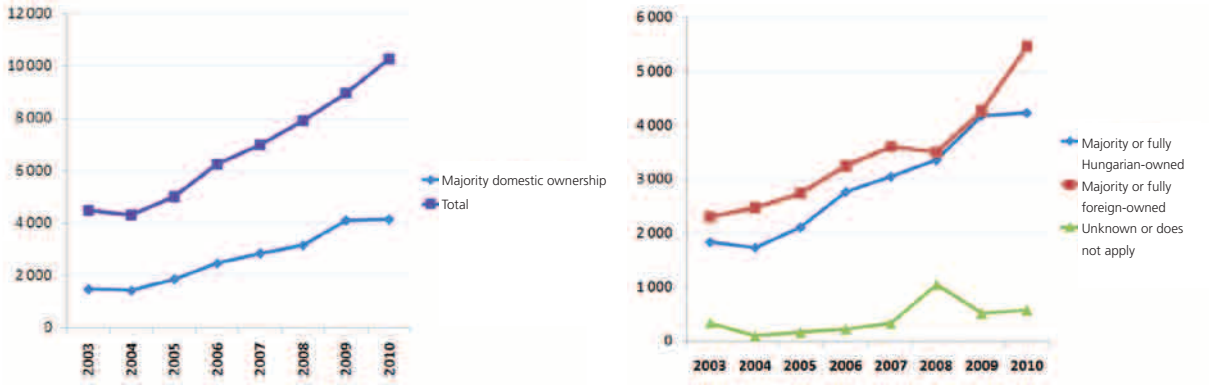


Figure 11. Number of research and development personnel (FTE) by ownership type
Source: Hungarian Central Statistical Office

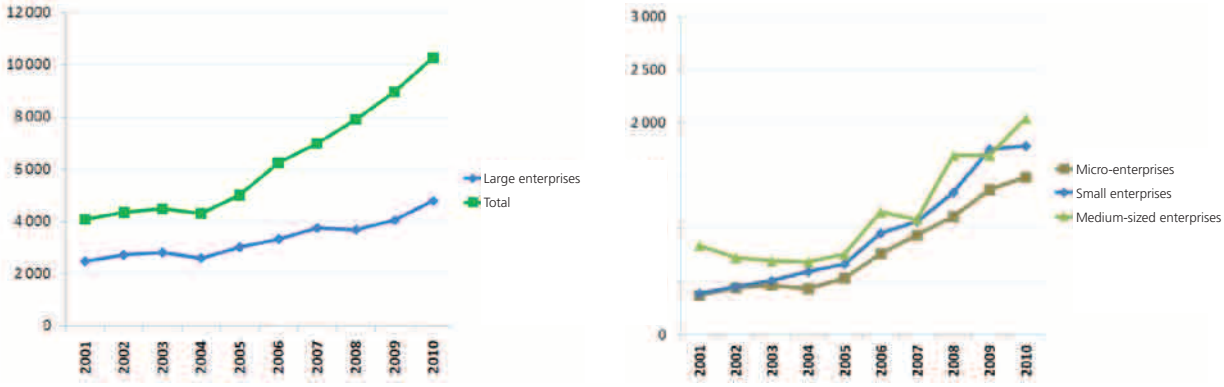


Figure 12. Number of research and development personnel (FTE) by size category
Source: Hungarian Central Statistical Office

for small enterprises increased 4.5-fold). Medium-sized companies carry roughly the same weight in terms of research personnel headcount. However, there was no increase in the number of research personnel employed by medium-sized companies between 2001 and 2010 compared to the micro and large enterprise sectors where the average number of research personnel nearly doubled.[21]

Medium-sized companies are key players in the Hungarian economy in terms of growth and innovation, yet their R&D and innovation performance remains poor.

3.3. R&D EXPENDITURE

Originally, the Lisbon Strategy outlined in 2000 set the objective for research and development expenditure as a proportion of GDP to reach 3% in the EU by 2010. That target was not reached: the indicator generated for 27 EU member states only showed an increase from 1.86% in 2000 to 2% in 2010. Nonetheless, the target remains in place: the EU 2020 Strategy contains the same 3% indicator, but now for 2020. Hungary's result was 0.92% in 2001, which unevenly increased by over 0.2 percentage points to somewhat reduce the gap from the European average. Over the same period, the Czech Republic, for instance, was able to increase its expenditure-to-GDP ratio by 0.4 percentage points.

Hungarian R&D expenditure as a proportion of GDP (GERD/GDP) is roughly half the EU-27 average. The values for Poland and Slovakia are lower than the Hungarian value here as well but the value for the Czech Republic exceeds the Hungarian value.

[21] See also the table in the Annex.

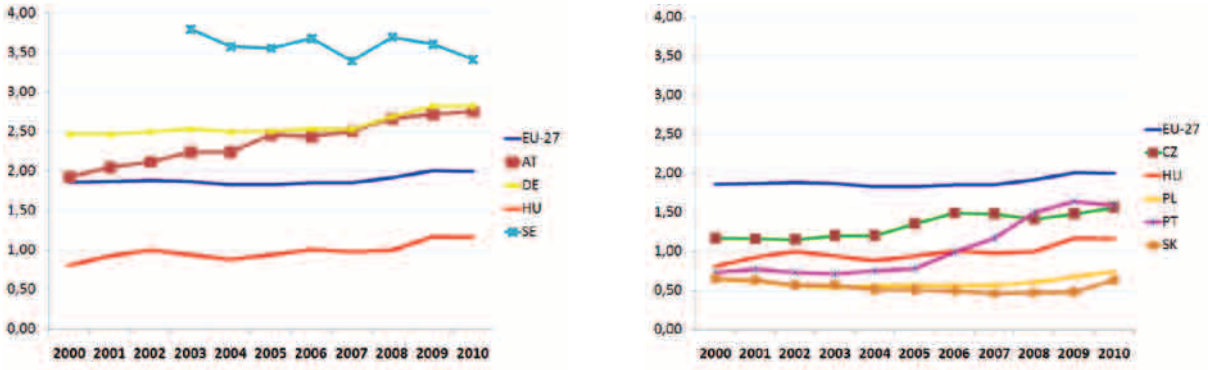


Figure 13. The ratio of Hungarian R&D expenditure (GERD/GDP) in international comparison (%)
Source: Eurostat

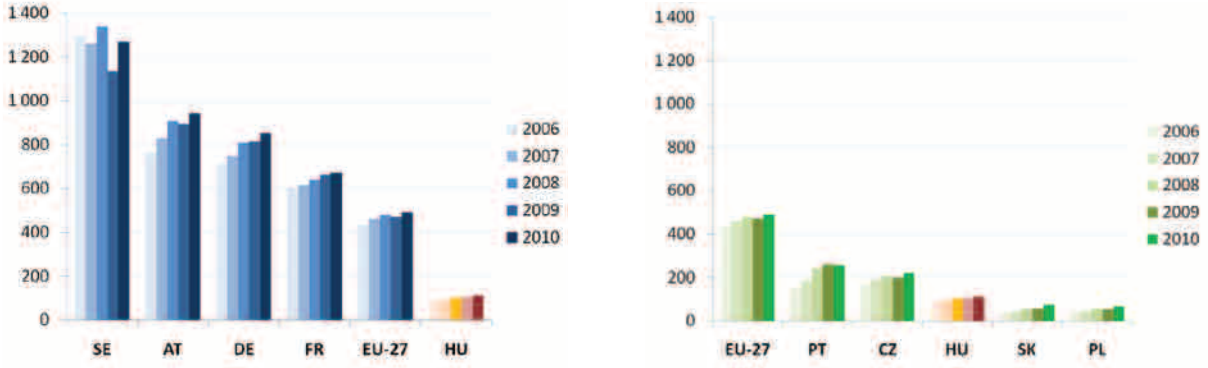


Figure 14. Per capita R&D expenditure (EUR)
Source: Eurostat

Hungary's per capita R&D expenditure is significantly lower than that of the developed countries. In 2010 the per capita R&D expenditure was EUR 800 in Germany and EUR 600 in France but barely exceeded EUR 100 in Hungary, which is less than one-quarter of the EU-27 average (EUR 490). Of the Visegrád Four countries, the Czech Republic has a relatively high R&D expenditure level (nearing that of Portugal), while Slovakia and Poland are behind Hungary.

ALTHOUGH R&D EXPENDITURE-TO-GDP INCREASED, THE RATE OF GROWTH WAS SLOW, MEANING THAT HUNGARY WAS UNABLE TO SIGNIFICANTLY REDUCE OVER 10 YEARS THE EXTENT TO WHICH IT LAGS BEHIND IN INTERNATIONAL COMPARISON

During the period of relative abundance of liquidity, Hungarian economic policy used strong incentives, primarily tax policy means, to encourage corporate research and development spending. In addition, significant grant amounts were paid to the business enterprise sector for RTDI purposes from the Research and Technological Innovation Fund and the EU Structural Funds between 2004 and 2009.[22] Consequently, fiscal (tax policy) and supply (grant) incentives applied a sort of "R&D shock therapy" to the economy. As a result, nominal enterprise R&D expenditure between 2000 and 2010 nearly quadrupled from HUF 47 to HUF 186 billion and even doubled in real terms, resulting in a GDP-rated increase from 0.36% to 0.69% (with 2005 being the watershed year).[23] During the same period, non-corporate R&D expenditure decreased in real terms.

[22] Even so only less than half the funds available under the Research and Technological Innovation Fund were paid to the business enterprise sector. The reasons for this are manifold; for more detail see the joint analysis by Ernst&Young and GKI (2010).
[23] We also need to take into account the fact that the high-value calls for proposals of the Structural Funds (Social Infrastructure OP, Social Renewal OP) may have given rise to unsustainable structures, thereby curbing the opportunities for grants to lower-value innovation options.

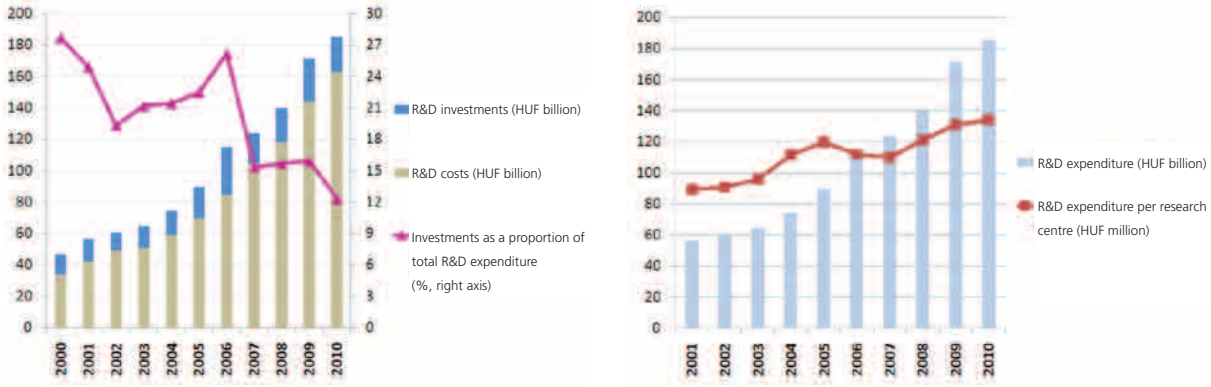


Figure 15. Enterprise research and development expenditure
Source: Hungarian Central Statistical Office

A warning sign in terms of the long-term perspective is that the proportion of ratio of R&D expenditure accounted for by investments has fluctuated considerably since 2000 and overall shows a sharp decline. Investments fell back significantly within research and development as a whole, resulting in increasing backwardness in terms of infrastructure, which makes it very difficult to maintain the current level of the Hungarian knowledge base[24] and virtually impossible for companies unable to finance substantial R&D infrastructure to gain access to the services provided by such infrastructures.[25]

THE PROPORTION OF CORPORATE R&D INVESTMENTS WITHIN OVERALL CORPORATE R&D EXPENDITURE FLUCTUATES WITH A DOWNWARD TREND COMPARED TO RUNNING COSTS

R&D expenditure per research centre is increasing only in nominal terms (HUF 90 million in 2001 and HUF 134 million in 2010); in real terms a reduction can actually be observed. All this may be explained by small R&D enterprises gaining ground, which is a positive development in other respects (e.g. potential strengthening of "gazelles" that produce high growth rates and are often intensive in terms of R&D[26]). More research is needed to reveal in more detail the reasons behind the significantly declining proportion of R&D investments and the structural and other characteristics of R&D investments.

The various industries have some special characteristics in terms of the research and development expenditure of companies.

- In Hungary the pharmaceutical industry is the engine of R&D expenditure. This industry realized the highest amount of R&D expenditure (close to HUF 56 billion in 2010). The long-term, steady upward trend in R&D dynamics is most probably not independent from the fact that among Hungary's large volume producing industries pharmaceutics is the most competitive.
- The performance of the IT sector is a key factor in the development and growth of all branches of the national economy. An important development is that by now computing services, including information technology and telecommunications as a whole, has become the second largest engine of growth, although it has a substantially more fragmented market structure than the pharmaceutical industry.
- The third industry capable of significantly increasing its R&D expenditure is vehicle manufacturing, one of the engines of Hungary's economic growth for decades. Road vehicle manufacturing, for example, is similar to the pharmaceutical industry in that it has a long history in Hungary. In addition to the existing capacities, multinational motor vehicle manufacturers

[24] Expansion, of course, is what would be desirable.
[25] The publicly available database of Project NEKIFUT (Project for Review and Roadmap for National Research Infrastructure) provides information about the available research infrastructures.
[26] Based on the Békés and Muraközy (2011) study, "gazelles" in Hungary are not necessarily R&D intensive, innovative companies. That of course does not mean (nor do the two authors claim) that innovative start-up companies do not deserve special attention.

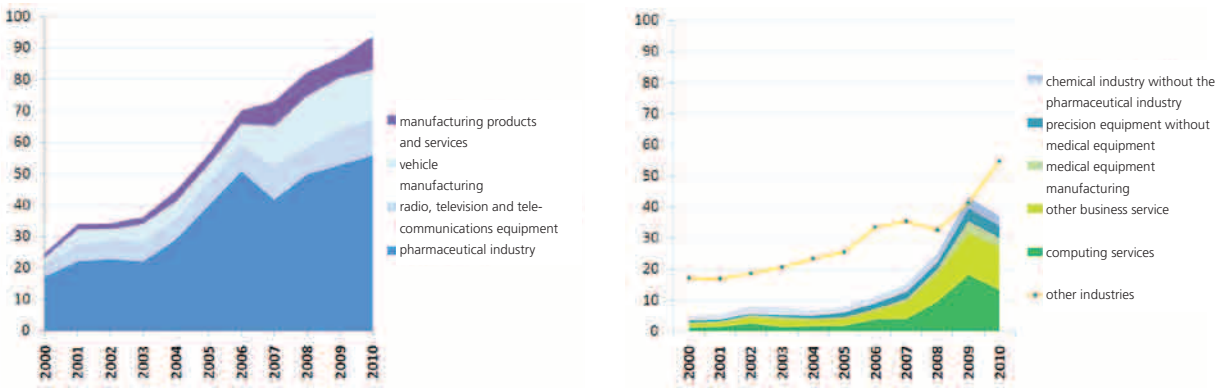


Figure 16. Enterprise research and development expenditure by industry (HUF billion)
Source: Hungarian Central Statistical Office

have also opened plants in Hungary and made Budapest, Győr, Miskolc and Kecskemét centres of vehicle manufacturing. These multinational companies operate significant R&D centres within their ranks but they are also major R&D clients of universities and research institutes.[27]

THE PHARMACEUTICAL INDUSTRY, THE IT SECTOR AND THE VEHICLE MANUFACTURING INDUSTRY ARE DECISIVE IN TERMS OF CORPORATE R&D EXPENDITURE. FOREIGN COMPANIES DOMINATE THE SCENE HERE

Basic research is also a fundamental element of the innovation system

Located in the countryside and now employing nearly 70 people, a biotechnological company began development and established a research and development base on the back of the results of its basic research. It turned this developed test system into a product, which served as a basis for its business. Almost half of the company's employees hold a scientific degree at some level. The significance of basic research projects, of course, lies most often not so much in the direct use of research results, but rather in spillover effects.

The three industries referred to above spend large amounts of money on research and development. Since 2007 R&D expenditure has significantly increased in vehicle manufacturing and in the IT sector; however, the decline in R&D spending among companies of the IT sector from 2009 to 2010 in the latter group indicates a certain setback. A decline was also observed in medical equipment manufacturing, other business services and even the precision equipment industry and some other industries. That is presumably a result of the crisis: smaller companies are more vulnerable to recession than large enterprises, at least as far as their R&D expenditure is concerned (see later the Figure by size categories, which indicates a decline in the R&D expenditure of small enterprises).

During the last years of the 10-year review period the total R&D expenditure of large enterprises only increased slightly (in fact, in 2009–2010 a nominal stagnation was observed, which was a 4% reduction in real terms[28]), whereas the SME sector managed to maintain its R&D momentum until 2010. The increase in the total expenditure of medium enterprises is noteworthy, and is also supported by the increase in current price of the average expenditure data.[29]

[27] Since the political transformation, a number of high-tech companies implementing some (but not significant) R&D in Hungary have left the country with their production units and thus proved non-competitive in the Hungarian economy under the local circumstances. These have included Philips, IBM, Elcoteq and more recently Nokia. The contribution of new, innovation-based domestic knowledge to the added value of production was mostly negligible in the above cases, unlike in certain cases of the pharmaceutical industry, the IT sector and vehicle manufacturing.
[28] The 2009 consumer price index was 4.2% and the GDP deflator stood at 3.6%.
[29] These data also support the argument that grants for R&D activities did not affect small and medium enterprises equally.

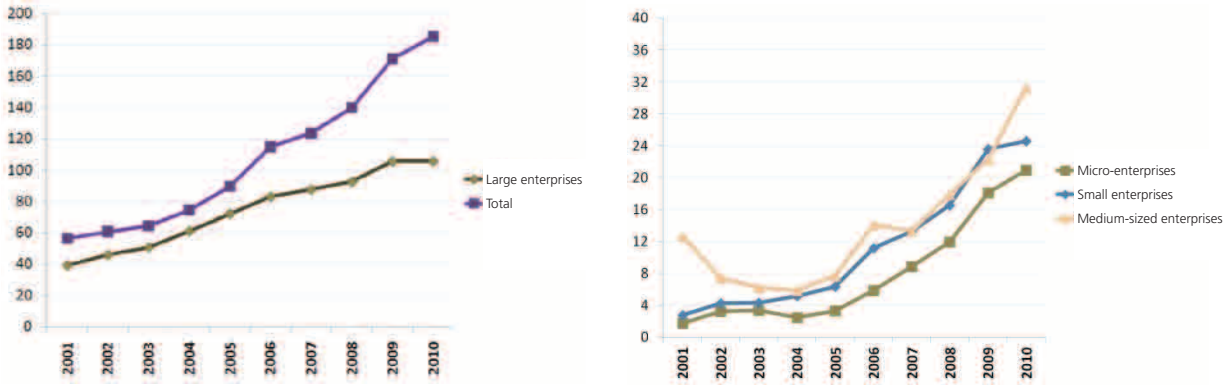


Figure 17. Enterprise research and development expenditure (HUF billion)
Source: Hungarian Central Statistical Office

As for the overall picture of businesses, there is no significant nominal increase in R&D expenditure per company. More specifically:

- the per company R&D expenditure is growing at a slower rate among large enterprises, while
- R&D expenditure is increasing for micro enterprises,
- and, after falling back in 2007, the expenditure level of medium-sized enterprises is increasing significantly,
- a considerable increase was observed in the case of small enterprises but in 2009-2010 the momentum ceased and their R&D expenditure decreased.

Stagnation is registered in real terms (in fact a slight decline), with the average R&D expenditure of medium-sized companies declining in real terms.

R&D EXPENDITURE PER BUSINESS ENTERPRISE SECTOR RESEARCH UNIT HAS NOT INCREASED OVER THE PAST DECADE, MEDIUM-SIZED ENTERPRISES HAVE BEEN UNABLE TO STRENGTHEN THEIR POSITIONS, AND THERE IS A SIGNIFICANT SPREAD IN R&D EXPENDITURE

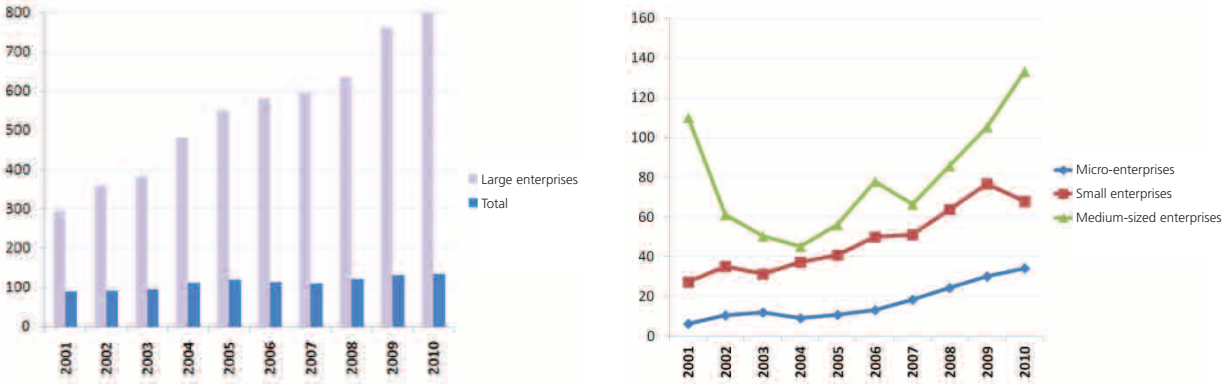


Figure 18. R&D expenditure per company (HUF million)
Source: Hungarian Central Statistical Office

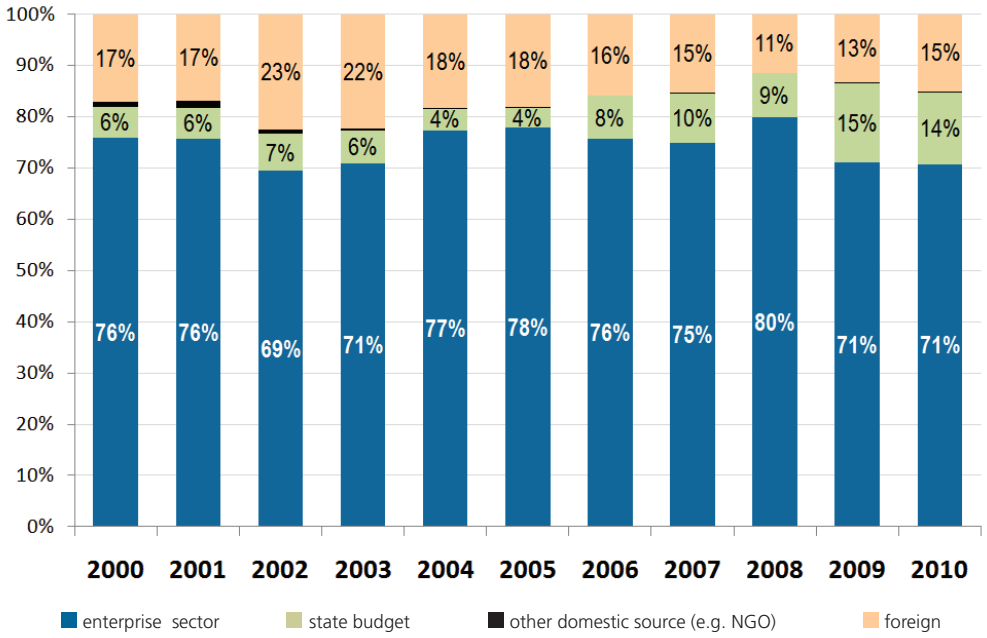


Figure 19. Breakdown of sources of enterprise research and development expenditure (%)
Source: Hungarian Central Statistical Office

Businesses finance their R&D expenditure from own sources, from the state budget (mostly through calls for proposals), from foreign sources (from foreign calls for proposals and/or other foreign sources, e.g. sources of their parent companies) and other (typically non-profit) sources:

- until 2009 own sources had financed roughly 75-80% of R&D performance, but in more recent years that percentage has dropped to about 70%,
- until 2004-2005 the proportion of state budget sources was very low, around 4-6%, then it doubled by 2006 and again by 2009 and even after a slight decrease was close to 14% in 2010,
- the proportion of foreign sources has also fluctuated and more recently settled at around 13-15%, which is quite high in international comparison.[30]

An important development worth emphasizing is that while only about 20% of the R&D expenditure of the business sector in the OECD member countries is financed by foreign companies, this figure is above 60% in Hungary and only Ireland has a similarly high ratio.

THE HUNGARIAN SUBSIDIARIES OF FOREIGN COMPANIES PLAY A CRUCIAL ROLE IN ENTERPRISE R&D FINANCING, AND THE IMPORTANCE OF THE STATE BUDGET INCREASED BETWEEN 2005 AND 2010

Companies involved in R&D activities can use various types of grants won through calls for proposals. In addition to the Hungarian call-for-proposals system and the partner financing sources of the European Union's Structural Funds,[31] direct sources from Brussels are also available through the EU's Framework Programmes.[32]

[30] For detailed information see the Annex.
[31] Under the First National Development Plan in 2004 to 2006, and since 2007 through the operative programmes of the New Hungary Development Plan and the New Széchenyi Plan.
[32] A small section of companies also have access to overseas (USA, Japan etc.) resources.

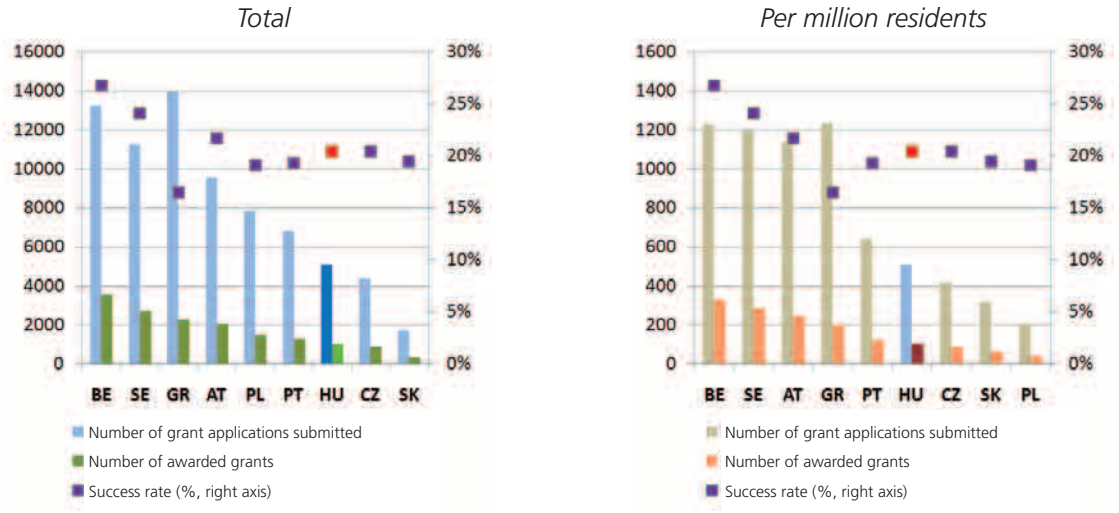


Figure 20. Performance of Hungarian participants in the EU's Seventh Framework Programme until late 2011
Source: ECORDA

Regional opinions about the Hungarian call-for-proposals system

Based on the 26 interviews received, the majority of companies (18 out of 26) have won Innovation Fund grants. Most of them mentioned the Baross Gábor Programme (10), the Jedlik Ányos Programme (5) and the Innocsekk call for proposals (4). The respondents did not consider the calls for proposals of the Innovation Fund successful due to the lengthy settlement period and the almost 1.5-year-long period when the programme was suspended. They considered the relevant calls for proposals of the operative programmes of the New Széchenyi Plan more complicated than those of the Innovation Fund and also unsuitable for SMEs. The majority of the survey participants were of the opinion that the calls for proposals of the New Széchenyi Plan cannot replace the calls for proposals of the Innovation Fund. This is also mirrored in the policy grant logic, according to which the New Széchenyi Plan calls for proposals are primarily designed to help regional catching up and cohesion whereas the calls for proposals of the Innovation Fund follow innovation policy objectives that are independent of specific regions.

Hungarian applicants' results in R&D calls for proposals announced by the European Union are average. Based on data from the end of the last year of the Seventh Framework Programme currently in progress, Hungary performs well in relation to the Visegrád Group, but its performance falls below that of the former member states. The percentage of successful applications (20.4%), however, is close to the EU average of 22%.[33] As for the amount of grants awarded as a proportion of the total project amount, Hungary's result is only 14.4% compared to the EU average of 20.7%.

The report by the European Commission published in early 2012[34] provides information about the proportion of the full grant amount awarded under the "Cooperation" R&D programme, the largest part of the Seventh Framework Programme, that goes to SMEs.[35] Within the EU-15, an average of 15% went to SMEs, but the percentage was slightly lower in the case of the most developed countries, e.g. 14.5% in Germany's case and 12.4% in Sweden's case. The average for the new member states (EU-12) was 23%, somewhat higher than that of the old member states. The proportion going to Czech SMEs, which can be regarded as more developed, was around average, while Hungarian SMEs and Slovakian SMEs won 30.2%

[33] See also the table in the Annex.
[34] Eighth Progress Report on 2007–2011 SMEs' participation in FP7, European Union, 2012.
[35] With regards to the Framework Programme as a whole, there are no statistics available with breakdown by enterprises.

and 31.1% of the total grant amount respectively.[36] The SMEs of the relatively underdeveloped countries were more successful in the research programmes for the benefit of SMEs of the Cooperation programme than all the other organizations of the given country participating in the programme (research institutes, larger enterprises).

International vs. domestic calls for proposals

A small Hungarian enterprise operating in a special technology field was contacted by an international research coordinator and asked to work as a supplier for an R&D project financed from the Seventh Framework Programme. This company told us that they are certain that compared to Hungarian calls for proposals, international calls for proposals offer more favourable opportunities and fit the R&D logic better. This opinion is shared by a small enterprise with a successful history of over 10 years in bio-energetics. The other SMEs participating in the interviews typically have no experience in the implementation of international call-for-proposals projects. Their subjective opinion is somewhat more favourable of international calls for proposals but many of them mentioned that they were also satisfied with domestic call-for-proposals schemes.

A In addition to direct grants for applications, another important group of incentive tools are research and development tax allowances, whose actual operating mechanism we know little about. Until the recent change regarding the innovation contribution, the Hungarian tax system, even in international comparison, contained significant indirect incentives to bolster corporate R&D activities.[37]

THERE IS STRONG INTERNATIONAL COMPETITION IN TERMS OF GOVERNMENT GRANTS FOR ENTERPRISE R&D, AND HUNGARY'S POSITIONS MAY BE AT RISK IN TERMS OF DECISIONS MADE BY FOREIGN DIRECT CAPITAL REGARDING THE LOCATIONS OF KNOWLEDGE-BASED ACTIVITIES

The innovation contribution as an indirect incentive

Until the end of the year 2011, the obligation to pay the innovation contribution could be reduced by the direct costs accounted for own R&D activities and the costs of publicly funded R&D work or work outsourced to non-profit research organizations. Close to half of the 26 interviewed companies (12) reported that they had already taken advantage of the option to reduce their payment obligation of the innovation contribution. These companies are typically hit hard by the changes in the tax regulations (11 of the 12) resulting in a significant slow-down in terms of developments for 6 companies (half of those companies using the option to lower their innovation contribution). Some of the large enterprises are not convinced that the new calls for proposals and the possibility for R&D to be certified on the project level results in the same advantage and thus the same incentive effect as earlier.

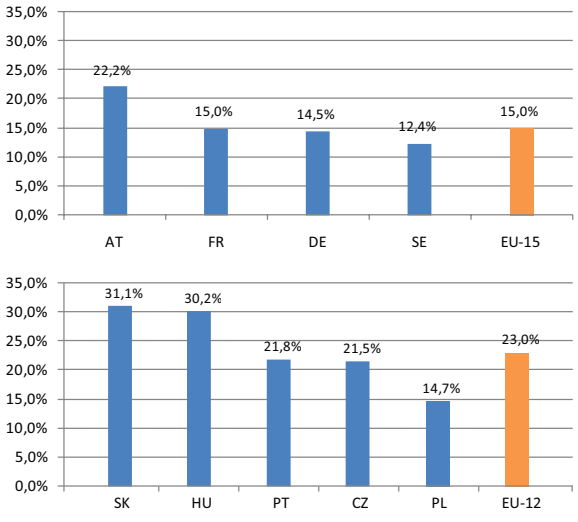


Figure 21. The proportion of SMEs participating in the Seventh Framework Programme (%)
Source: Eighth Progress Report on 2007–2011 SMEs' participation in FP7, European Union, 2012.

[36] The available report does not contain EU-27 specific data.

[37] The new regulation related to the innovation contribution has significantly changed the proportion indicated in the Figure, as a result of which the proportion of indirect grants is expected to decrease by around 50 percent and that of direct grants is likely to increase.

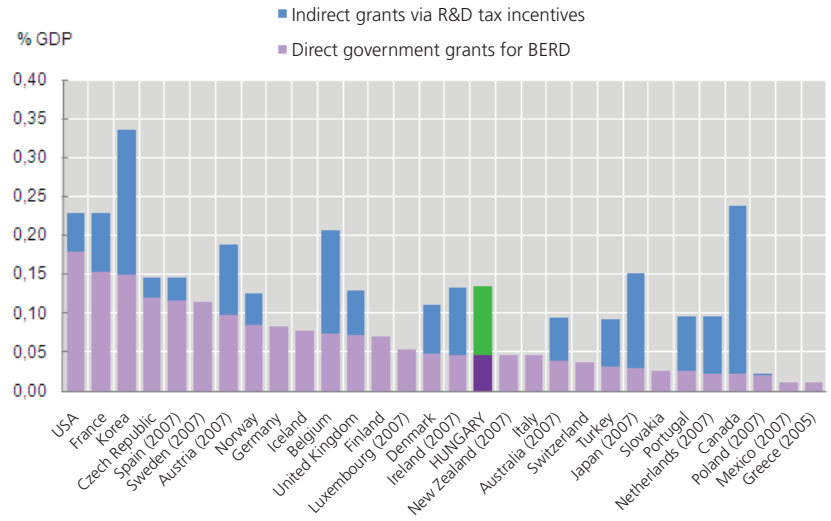


Figure 22. Direct and indirect government grants for corporate R&D as a percentage of GDP, 2008
Source: OECD (2010), Measuring Innovation: A New Perspective (September 2010 figure update), based on OECD, R&D tax incentives questionnaire, January 2010; and OECD, Main Science and Technology Indicators Database, September 2010.

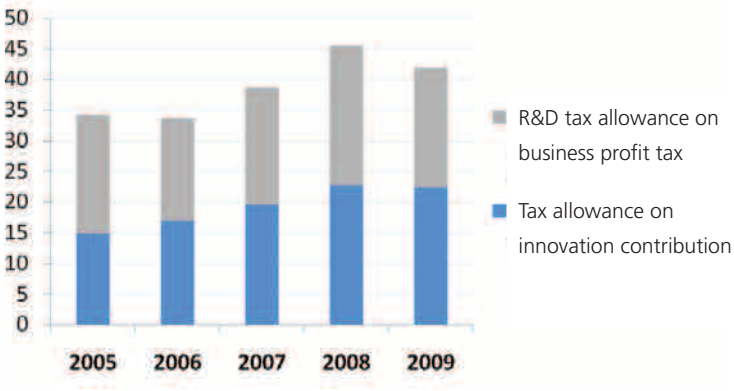


Figure 23. The amount of key R&D tax incentives (HUF billion)
Source: NGM-IKF (Ministry of National Economy, Innovation and R&D Division) calculation based on NAV (National Tax and Customs Administration) data

The 2010 Ernst&Young-GKI evaluation also pointed out that the majority of direct R&D grants are awarded to small and medium-sized enterprises. On the other hand, National Tax and Customs Administration (NAV) data suggest that the majority of indirect grants (i.e. tax advantages) are given to large enterprises (which, for the most part, are in full or majority foreign ownership). Companies involved in research and development are often uncertain as to exactly how, for what specific activities and under what circumstances they can gain a tax allowance and for this reason they do not to take advantage of this opportunity.[38]

[38] The 2011 corporate survey by Deloitte asked large enterprises about their opinion of R&D tax allowances. Many of the responding companies (33%) are not familiar with the available R&D tax allowances and thus, due to the uncertainty as to how to gain approval by the tax authority, consider it a risky business. Although 11% of the survey participants know about these tax allowances, they cannot decide whether their companies carry out R&D activities that meet the criteria; 7% said they do not apply for tax allowances because of the unknown risk management; 6% also highlighted the uncertainty of risk management but believe that the risk of tax allowances is mostly due to the unknown position of the tax authority. It may increase the uptake of tax allowances if the company planning to take advantage of such opportunity requests an official statement in order to eliminate uncertainties. With the amendment of the Innovation Act in February 2012, it became possible for the Hungarian Intellectual Property Office, on request, to issue a decision binding on the tax authority as to certification of the research and development activities of businesses.

3.4. THE ROLE OF RESEARCH AND DEVELOPMENT AND INNOVATION GRANTS

The experiences of internationally competitive companies clearly indicate that no business can keep up with the competition without substantial innovation expenditure. This primarily requires own expenditure within the company that can only be complemented by grant-type outside opportunities and other incentives. In other words, corporate expenditure is needed not only to finance research and development activities but also to adapt, apply and market knowledge and new information acquired either with or without R&D.

Companies usually finance the technological and non-technological innovation[39] they need for their operation and successful market presence on their own or have the clients of their customers, products and services finance those.[40] In addition to own expenditure and client-side financing acquired on the market, innovation in developed industrial countries is also facilitated by community (state or other EU level) direct sources and allowances (e.g. tax allowances), capital funding and various other forms of financing resources.

As part of a Community Innovation Survey for the period 2006-2008, the Hungarian Central Statistical Office conducted a survey to find out what outside grants innovative companies received to finance their innovative activities.

ONE QUARTER OF INNOVATIVE COMPANIES WITH OVER 10 EMPLOYEES, I.E. A SMALL PROPORTION OF COMPANIES IN BUSINESS, RECEIVE PUBLICLY FUNDED GRANTS FOR THEIR INNOVATIVE ACTIVITIES AND EVEN FEWER PARTICIPATE IN INTERNATIONAL CALLS FOR PROPOSALS.

Over one-fourth of innovative companies received some publicly funded grants (from the state or the local government). One-fifth of all the innovative companies mentioned central government grants (including from ministries and their agencies). Local or regional municipal grants are insignificant in Hungary and affect only one in one hundred innovative companies. The European Union, however, provides more substantial funding for innovation: over one-tenth of innovative companies have indicated that their innovations involved some EU source (including grants received from the Structural Funds). As far as R&D with a higher knowledge content (and more risks involved) is concerned,

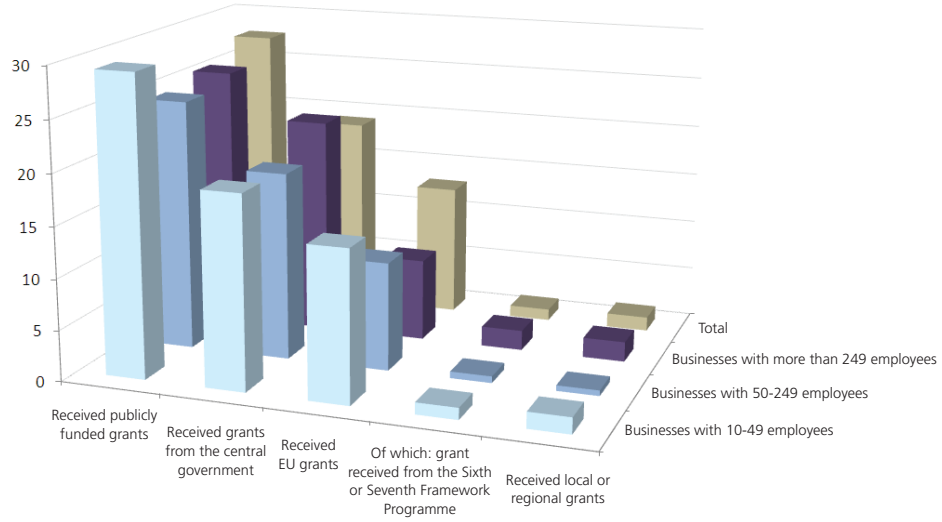


Figure 24. Proportion of innovative companies receiving the given grant between 2006–2008 by size category (%)
Note: Businesses with more than 10 employees
Source: Hungarian Central Statistical Office, Community Innovation Survey

[39] For definitions, see the beginning of chapter 4.
[40] Even a rough overview of enterprise innovation financing decisions is beyond the scope of this publication.

1% of the responding companies mentioned that the implementation of the innovation project received help from the EU's Sixth or Seventh Framework Programme. Yet, we need to maintain a clear distinction between innovation and R&D as the modest direct role of the Framework Programmes in innovation does not mean that Hungarian companies cannot or do not want to participate in international RTDI cooperation projects, nor does it mean that the indirect innovative effects of the Framework Programme would be insignificant.[41]

The responses seem to back up everyday experience in that the funding of innovation from external sources in Hungary primarily means publicly funded innovation. Since capital funding for companies, especially those owned by Hungarian private individuals, is moderate compared to in developed market economies, the system of state assets including grants that provide real additional sources to companies such as those received from the Structural Funds plays an important role.

We can also see that the level of support received is roughly the same in all size categories (at least as far as the proportion of funded companies is concerned). SMEs and especially those micro-enterprises that have large growth potential and are more willing to take risks when utilizing new knowledge have not received greater support so far.

RTDI is risky

Scientific and technological uncertainties are significant at the early stage of the development process but then are reduced with time. Market uncertainties, however, are considered significant until development costs are repaid. A good example for market uncertainty is a biotechnological company working its way into the Japanese market that once failed because it technology was stolen. The second time it learned from this experience and succeeded in breaking onto the Japanese market.

RISKS INVOLVED NEED TO BE TAKEN INTO ACCOUNT WHEN ESTABLISHING RTDI GRANT SCHEMES

There are risky RTDI projects in every company category. Differentiation with regard to risks and uncertainties assumed by companies is on the agenda of both EU and Hungarian policymakers in terms of awarding funding.

3.5. THE ROLE OF VENTURE CAPITAL

Venture capital first appeared in Hungary after the political transformation in the early 90s. Since then the sector has undergone significant development both in regional and European comparison. Creating hybrid funds, the Hungarian JEREMIE Programme[42] launched in 2009 reinforced this tendency.

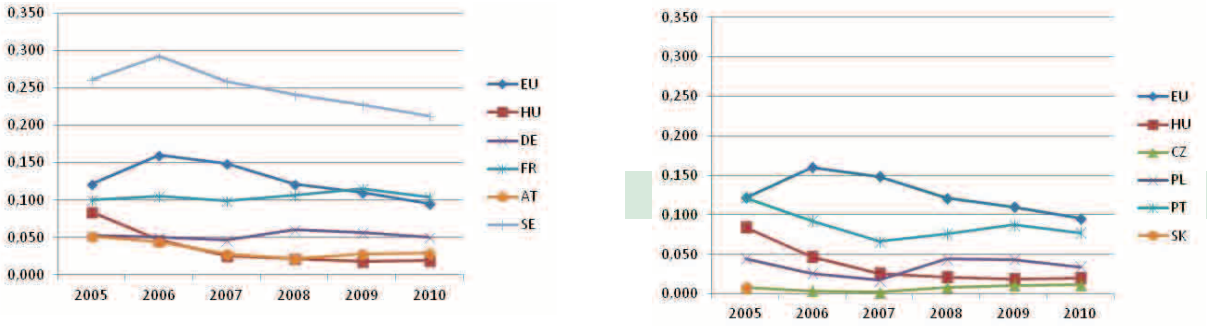


Figure 25. Venture capital and private equity investments as percentage of GDP
Source: Innovation Union Scoreboard (2011)
Notes: (1) Venture capital figures include both early-stage, expansive and buyout-type capital. (2) The average is based on the 34 European countries considered.

[41] The above argument is supported by the following 2010 EC expert opinion: "There is some evidence that successive FPs, and FP7 in particular, are having a positive 'leverage' effect in promoting national research efforts and reinforcing the research and innovative capacity of industry." (p. 8 of the work cited above)
[42] JEREMIE: Joint European Resources for Micro to Medium Enterprises

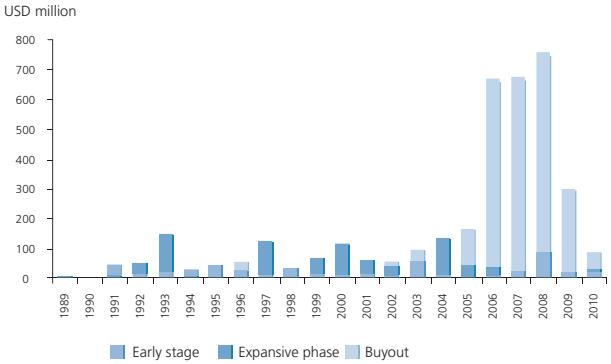


Figure 26. Changes in the value of annual venture capital and private equity investments in Hungary by function of the financing
Source: Karsai (2011), p. 848.

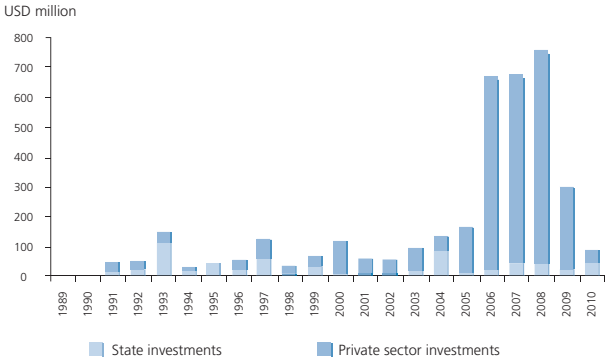


Figure 27. Changes by year in the value of annual venture capital and private equity investments in Hungary
Source: Karsai (2011), p. 846.

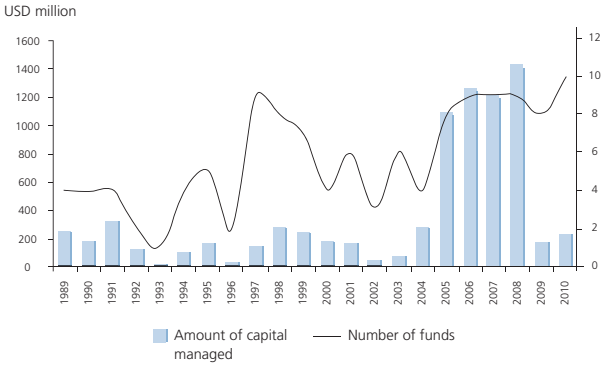


Figure 28. The number of venture capital and private equity funds and the value of their capital allocated to Hungarian investments
Source: Karsai (2011), p. 837.

Based on the figures of EVCA (European Private Equity and Venture Capital Association) and HVCA (Hungarian Venture Capital and Private Equity Association), venture capital and private equity investments in Hungary as a percentage of the GDP are at a significant level not only in regional but also in European comparison. Based on the data of the Innovation Union Scoreboard[43], capital investments covering early stage, expansive and buyout type venture capital amounted to 0.09% of GDP in 2005, which was higher than that in Poland, the Czech Republic, Slovakia and even Austria and came close to the 34 European countries' average of 0.12%. The volume of investment, however, fell considerably from 2005 and was only measured at 0.02% of the GDP in 2010.

If we exclude the last, buyout-type investments of the classic corporate life cycle from the value as a percentage of GDP, we can see a significant discrepancy: the ratio in Hungary is less than one-tenth of that in Europe. This brings us to the conclusion that one-time, large amounts of money invested in buyouts improved Hungary's rating, while riskier, early-stage investments are atypical. Since 2009, the volume of venture capital investment transactions has significantly fallen due to the economic and the financial recession.

ALTHOUGH VENTURE CAPITAL INVESTMENTS ARE SIGNIFICANT IN HUNGARY, EARLY-STAGE FINANCING HAS BEEN ATYPICAL IN THE RECENT YEARS

Roughly 90% of the venture capital and private equity investments in Hungary came from foreign sources (global and regional funds) and the remaining 10% was made up of funds investing only in Hungary. It is indicative of the different interests of Hungarian and regional funds that financing for companies in the expansive and start-up phases was primarily provided by Hungary-based investors while regional financiers were primarily interested in buyout opportunities.

[43] Innovation Union Scoreboard 2011, Pro Inno Europe, INNOMETRICS, 7 February 2012.

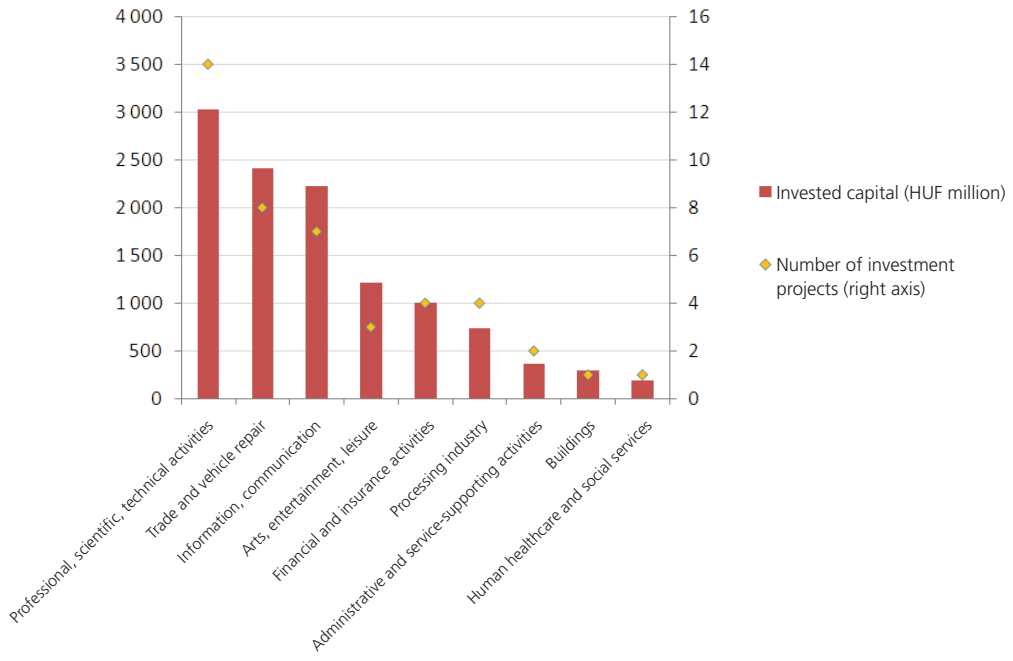


Figure 29. Placements of JEREMIE venture capital programmes until February 2012 by industry
Source: Magyar Vállalkozásfinanszírozási Zrt. (Venture Finance Hungary plc.)

Corporate life cycle and financing

A highly innovative company, which currently employs just 4 people and exports high-tech products, plans to primarily sell its products in 2–3 years' time (instead of developing them) and could be an ideal target for venture capital. This is also in line with the current owners' intentions to sell the company to international investors at some point in the future. A 3-person biotechnological company with its own, unique biological procedure for pharmaceutical research quotes the scale of capital demand as a difficulty for successful implementation. An award-winning company manufacturing alternative vehicles cannot find an investor, although the development path it took 11 years ago has proven successful, and is at a progressive disadvantage in terms of product life cycle.

The volume of investments is exceptionally high in the chemical, medical science and healthcare industries while the number of investment projects is above average in ICT and the manufacture of consumer goods.

Over the past two years the venture capital financing options of early-stage innovative companies have expanded. A total of 8 capital funds with a total nominal value of approx. HUF 45 billion have been set up within the framework of the JEREMIE programme with EU co-financing. Capital funds first appeared in 2010 and implemented 11 capital placements that year, which was continued with 33 additional investments in 2011.

THE JEREMIE VENTURE CAPITAL FUNDS CAN MARK A TURNING POINT IN TERMS OF EARLY-STAGE CAPITAL FINANCING OPPORTUNITIES

Overall, the distribution of capital placement by industry reinforces the opinion that the opportunity for above-average growth, whose professional feasibility the decision makers managing the funds measure according to their own growth expectations, is available not only to technological-type RTDI companies.

4. INNOVATION RESULTS AND DRIVING FORCES

This section is based on the 2004–2006 and 2006–2008 data of the Community Innovation Survey. The survey defines types of innovation on the basis of the third edition of the OECD Oslo Manual (2005). According to the Manual, an innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations. Types of innovations include technological innovations (product or process innovations) and non-technological innovations (marketing and organizational innovations).[44] Within the product and process innovation category, surveys also typically distinguish between unfinished and failed innovations.

In the Community Innovation Survey, innovative companies are businesses that introduced innovation during the period under review in the survey. Consequently, a business is a product or process innovator if it introduces or attempts to introduce a new or significantly improved product or process in the relevant period.

In this document, we will present the innovation performance of the enterprise sector in terms of the following aspects:

- we will describe the weight and penetration of innovative companies within the business/enterprise sector,
- we will describe the extent of various forms of innovation introduced by innovative companies,
- we will also discuss the role of innovation in business performance,
- we will show what motivations lie behind companies' innovations in the interests of environmental sustainability,
- we will present the characteristics of the sources of information required for innovation,
- and finally we will briefly discuss factors hindering innovation, specifically from the point of view of businesses.[45]

4.1. PENETRATION OF INNOVATIVE COMPANIES

The ability of the business sector and the economy as a whole to reform themselves and their products or services is of key importance to both. Key measures of enterprise innovation include the proportion of companies pursuing innovative activities in the economy as a whole, the relationship between the size and innovation ability of companies and the percentage of innovative businesses in individual regions.

In total around one-fifth of businesses with more than 10 employees qualify as innovative companies and only a very small increase was registered in this respect in the later survey as compared to the earlier survey. Innovativeness rises more or less exponentially with increase in company size:

- around 15% of small enterprises
- 30% of medium-sized enterprises, and
- nearly 60% of companies employing at least 250 persons are innovative.

[44] It is important to recognize that the distinction refers to technical content, but the term 'technology' is used in a much broader sense today than it used to be. It is a noteworthy development compared to the definition in the earlier versions of the Oslo Manual that the word "technology" has now been removed from the definitions of product and process innovations. Although the definitions of product and process innovations still include functional or user-friendliness related improvement as a key component, the purpose of removing the word "technology" was to make these terms more "intensive" and applicable to businesses with low intensity R&D activities (e.g. companies in the service industry). Technological innovation, however, has not been downgraded; the authors simply broadened the definition used for survey purposes. The problem is that in Hungary these terms are often confused.

[45] It is beyond the scope of this report to analyze the comprehensive dynamics of the processes using a systemic approach.

Niche market opportunities

A company in Southern Hungary, which now employs more than 70 people, started off focusing on product categories with small turnover within its globally significant industry because it thought that it would not be worthwhile for large companies to produce them. This company uses business intelligence methods to follow market trends and continuously manages to identify the niche markets of its industry and aligns the implementation of research and development with this, focusing on the domestic market primarily. Another company, whose software is used on 125 million devices all over the world, used a similar strategy successfully to find a global niche market in information technology (in a different market size from the previous company). This company, which is now a group of companies, does not simply monitor market demand, but is one step ahead of the market on the basis of technological changes and seeks to determine what product development opportunities will be created by technological advances. There is also a small enterprise that is gaining larger and larger shares of international markets in the field of precision mechanics; it started off after privatization and produces unique products, replacing adaptive innovations with its own developments.

THE INTENSITY OF INNOVATION ACTIVITY IN THE BUSINESS SECTOR IS LOW BY INTERNATIONAL COMPARISON; IT IS PARTICULARLY LOW AMONG MEDIUM-SIZED COMPANIES AND EVEN LOWER AMONG SMALL ENTERPRISES.

According to the 2008 CIS survey, 29% of Hungarian businesses qualified as innovative companies (in the industries used in international comparison[46]), which was not only significantly below the 51.6% average of the EU-27 and the figures of more advanced EU Member States, but also lower than the Central European and Portugal average, and only exceeded the Polish figure.[47] The proportion of small enterprises paints an even worse picture: only of quarter of this category is innovative in Hungary while the EU average is nearly double of this figure. Hungarian statistics are somewhat better among companies with more than 250 employees, as 67% of Hungarian companies of this size are innovative as compared to the 79% average of the EU-27. Compared to countries in the same group, the Hungarian figure is about the same as the Slovakian or the Polish one but falls behind the Czech and Portuguese results.

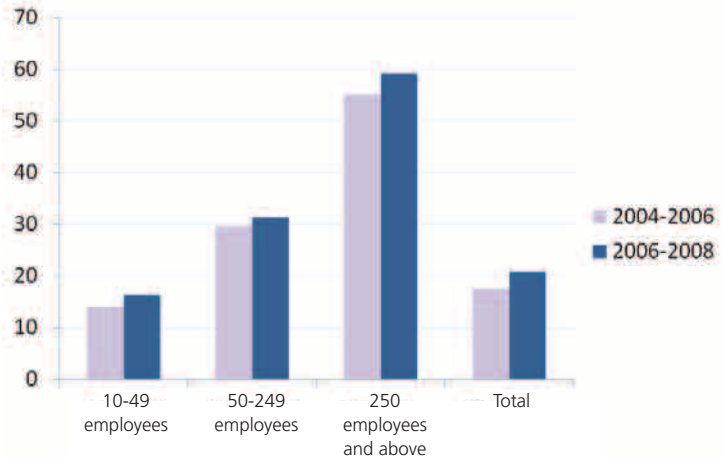
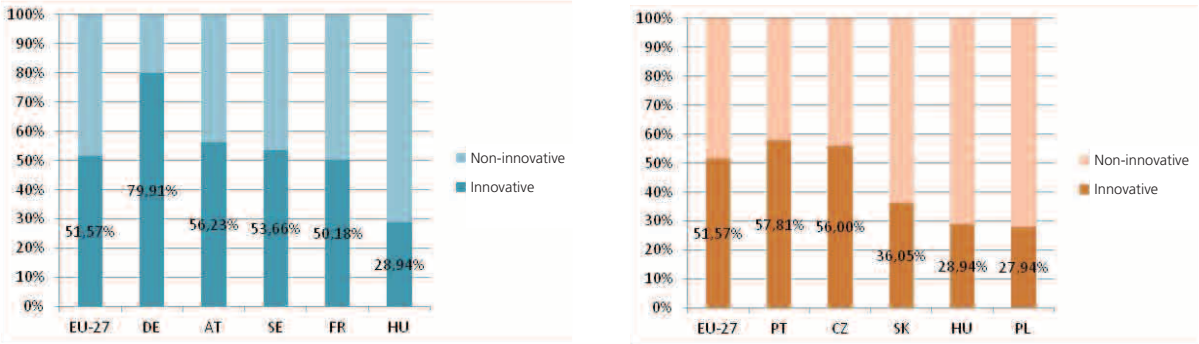


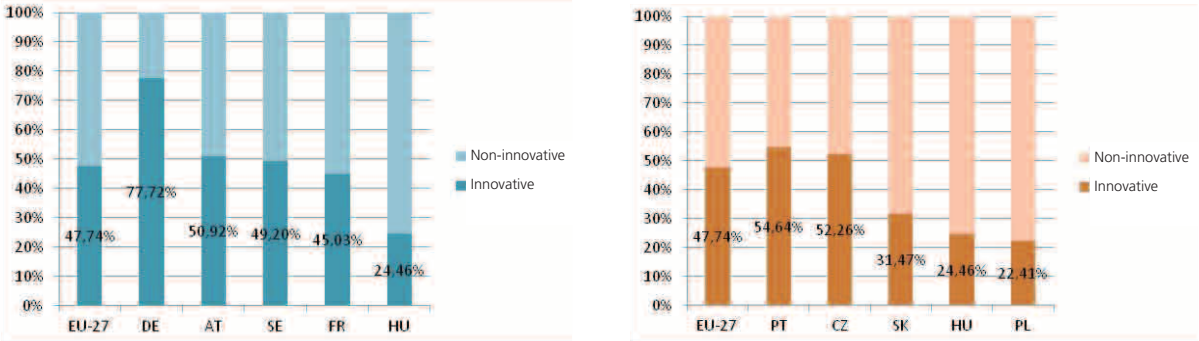
Figure 30. Proportion of innovative companies by size (%)
Note: Businesses with more than 10 employees
Source: Hungarian Central Statistical Office, Community Innovation Survey

[46] That is, in the NACE B, C, D, E, G46, H, J58, J61, J62, J63, K and M71 industries.
[47] In more advanced countries, the role of R&D-based innovation is generally given greater emphasis, which should be taken into account during analysis of responses in the CIS survey.

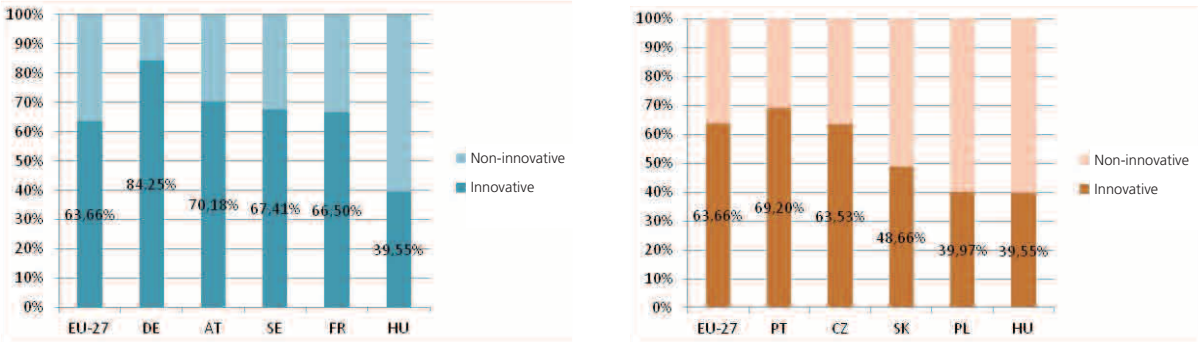
Total number of businesses



Businesses with 10-49 employees



Businesses with 50-249 employees



Business with 250 employees and above

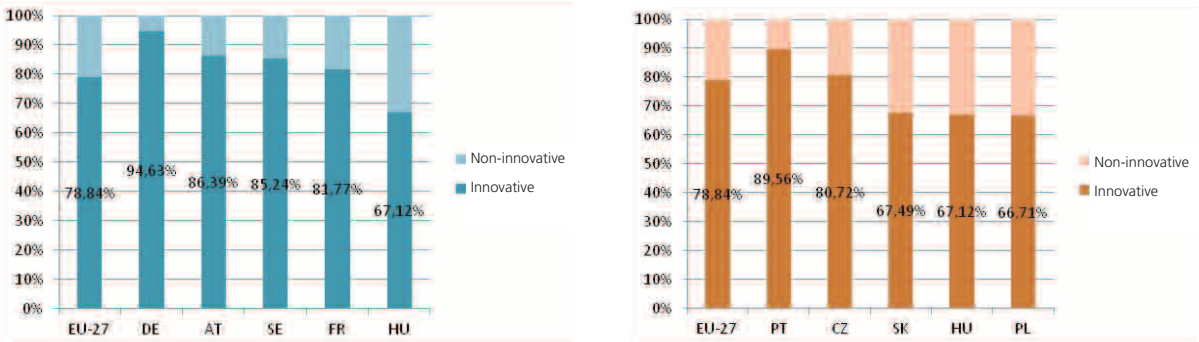


Figure 31. Percentage of innovative companies in 2008, international comparison
Source: CIS2008
Note: the figure only includes data of companies in the NACE B, C, D, E, G46, H, J58, J61, J62, J63, K and M71 industries.

World market leadership: a challenge to management

Since the political transformation, few companies had considerable global success in innovation based on new knowledge, but there are exceptions, particularly in the field of information technology. The case of the company making virtual architectural design tools is well-known. There is also a now 9-year-old business that develops software for devices connected to IT systems; its services are now used by 125 million devices. The management of both companies pointed out that breaking into the global market posed enormous organizational development and management challenges.

IN THE SME SECTOR, THE INNOVATIVE PERFORMANCE OF EVEN CENTRAL HUNGARY IS SIGNIFICANTLY BELOW THE EU AVERAGE

In Hungary, the competitiveness and stage of development of the various regions are uneven and the proportions of innovative companies also vary region by region. It is informative to take a closer look at small and medium-sized enterprises as their competitive environment is different from that of the larger companies and it is the development of the SMEs that may provide an opportunity for catching up.

- On average, nearly every seventh SME is involved in the development of a new product or process,
- there are two regions above the average, Central Hungary (18%) and Central Transdanubia (17%), while
- the two regions with the lowest innovation intensity among SMEs are Southern Transdanubia and Northern Hungary (10% each).

4.2. TYPES OF INNOVATION

It may be concluded on the basis of available data that the proportion of companies implementing product and process innovations grew by the period between 2006 and 2008 as compared to the period between 2004 and 2006. Between 2006 and 2008, the proportion of marketing and organizational innovator businesses was slightly higher than the proportion of businesses implementing a new product and/or process innovation.[48] This shows that the reorganization of business processes, updating of customer service systems, introduction of company information systems, other management innovations etc. are key forms in which company innovations are implemented.

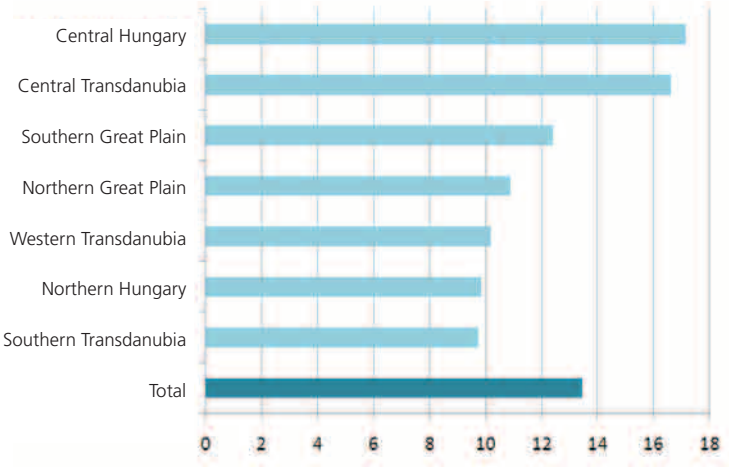


Figure 32. The proportion of SMEs involved in the development of new products and processes (%, 2004–2006)
Note: Businesses with more than 10 employees
Source: Hungarian Central Statistical Office, Community Innovation Survey

[48] It should be noted with regard to interpretation and comparability of the data that the available data are relatively old. Since marketing and organizational innovation were only introduced as grouping criteria in 2005, the comparison of the two sets of data from the Hungarian Central Statistical Office produce results that are not unambiguous.

The significance of organizational innovation

A manager of a small enterprise successful particularly in technological innovation said the following: "The key is continuous innovation in a broad sense. Everything that is new to the company is introduced instantly whenever possible. That includes innovations in computing technology, cost structure, commercial line or even lean management etc. Industrial innovation is only a part – and probably a smaller part – of innovation processes." The manager added that it is vital to learn the optimal operation of foreign companies' branch offices and subsidiaries, and from Hungary that can be tricky.

IN HUNGARY, A SIMILAR PROPORTION OF MARKETING AND SALES ACTIVITY AND ORGANIZATIONAL PROCESS INNOVATIONS CAN BE OBSERVED AS OF PRODUCT AND PROCESS INNOVATIONS WITH TECHNOLOGICAL CONTENT.

Approximately one-third of SMEs are product or process innovators in the EU on average, but in Hungary only 17% of SMEs may be considered process innovators. German and Austrian SMEs are far above the EU average but even Czech and Slovak companies of this category outperform their Hungarian peers in innovation. The proportion of marketing and organizational innovators in the EU average is high, around 40% (and over two-thirds in Germany), while in Hungary only one-fifth of SMEs have been innovative in this field. In certain countries, including Austria and Poland in addition to Hungary, a decreasing level of marketing and organizational innovation can be observed.

Research-intensive spin-off companies

Spin-off enterprises are key players in the innovation system and their presence also provides proof that the operation of the system is balanced. Such businesses emerge when new knowledge is created within a large organization (typically a university but sometimes even private sector organizations) and it is reasonable to start a company to utilize such knowledge commercially. There are very few spin-off enterprises in the Hungarian economy and the number of sustainable spin-off companies is only growing at a slow pace. The success of a university spin-off launched in 2004 to utilize bioinformatics knowledge of the institution highlights the significance of interdisciplinary knowledge. This enterprise now employs 20 people; its main development objective is to find and generate new markets. In this field, the price of genome sequencing is falling more and more sharply, which means that the quantity of data to be processed is growing; the company believes this is both a threat and an opportunity for them.

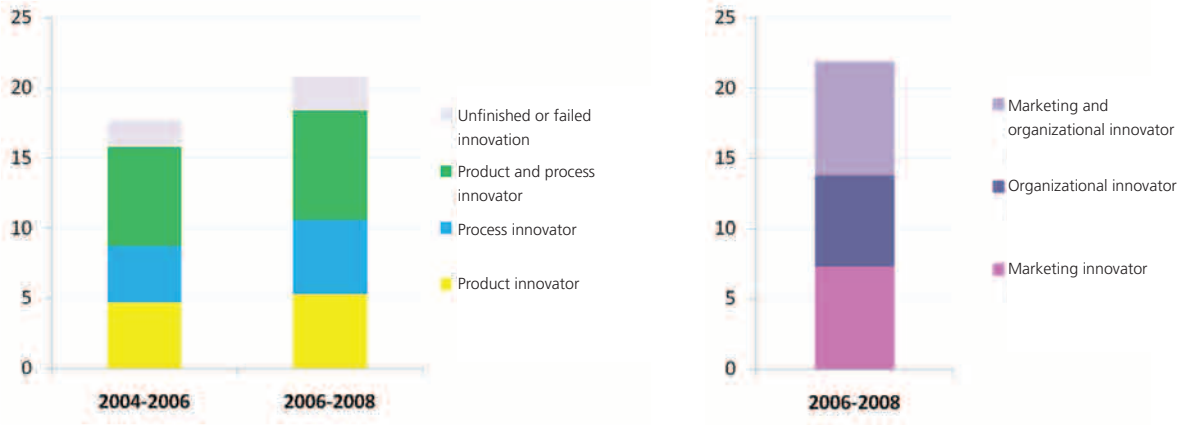


Figure 33. Proportions of innovative companies by types of innovation (%)
Note: Businesses with more than 10 employees
Source: Hungarian Central Statistical Office, Community Innovation Survey

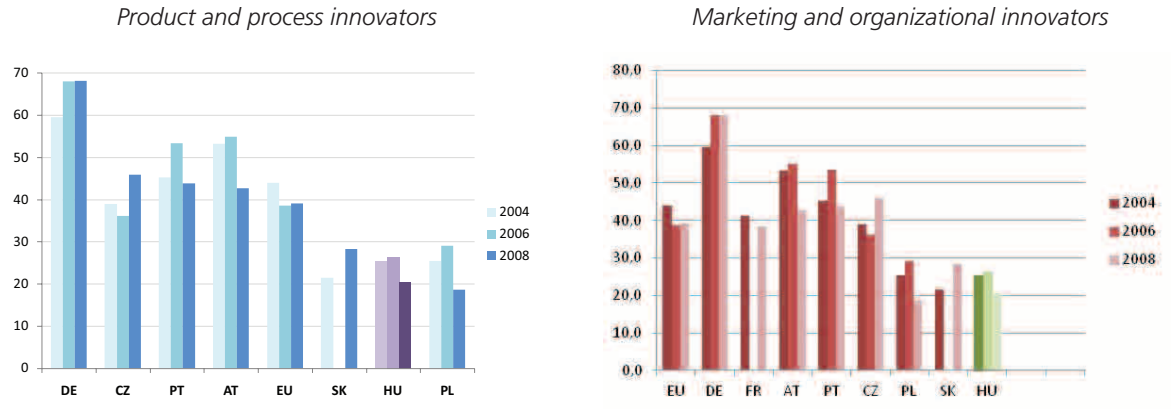


Figure 34. Breakdown of innovative SMEs among all SMEs (2006, %)
Source: Innovation Union Scoreboard (2011)

The data broken down by regions support national data: in every region, the proportion of marketing and/or organizational innovator companies is higher than companies introducing new products/processes. Figures in Central Hungary are the highest for both innovation categories and this region has both the highest number and proportion of innovative companies. Although the proportion of product and/or process innovator companies is the worst in Northern Hungary, the region occupies second place behind Central Hungary in the proportion of companies implementing marketing and/or organizational innovation.

4.3. THE ROLE OF INNOVATION IN BUSINESS PERFORMANCE

Community Innovation Survey data suggest that companies implementing product innovation earn two-thirds of their sales revenue from the sale of unchanged products. About 12 to 13% of the sales revenue of product innovators comes from the sale of

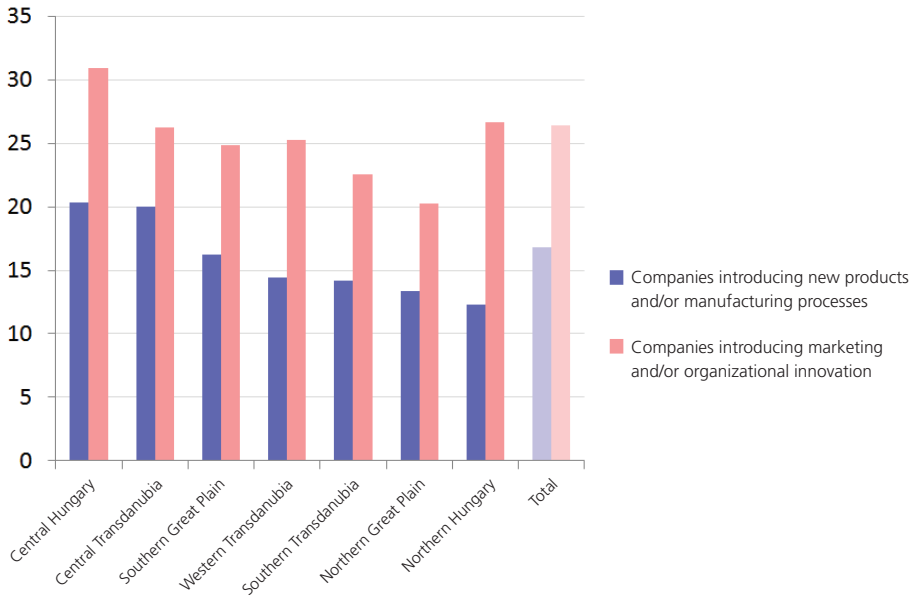


Figure 35. Proportion of innovative SMEs by region in 2006 (%)
Note: Businesses with more than 10 employees
Source: Hungarian Central Statistical Office, Community Innovation Survey

products that are new for the particular company but are known on the market. On average, about one-fifth of sales revenue is derived from products that are also new on the market. While only 7% of the sales revenue of small enterprises comes from new products, the same figure for large enterprises is 23%. These low percentages are no surprise as the primary source of funding the development and market launch of new products is the profit from existing products.

In a small, open economy the competitiveness of export is a key factor in corporate performance, which is why there is a connection between export capacity and innovativeness:

- In Hungary, 17% of companies supplying to local and regional markets,
- 28% of companies supplying to European markets, and
- 38% of companies supplying to other foreign markets are innovative.

COMPANIES THAT HAVE TO FACE FOREIGN MARKET COMPETITION ARE MORE INNOVATIVE

Challenges of exporting innovative products and services

A medical equipment manufacturing company managed to overcome the difficulties of obtaining international patents and is proud of managing to enter new markets in the Middle East. However, its attempts to register with the relevant authority (the Food and Drug Administration) in the United States of America failed. This is just one example of the formidable barriers to going international and growing through export markets, which include unwillingness to grow, challenges to management, conduct of competitors and administrative barriers among other factors.

The same connection applies to product and process innovator companies. In other words, it may be said that the larger the market and the fiercer the competition, the more innovative the company must be to succeed.

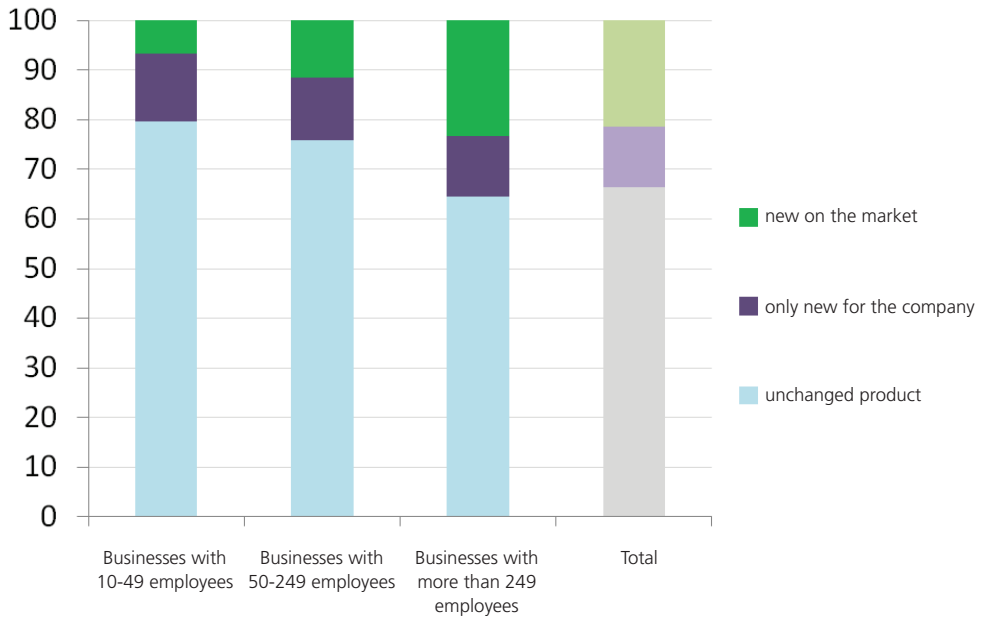


Figure 36. Breakdown of sales revenue of product innovator companies according to the degree of novelty of the new product (%), 2006–2008
Source: Hungarian Central Statistical Office, Community Innovation Survey

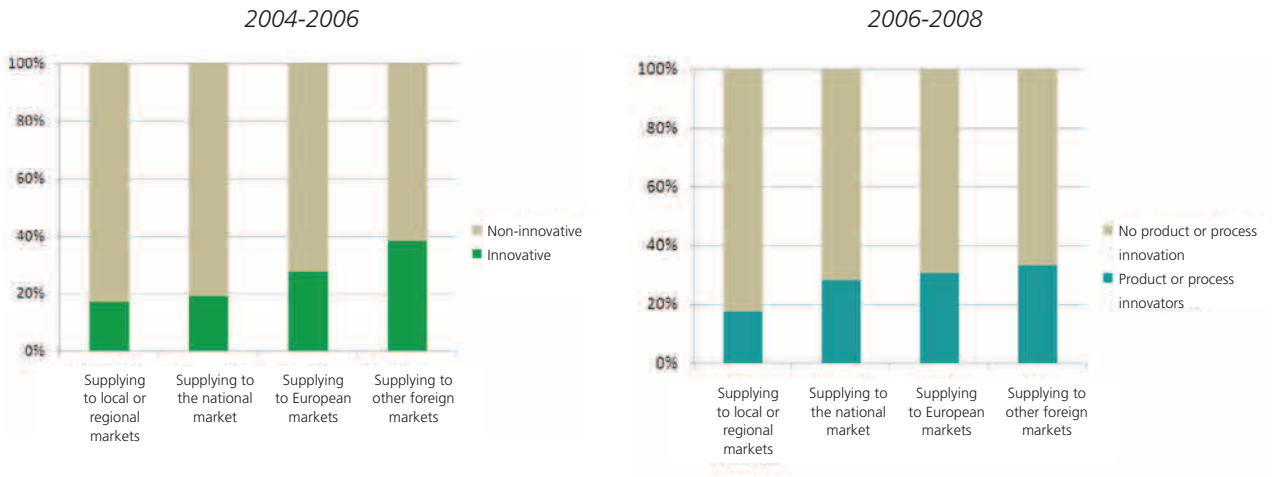


Figure 37. What percentage of companies in the given market can be considered innovative? (%)
Note: Businesses with more than 10 employees
Source: Hungarian Central Statistical Office, Community Innovation Survey

The proportion of SMEs filing corporate tax returns that could hold their ground on export markets was between 4 to 5% over the past 5 years. It is advisable to track their numbers and development, as new research (e.g. Inzelt (2011) or L. Halpern-B. Muraközy (2012)) also confirms that there is a connection between export capacity and innovations.

According to unit value indices, Hungary's added value is falling while in the Czech Republic and Poland the export unit value is growing at a higher rate than the import unit value. This means that the export goods of the competitor countries represent increasingly high value, for which imports of increasingly low value are required. This carries the risk that the competitive

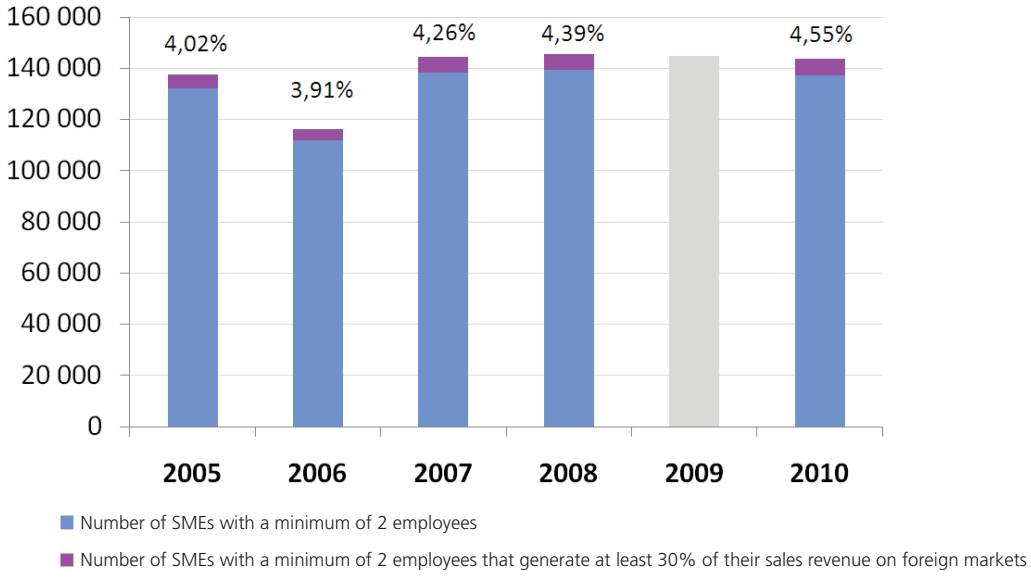


Figure 38. Number and proportion of SMEs with export capacity in Hungary (among companies filing a corporate tax return)
Note: the generation of appropriate data from 2009 requires additional consideration
Source: NGM-IKF (Ministry of National Economy, Innovation and R&D Division) calculations on the basis of NAV (National Tax and Customs Authority) data

[49] I.e. enterprises that have actual operations.

advantage will erode on the macro-level if the product structure is not reformed.

The balance of high-tech products (using a narrow definition of such products) has been permanently positive in Hungary and is a much higher figure than those of its competitors. However, by now the Czech Republic also has a positive balance. High-tech exports are primarily attributable to large enterprises. However, their innovation-related decisions, which help them maintain or improve their competitive advantage, are typically made by company headquarters located abroad.

Connected to the global value chain

A company producing and distributing healthcare devices, founded in 1991 and currently employing a total of 700 people and operating as a subsidiary of an international company has 35 full-time staff members with degrees in science employed as R&D specialists. The company sets the development goals in cooperation with the parent company as the products of the subsidiary are not sold to customers independently, but are actually software integrated into machinery developed abroad. Consequently, the results of development efforts are first sold within the company group and generate sales revenue from exports. However, the finished product is sold through a international network and the sales process is managed by the parent company. The strategy of the Hungarian subsidiaries is developed in close cooperation with the headquarters of the company group.

THERE IS A GLARING CONTRADICTION BETWEEN THE HIGH-TECH EXPORT PERFORMANCE AND THE GENERAL STATE OF THE ECONOMY: COMPANIES FOCUSING ON HIGH-TECH EXPORTS SHOW A MUCH BETTER PERFORMANCE THAN THE AVERAGE OF THE BUSINESS ENTERPRISE SECTOR

According to Community Innovation Survey data, innovation may also play a decisive role in securing and maintaining a competitive advantage. Within the framework of innovation efforts made for the purpose of gaining a competitive advantage, the main objective is to improve product or service

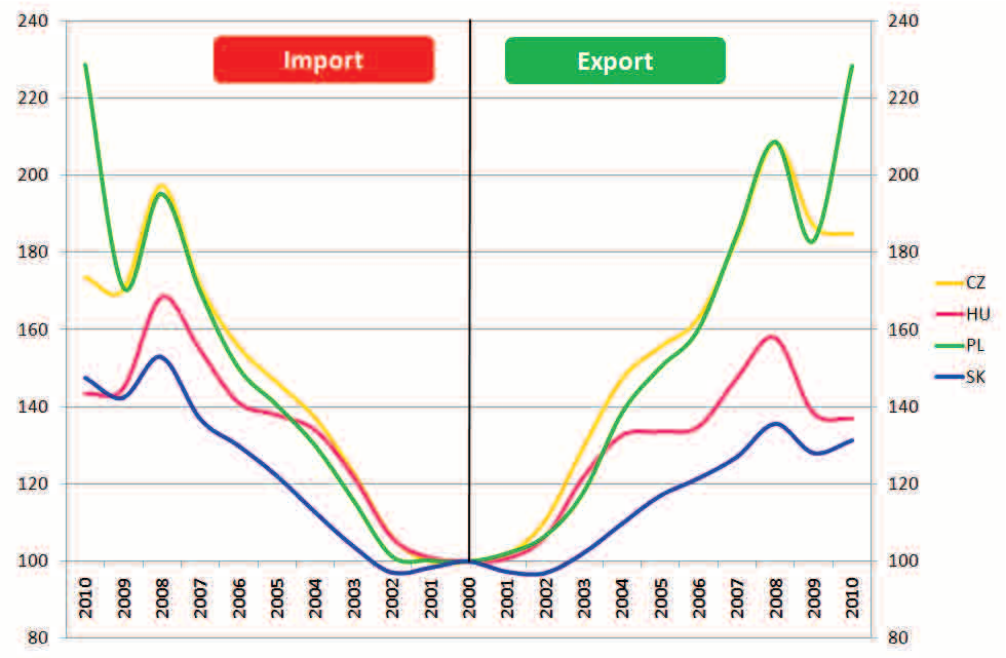


Figure 39. Goods export and import unit value indices (2000=100)
Source: NGM-IKF (Ministry of National Economy, Innovation and R&D Division) figure on the basis of UNCTAD data

Figure 40. Proportion of high-tech exports and imports (%)
Note: the following processing industry sectors qualify as sectors manufacturing high-tech products: aircraft manufacturing, computers/office equipment, electronics/telecommunications, pharmaceuticals, scientific equipment, electrical equipment and machines, chemical industry, non-electronic machinery, military technology
Source: Figure based on Eurostat data

quality, regardless of company size (on average, two-thirds of all innovative companies and three-fourths of large innovative enterprises consider this objective very important). In the ranking of priorities, increasing market share and expanding product/service range are also highly important. Fewer than half of the enterprises believe that the replacement of products/processes is important, but this proportion grows as the company size grows. This is, of course, no surprise as it is primarily in large enterprises' interests to reduce the length of product life cycles.

SMALLER ENTERPRISES' INNOVATION EFFORTS ARE ADAPTIVE AND FOCUS ON QUALITY IMPROVEMENT WHILE LARGER ENTERPRISES' INNOVATION EFFORTS FOCUS ON PRODUCT AND PROCESS INNOVATIONS

Demand extends, but pressure from competitors reduces lifecycles

A company with internationally recognized achievements in materials technology foresaw the expected market trends right from when the company was formed. The particular material the company produces is used extensively but the fact that it is now widely accepted in interior design and the luxury industry helped the company break onto new markets. The innovative solutions that the owner of the company developed allowed the company to be the first to enter the interior design and luxury product market. Its efforts were supported by proprietary rights of industrial property protection and by know-how. According to the management of the company, intellectual property and know-how will help the company maintain its quality edge against competitors trying to imitate its products.

The majority of innovative companies in Hungary believe that the key goals of innovation efforts are improving product or service quality and achieving a larger market share.

4.4. DEMAND FOR INNOVATIONS SUPPORTING ENVIRONMENTAL SUSTAINABILITY

The three pillars of sustainability and sustainable development are the economy, society and the environment; they constitute a unified and integrated system. Any change in these has a strong effect on the other two. In the field of RTDI, requirements of sustainability are increasingly taken into account by managers and policymakers.

Business and community requirements are now stronger all over the world. National and international regulations related to sustainability and in particular environmental sustainability are getting stricter and penalties are higher. Companies are expected to take sustainability into consideration when adopting their long-term strategy and their action plans. Also, businesses themselves have recognized that growth alone should be replaced by growth based on sustainability in order to allow them to retain or improve their market position and to help the economy progress.[50]

Figure 41. What percentage of technological innovator companies marked the given objective as "very important" in 2006–2008?
Note: Businesses with more than 10 employees
Source: Hungarian Central Statistical Office, Community Innovation Survey

[50] However, a reactive problem-solving approach to the social and environmental challenges of sustainable development is not sufficient. Companies' approach should be more creative and focus on the inspiring recognition of problems and the search for novel solutions. A prestigious group of authors stated that innovation opportunities must be recognized instead of simply being less bad. (See Senge et al. (2008) for details).

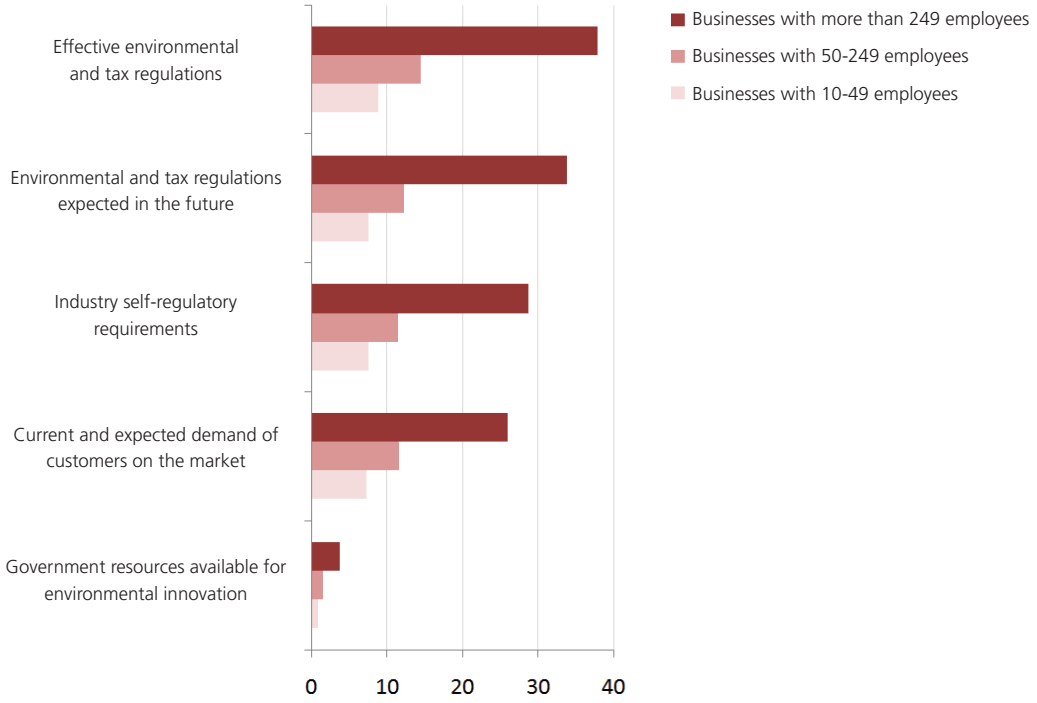


Figure 42. The key motivating factors for environmental innovation for businesses with more than 10 employees (%), 2006–2008
Source: Hungarian Central Statistical Office, Community Innovation Survey

Transformation of traditional industries

A privatized large enterprise (whose production traditionally pollutes the environment) reformed its technology as the foreign owner made environmentally conscious investments for this purpose. Social responsibility and commitment to sustainable development are now integral parts of corporate culture. Corporate governance in this company combines empathy, solidarity, environmental consciousness and strong compliance with health and safety regulations at work and does not accept any compromises in this regard. Outstanding performance in these fields is rewarded at local and national level and even the parent company, which used to have a poor reputation in these areas, managed to improve its image. A family business founded in 1990 in the field of technology with 19 employees and 9 patents enjoys success with products specifically designed to improve energy efficiency.

In the field of innovation, progress is more and more often combined with tasks related to sustainable development. For instance, a Communication published by the European Commission in 2009 on the review of the EU Sustainable Development Strategy promotes the exchange of good practices related to innovation between Member States.[51]

IN HUNGARY, THE DEMAND FOR INNOVATIONS SERVING ENVIRONMENTAL SUSTAINABILITY IS MOTIVATED MORE BY ADMINISTRATIVE DECISIONS THAN BY MARKET INDICATIONS

According to Community Innovation Survey data, Hungarian enterprises implement environmental innovations when they are required to meet certain administrative and regulatory standards. For businesses with more than 10 employees:

- effective environmental and tax laws are the primary motivating factor behind environmental innovation;

[51] See EC (2009).
[52] Sveiby (1998), for instance, added knowledge-based items to both the assets and the liabilities sides of the traditional balance sheet in order to allow a more accurate assessment of the value of companies by including knowledge-based items.

- the second most important factor motivating such innovations is preparation for future environmental and tax regulations;
- self-regulation of the industry, that is, voluntary compliance with guidelines and agreements adopted by certain industries, typically those with a larger environmental impact.

The motivating effect of the availability of government resources that may be specifically spent on environmental innovation is limited. Companies usually adopt plans for several years ahead and if they do not consider it worthwhile to maintain environmentally beneficial conditions financed by grants, they will presumably not apply for grants. The ability to calculate for the long term is important for enterprises in this regard.

LARGER COMPANIES FOLLOW CUSTOMER DEMAND AND INDUSTRY TRENDS WITH THEIR ENVIRONMENTAL INNOVATIONS MORE CLOSELY THAN SMALLER ONES

The relevant data suggest that the motivations behind their environmental innovations strongly depend on the size of the companies. The larger a company is, the more importance it attributes to environmentalism and the more likely it is that the opinions of stakeholders (such as customers) will be heard.

4.5. SOURCES OF INFORMATION REQUIRED FOR INNOVATION

The primary resources for competitive companies are human resources and, increasingly, knowledge of individuals and knowledge concerning organizational routines, technology and processes.[52] It is indispensable for an enterprise to update and maintain its knowledge and integrate new information into company processes efficiently. If a company fails to reform its knowledge base for an extended period, it will sooner or later fall behind its competition. Reform may include the exclusion of outdated technology and knowledge from the company's operations to make sure the organization only retains knowledge that can be utilized efficiently.[53]

From what sources do companies obtain the information and knowledge required for development and how do companies reform or update their knowledge? According to Community Innovation Survey data, elements of information required for technological innovation are primarily created in the typical value chain or industry of the company.

- Approximately 40% of companies obtain the information required for innovation from within the company or the company group, and this figure is only slightly determined by company size (larger enterprises tend to rely slightly more on their existing knowledge during innovation).
- A similar proportion of companies of different sizes (35%) claims that the second most important source of information is customers (including customer feedback on products and market research conducted ahead of new development projects).
- Some 15 to 25% of the surveyed enterprises claimed that the roles of suppliers and competitors are also significant.

[53] Some authors refer to this as a process of focusing on core competences. It is generally believed that the first definition of 'core competence' appeared in an article by Pralahad and Hamel (1990). It should be noted here that the legal boundaries of the company does not necessarily match its operational boundaries. As a result, some analysts use the term 'strategic business unit' for what we mean by company and its knowledge in everyday use.

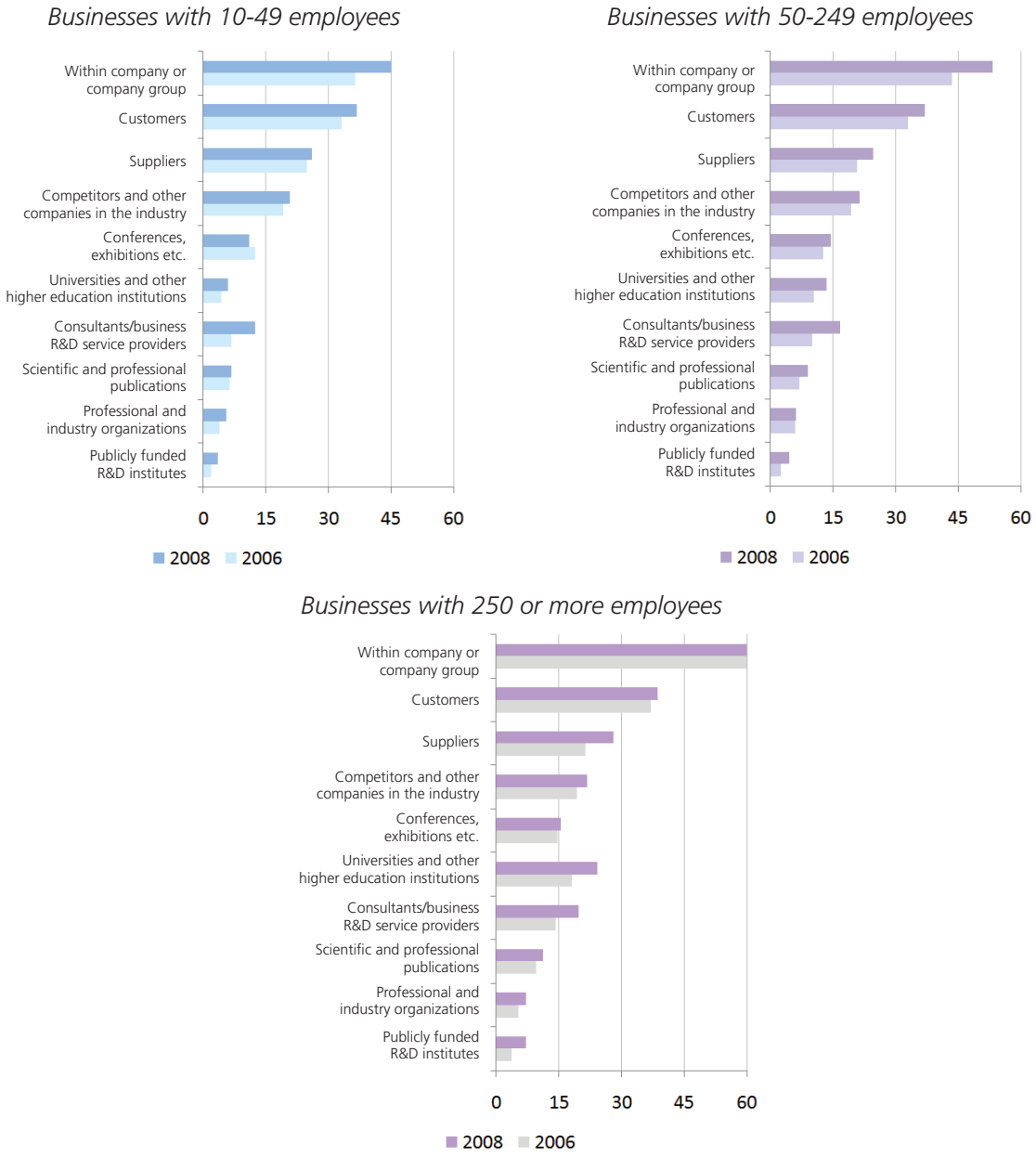


Figure 43. The proportion of companies introducing technological innovation that consider the given source of information important (%)
Source: Hungarian Central Statistical Office, Community Innovation Survey

THE SOURCE OF INFORMATION FOR TECHNOLOGICAL INNOVATION IS GENERATED IN THE COMPANY'S TYPICAL VALUE CHAIN. HOWEVER, A GREATER PROPORTION OF LARGER COMPANIES TEND TO RELY ON KNOWLEDGE-INTENSIVE ORGANIZATIONS (TYPICALLY INSTITUTES OF HIGHER EDUCATION) OUTSIDE THEIR INDUSTRY.

State and publicly funded R&D institutes play a minor role in the flow of information to enterprises, while the role of higher education institutes is more substantial, and increases strikingly with company size: in the case of large enterprises, the role of colleges and universities is even greater than the role of R&D firms and consultants from the business sector. This is because companies facing stiff competition must rely on external knowledge. As a result, such enterprises

depend more on universities, other higher education institutions and various publicly funded R&D institutes to obtain external knowledge and information. (As shown above, this company category is more innovative than smaller enterprises.)

Close cooperation with knowledge-intensive organizations is increasingly becoming the key to innovation success in securing and improving competitiveness. The Community Innovation Survey did not distinguish between the types of organizations that enterprises developing products cooperate with; it was only asked whether there is some form of cooperation. The willingness of small and medium-sized enterprises to cooperate in innovation is at a similar level, with around two-thirds of companies running most of their development projects internally. The proportion of larger companies doing so was similar in 2008, although it was higher earlier.

ONLY A SMALL NUMBER OF COMPANIES WORK ON DEVELOPMENT PROJECTS IN COOPERATION WITH SOME OTHER ORGANIZATION, WHICH INDICATES LIMITED WILLINGNESS TO COOPERATE

In general, a small number of companies decide to cooperate with other organizations, but their proportion is larger in the case of bigger companies. The proportion of companies adapting development by other organizations is similar to the proportion of companies running joint development projects. However, the significance of adaptation is slightly smaller for larger companies.

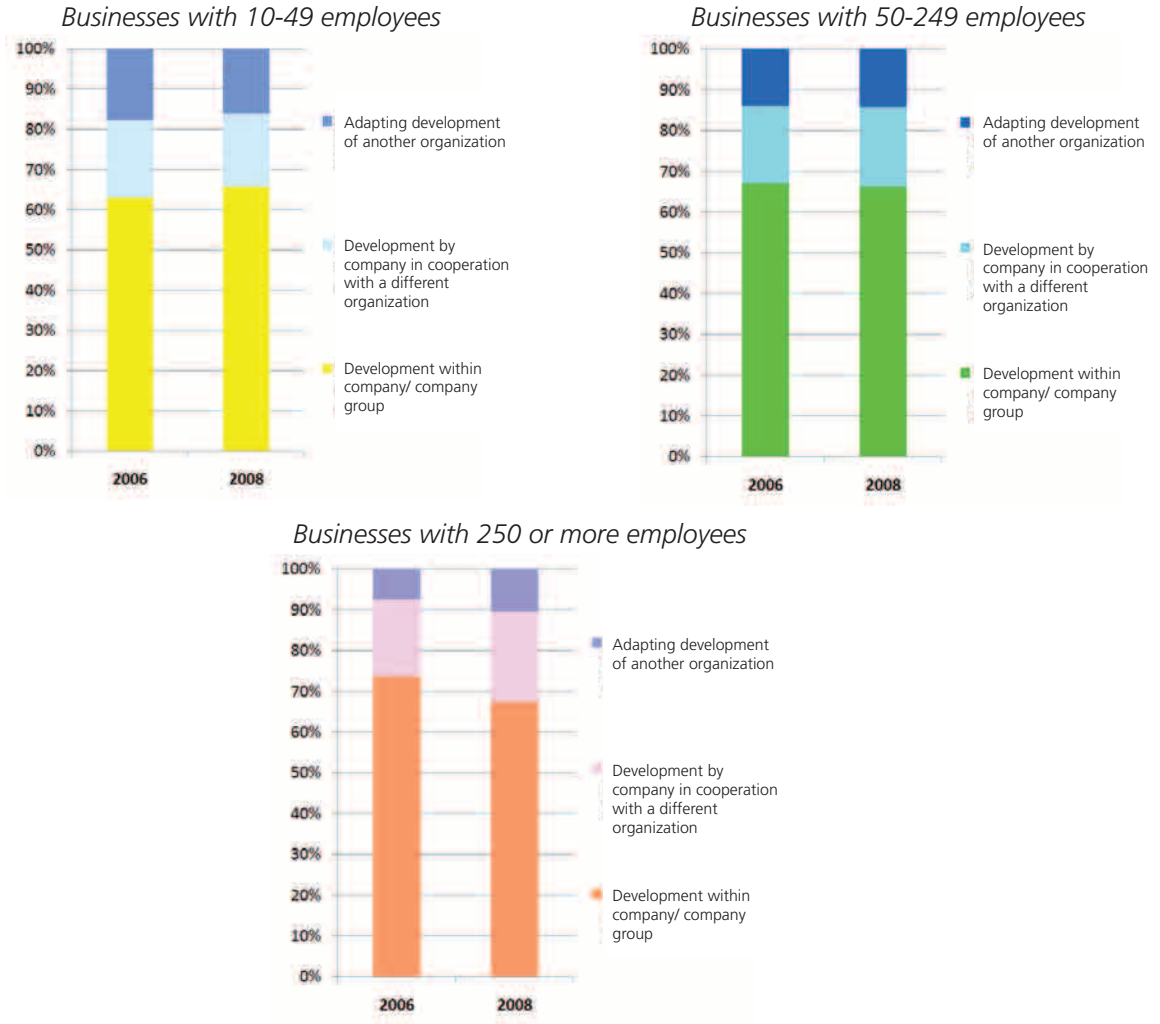


Figure 44. Cooperation in product innovation development
Source: Hungarian Central Statistical Office, Community Innovation Survey

5. FACTORS HINDERING INNOVATION

Innovation can be a risky activity, particularly when a large amount of research and development is undertaken in connection with it. Smaller companies are less prepared to take this risk:[54] the ratio of enterprises giving up innovation projects is higher in the case of larger companies.

Of the enterprises giving up innovation projects for some reason, around 25% quit as early as in the planning phase, and a slightly smaller proportion (about 15%) when they lag behind schedule to a significant degree for any reason. The overall proportion of companies quitting innovation in the implementation phase is slightly smaller but in the case of companies with more than 250 employees this was the second most frequent quitting phase.

The most important reasons for quitting were financial reasons. Around 29% of respondents claimed they gave up innovation due to a lack of funds internally and a similar number (27%) said that high innovation costs hinder the process. Further, around 20% of companies mentioned the lack of external financial resources as a factor that greatly hindered innovation.

However, it should be noted in connection with the analysis of survey results that the factors hindering innovation are interrelated. For instance, the lack of funds, which was a key factor, is likely to have been caused by other factors (such as the lack of skills required for implementation) which were not apparent during the first financial planning phase.

Challenges of protecting intellectual property

Those successfully implementing innovations that may potentially generate large market demand should expect their competitors to take countermeasures. A Hungarian materials technology company won a number of patent infringement cases and patent opposition proceedings against a German market leader between 2006 and 2011. In the long run, the company plans to focus on the effective management of its intellectual property. Another Hungarian-owned company that introduced major innovations in the field of drive technology devoted a lot of energy to having the solution protected by all existing forms of intellectual property protection (patent, utility rights and design rights). While these are clearly positive examples, it is important to know that quite a few innovators fail to develop an appropriate business model for the innovation, to make sure it is protected under intellectual property law and to enforce any claims.

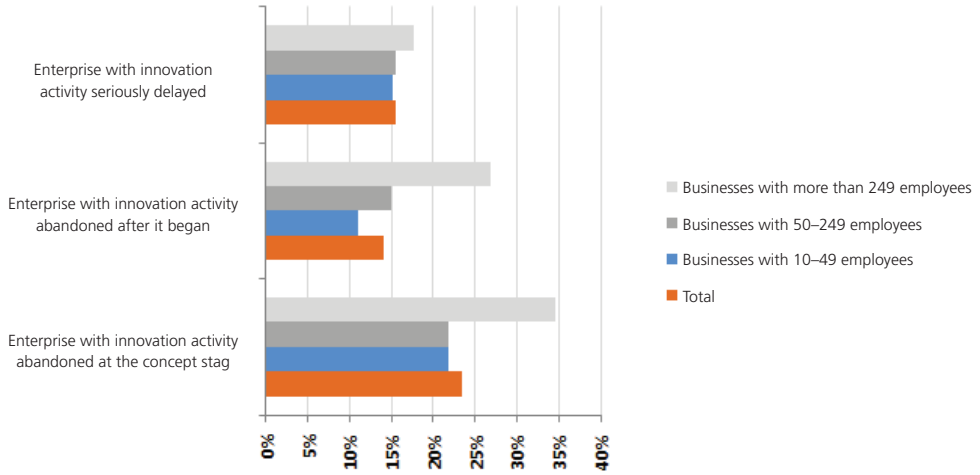


Figure 45. In which phase did companies give up innovations they had started?
Source: EUROSTAT, CIS2006

[54] Naturally that does not apply to innovative start-up companies but it is true of the economy as a whole.

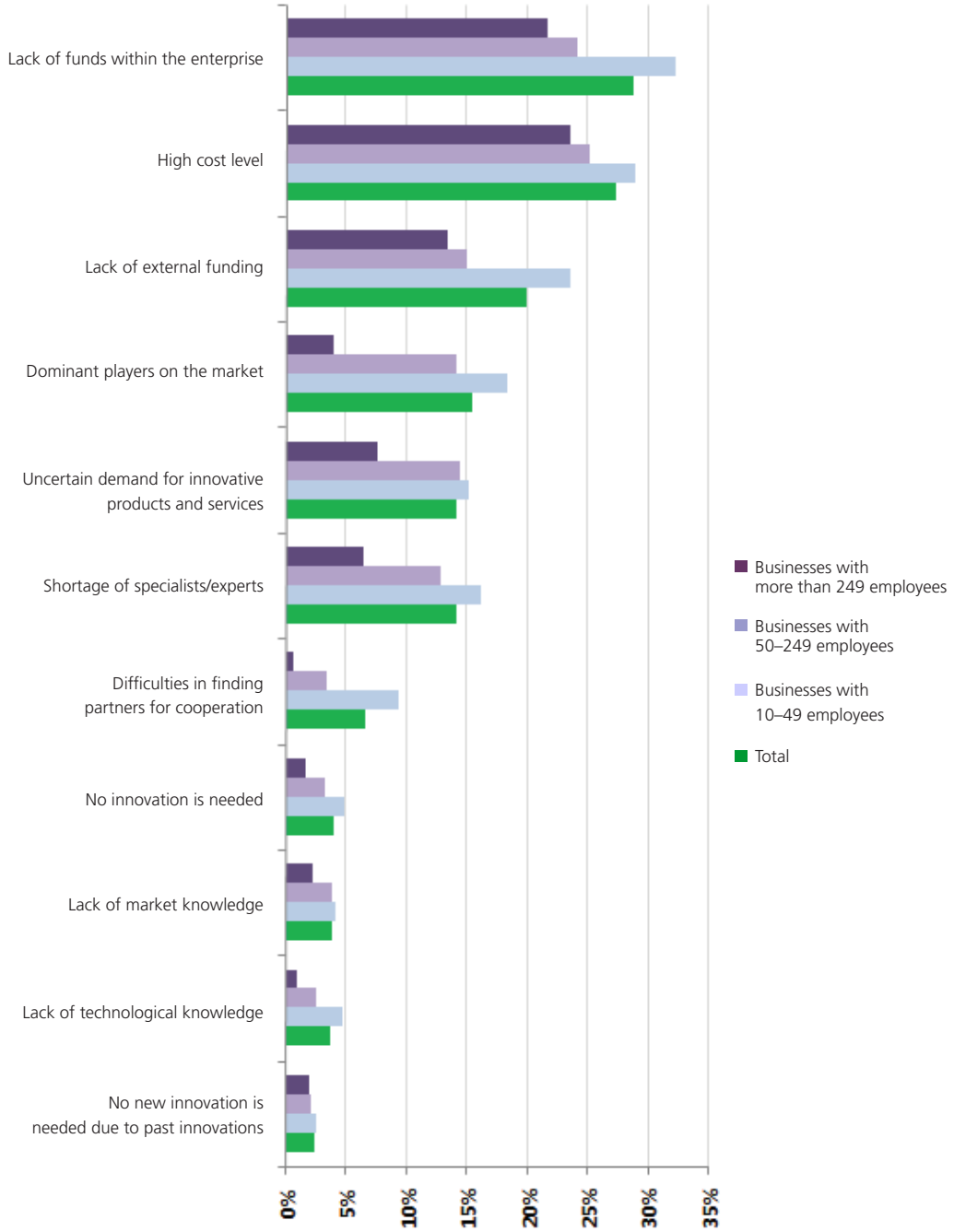


Figure 46. Factors seriously hindering innovation for innovative companies
Source: EUROSTAT, CIS2006

5. FACTORS HINDERING INNOVATION

Innovation is heavily influenced by market circumstances. 15% of companies claimed that their innovation is hindered by the fact that there are dominant market players in their field (only 4% of larger enterprises made this statement), while 14% mentioned the uncertainty of market demand for innovative products and services as a hindering factor.

FACTORS HINDERING INNOVATION ARE RELATED TO THE MARKETS AND HUMAN RESOURCES OF COMPANIES, WHICH THEY TYPICALLY EXPERIENCE AS FINANCIAL OBSTACLES

The third group of the major factors hindering innovation is related to human resources. 14% of companies classified the lack of specialists/experts as a significant hindering factor and on average around 7% said that their innovation is greatly hindered by the fact that they cannot find a suitable cooperation partner. The latter is chiefly a problem for smaller enterprises and barely mentioned by larger companies (just 0.6% mentioned it as a factor). It was not a separate question on the Community Innovation Survey but the respondents may have included under the lack of specialists/experts a factor that often mentioned by the domestic professional community in various forums: very often companies do not have a qualified innovation manager who is able to control the process and manage the key steps.[55]

Framework conditions also include significant hindering factors

Although the framework conditions of RTDI are not covered by the report, it is worth reiterating their great importance. For instance, a small technology firm that realizes the majority of its sales revenue on international markets and employs 100 persons (and is continuing to hire) claimed that the biggest obstacle to innovation is the ever-changing tax and economic environment (in particular tax rules). The changes affecting the innovation contribution had an adverse effect on the company as it greatly reduced the resources the company had available for its own development projects. However, the company believes that the qualification system is in principle a positive and forward-looking development. Other companies shared this opinion.

Non-innovative domestic companies face several obstacles:

- the biggest ones are the high cost of innovation and their lack of sufficient own resources to start developing innovative products or services;
- companies are unable to estimate the market demand for the innovative product or service they have in mind;
- innovation is a challenge because markets are dominated by established companies that are very hard to compete with (those that have already penetrated the market hold an edge as a result of their position);
- external funding is limited.

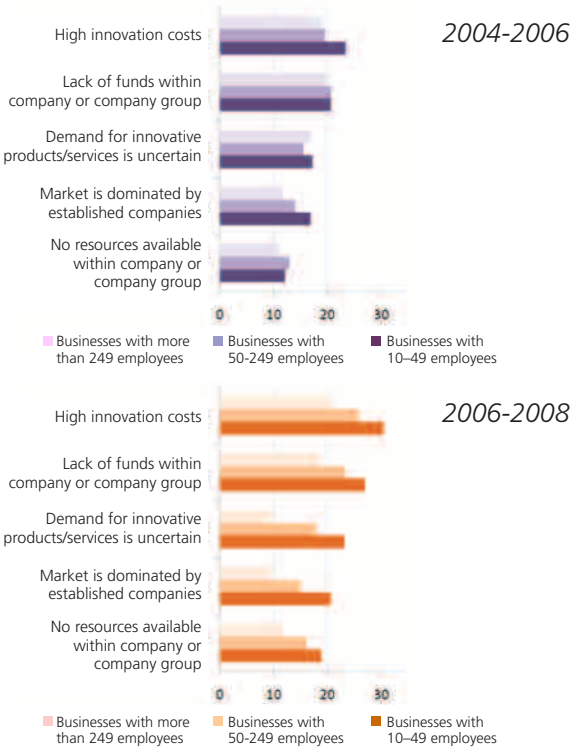


Figure 47. The proportion of non-innovative companies that selected the given factor hindering innovation (%)
Note: the figure only shows factors that affect at least 10% of non-innovative companies
Source: Hungarian Central Statistical Office, Community Innovation Survey

[55] The HRST (Human Resources in Science and Technology) measure totals those employees that either have a university or college degree or who occupy a position that requires high qualifications and that is key with regard to science, technology and innovation. In a list of 38 countries compiled by the OECD for 2010, Hungary came 28th in terms of proportion of HRST employees.

6. GROWTH AND JOB CREATION

The prolonged economic crisis that hit in 2008 shows that there is a real need for the new EU level policy mission focusing on growth and job creation and adopted around the mid-term assessment of the Lisbon Strategy. Since the start of the crisis in 2008, the President of the United States has stated a number of times that his country can create interesting and valuable (i.e. well-paid) jobs through innovation, and the majority of developed countries set out similar aims.

In Hungary, the demonstration of the relationship between RTDI and growth and RTDI and job creation is in its infancy.[56] That is why the data compiled for this report only allows us to provide a simple factual description.

Among innovative companies:

- Between 2004 and 2006 the sales revenue of companies with 10 to 49 employees doubled, businesses with 50 to 249 employees had 30% more revenue and the revenue growth of companies with 250 employees grew by 18%.
- The trend continued between 2006 and 2008; the smaller a company was, the bigger its revenue growth was. However, growth rates dropped compared to the previous period.

Among non-innovative companies:

- In both surveyed periods, companies with 50 to 249 employees had the highest growth rates.
- Between 2004 and 2006, companies with 10 to 49 employees had a low (hardly 15%) revenue growth rate while between 2006 and 2008 they had a higher increase in revenue.

It is worth mentioning that between 2006 and 2008 the revenue growth rate was higher for non-innovative companies than innovative ones (except for small enterprises). More in-depth analysis would be advisable to identify the reasons behind this.

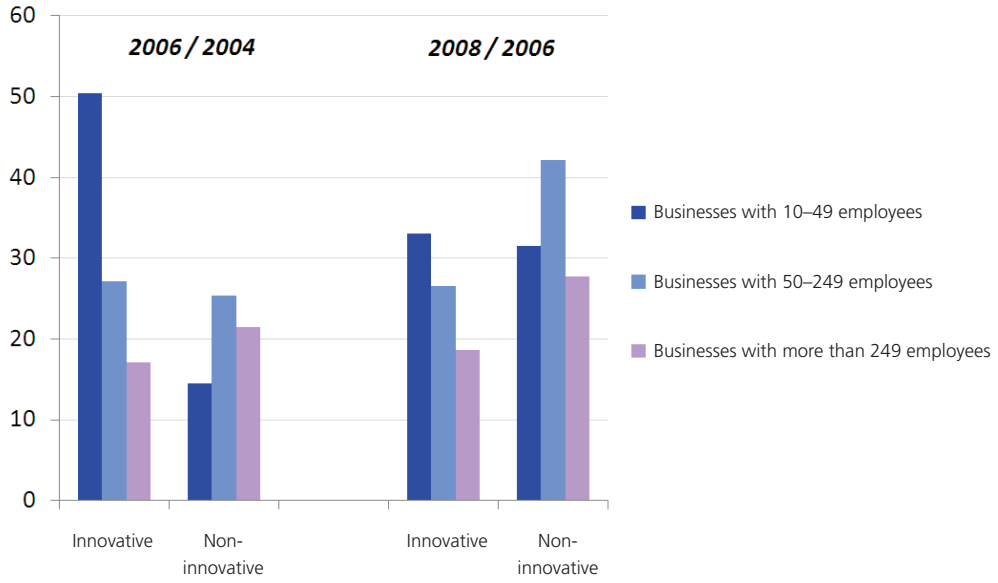


Figure 48. Changes in revenue growth rates (%)
Source: Hungarian Central Statistical Office, Community Innovation Survey
Note: The data shown in the figure are the sales revenue shown as a percentage of the total sales revenue.

[56] There is no causal relationship between growth and job creation.

6. GROWTH AND JOB CREATION

The relationship between enterprise innovation and the level of employment was as expected:

- in general, innovative companies expand their current staff more efficiently than non-innovative companies, and
- of the various company size categories, SMEs created the most new jobs.[57]

A HIGHER PROPORTION OF INNOVATIVE COMPANIES CAN INCREASE THEIR WORKFORCE

Between 2004 and 2006, the workforce employed by innovative companies of 10 to 49 employees grew by one-fifth and by 8% among innovative companies with 50 to 249 employees. The headcount of companies with 250 employees or more essentially stagnated. In each company size category, non-innovative enterprises employed fewer new employees, with downsizing even being reported at the large enterprise level.

Innovative companies hired fewer new employees between 2006 and 2008 compared to the earlier period. Among companies with 10 to 49 and 50 to 249 employees, a 10% increase in headcount was registered, while staff growth was nominal in the 250 or more category. In the same period, non-innovative enterprises hardly hired new employees, but companies with 250 or more employees hired more people than innovative and process innovative enterprises in the same size category.

An unusual story

In 1996, a biotechnology company was set up by Hungarian private individuals and an English development company. Today, the business is fully in Hungarian ownership and it is planned that the company will buy the name-related rights from the English company. They think their most important competitive advantage is their well-trained and innovative professional staff; they take pride in their minimal level of staff fluctuation, in an industry where fluctuation is typically high. The company developed an internal incentive scheme to help continuous training. It also supports employees in obtaining PhDs and doctorates, and some of the staff members teach at various higher education institutes. Continuous expansion is a key part of the strategy. Through an investment project, the company will probably add around 60 new employees to its current headcount of approximately 100 people and, with the new manufacturing capacity, it will be able to cooperate with pharmaceutical companies as an intermediary supplier in the production of marketable pharmaceuticals.

Growth in the number of employees (almost 35%) was striking among companies implementing process innovation only and with 10 to 49 employees. This phenomenon should be analyzed in depth. The role of technological modernization and process innovations should be mentioned as significant factors in modern market economies.

These data reflect the significance of the role of small and medium-sized enterprises in job creation and, indirectly, also indicate their potential to boost economic growth. SMEs, in order to retain their competitive edge, are faster and more flexible in their reactions to market changes than larger companies.[58] However, it is also important that large companies find their role in the Hungarian system of innovation.

[57] Job creation, which is a heightened expectation during crises, has certain limits. Papanek (2007) believes that although fast-growing SMEs are the potential engines of economic growth, there are several factors that impede their real evolution.

[58] Of course, it would be a mistake to underestimate the flexibility of large organizations today. IBM and Microsoft are two examples of fast accommodation to change in the past few decades, and numerous other examples are mentioned in professional literature.

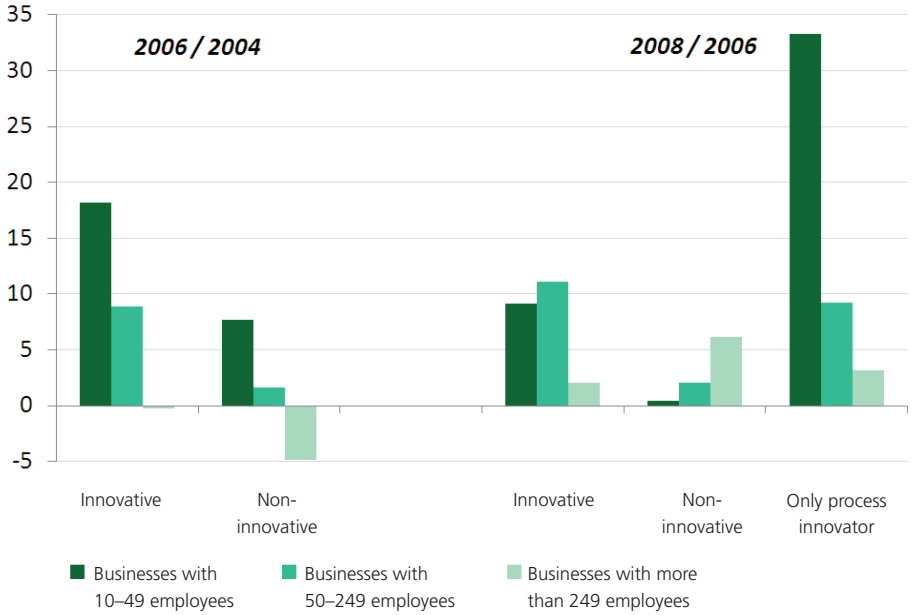


Figure 49. Changes in the number of employees (%)
Source: Hungarian Central Statistical Office, Community Innovation Survey

SUMMARY

Between 2000 and 2010, significant structural changes occurred in the field of enterprise R&D and innovation (RTDI) in Hungary, but the international gap only narrowed to a small extent and in certain sectors the divide in terms of enterprise RTDI performance even increased.

From 2005, the number of R&D companies started to grow rapidly; their number doubled in six years. In terms of the number of companies, together the western and the eastern parts of the country were able to narrow the gap between them and Central Hungary, although that is not reflected in their economic performance. The majority of the growth came from micro-enterprises (enterprises with 0 to 9 employees). The number of research companies with majority state or local government ownership fell and the number of their R&D staff dropped to one-fourth of the earlier figure.

Among R&D enterprises, the proportion of foreign owned enterprises doubled between 2003 and 2010, creating increased demand for Hungarian human resources in R&D.

A favourable trend in the period between 2001–2010 is that the number of small and medium-sized enterprises with an R&D profile also increased. The increase in the number of research and development businesses clearly occurred in two waves (from 2005 to 2006 and from 2008 to 2009).

After some stagnation between 2001 and 2004, the growth in the number of researchers has been steady and rhythmic since 2005. Between 2000 and 2010, the headcount of employees working as researchers and developers in the entrepreneurial sector increased by 15% per year on average and produced 2.5-fold growth during the period as a whole, while the average number of research personnel barely changed. Over half of corporate researchers work for companies with majority foreign ownership. Companies in Central Hungary employ almost twice as many researchers as in other regions, with that difference being primarily attributable to the large enterprise sector. The average number of research personnel employed by large enterprises and micro-enterprises has almost doubled. Of the business enterprise sectors employing the highest numbers of R&D staff (pharmaceutical industry, telecommunications, vehicle manufacturing, engineering and computing services), the large-scale expansion was primarily attributable to computing services, where by 2010 close to as many research and development centres were in operation as in the pharmaceutical industry.

At the end of the first half of the 2000–2010 period, fiscal (tax policy) and supply (tender) incentives applied a sort of "R&D shock therapy" to the economy. As a result, nominal corporate R&D expenditure during a 10-year period nearly quadrupled and even doubled in real terms, resulting in a GDP-rated increase from 0.36% to 0.69%. It is, however, a warning sign that

- non-corporate R&D expenditure decreased in real terms;
- the proportion of investments from R&D expenditure has fluctuated considerably since 2000 and overall shows a sharp decline;
- subsidiaries of foreign companies hold a large share of funding, which may cause vulnerability in economically turbulent times,
- R&D spending per company did not increase in real terms overall (although there was strong growth in real terms among micro, small and large enterprises).

In the R&D-intensive growth engine sectors (pharmaceutical industry, information technology and vehicle manufacturing), R&D expenditure in information technology dropped due to the crisis, with the same trend

occurring in some smaller industries (medical equipment manufacturing, precision equipment and business services). In enterprise R&D spending, the proportion of state budget sources was very low until 2005 but doubled in 2006 and reached almost 14% in 2010. In total, as a result of the joint performance of the enterprise and other R&D sectors, the gross R&D expenditure of GDPwhich was 0.92% in 2001, rose by 0.2 percentage points by 2010. This slightly narrowed the gap between Hungary and the EU average, but other economies, such as the Czech Republic and Portugal, catching up with the more developed part of the EU did a better job at reducing the difference.

According to the data available, the funding of innovation from external sources in Hungary primarily means publicly funded innovation. The majority of direct R&D grants are awarded to small and medium-sized enterprises. On the other hand, National Tax and Customs Administration (NAV) data suggest that the majority of indirect grants (i.e. tax advantages) are given to large enterprises (which, for the most part, are in full or majority foreign ownership). It is also clear, however, that SMEs and especially those micro-enterprises that have large growth potential but utilize new knowledge in riskier circumstances have not received a high degree of support. Differentiation with regard to level of risk assumed by companies is on the agenda of both EU and Hungarian policymakers.

Hungarian applicants' results in R&D calls for proposals announced by the European Union are average. Their performance is good by the standards of the countries within the Visegrád Group but they are behind companies of the "old" Member States. Also, few companies participate in calls for proposals.

Due to the significant differences in the number of R&D centres, R&D human resources and R&D expenditure between the country's regions, the innovation-related development of the regions is a challenge for innovation policy because, although the RTDI gap is being narrowed, economic performances have not improved substantially.

International comparison shows that the innovation performance of Hungarian companies is low, and it is particularly low among medium-sized companies and even lower among small enterprises. However, the proportion of companies implementing product and process innovations was higher in the period between 2006 and 2008 than in the period between 2004 and 2006. In Hungary, the competitiveness and stage of development of the various regions are uneven. Figures in Central Hungary are the highest for both innovation categories and this region has both the highest number and proportion of innovative companies, while even the companies of Central Transdanubia are slightly more innovative than the businesses in the remaining regions. The role of Central Hungary as a driving force has not come into question over 10 years and will persist in the longer term. The two regions with the lowest innovation intensity among SMEs are Southern Transdanubia and Northern Hungary (10% each) and although the share of product and/or process innovator companies is the worst in Northern Hungary, the region occupies second place behind Central Hungary in the proportion of companies implementing marketing and/or organizational innovation.

Innovativeness grows exponentially with company size: there are twice as many innovative medium-sized enterprises as innovative small enterprises, and the number of innovative large enterprises is double of the number of innovative medium-sized companies. There are more companies that implement innovations in marketing and sales activities or innovations in organizational processes than companies that use product and process innovations with technological content. Smaller enterprises' innovation efforts tend to be adaptive and

focus on quality improvement while larger enterprises' efforts tend to focus on product and process innovations. Also, there are more innovative companies among those exposed to competition on foreign markets. The export performance of innovative large enterprises mainly depends on the innovation activity of multinational companies, and Hungarian high-tech product exports seem to have become stuck at a certain level, unlike the performance of competitor countries.

In enterprise innovation, knowledge elements required for technological innovation are primarily created in the typical value chain or industry of the company. In general the number of companies deciding to cooperate with other organizations is small, but the willingness to do so increases with company size. The role of publicly funded R&D institutes is minor in the flow of information and new knowledge to enterprises whereas the role of higher education institutes is more substantial, and grows dramatically with the company size: in the case of large enterprises, the role of colleges and universities is even larger than the role of business sector R&D firms and consultants.

That Hungary seems to break away from global competition trends is also shown by the fact that Hungarian enterprises primarily implement environmental innovations when they are required to meet certain administrative and regulatory standards. The government resources available for environmental innovation do not seem provide minimal incentive. The larger a company is, the more importance it attributes to environmental considerations and the more likely it is that the opinions of stakeholders (such as customers) will be heard.

According to innovation surveys, innovation is primarily hindered by the lack of funds. However, when adopting innovation policy, it should be taken into account that hindering factors are interrelated and therefore factors other than the lack of resources have an impact, primarily those related to innovation management capacity. Factors hindering innovation are related to the markets and human resources of the companies, which companies typically experience as financial obstacles.

Smaller companies are generally less prepared to take this risk: the ratio of enterprises giving up innovation projects is higher in the case of larger companies. The main reasons for giving up innovation projects are of a financial nature. However, market circumstances (for instance, the extent to which the market structure is well-established), human resources problems and the lack of ability to cooperate all have a significant impact on the level of innovation.

Growth in employment correlates more closely with enterprise innovation than growth in sales revenue data. Innovative companies managed to expand their current staff to a greater extent than non-innovative companies, and the innovative SMEs hired the greater proportion of new staff than of other company sizes.

Although the review of enterprise RTDI processes between 2000 and 2010 was illuminating from several points of view, there are several issues that deserve further analysis:

- Key issues of the innovation performance of national economies include the level of intensity of innovation cooperation, the acceleration of the flow of knowledge and the increased level of participation in knowledge processes. It is also very important to get involved in international R&D, innovation and technology related cooperation and in global knowledge flows if Hungary wants

to make progress in narrowing the gap. Information about cooperative innovation processes in the economy needs to be collected more regularly than in the currently available analyses and at a systemic level.

- It is important to analyze identified trends and the reasons behind surges and drops (e.g. in the number of R&D centres, in expenditure and correlations with company size) in more detail so that more evolved policy can be developed.
- It would be important to study the extent to which we can talk about the integral development of the R&D company sphere, including an analysis of the different dynamics of various industries.
- Structural characteristics influence both RTDI performance in the narrow sense and company performance in a broader sense. Study of the relationship between ownership structures and innovation results could also help policymakers in developing new policies.
- It is important to analyze the relationship between RTDI input and output (e.g. productivity) as professionally as possible and comprehensively. That is also a considerable methodological challenge requiring modern quantitative and qualitative analysis tools.
- The additional framework conditions for domestic business sector R&D and innovation activities should also be analyzed. The analysis may identify key relationships between innovation and the macro-economic environment, between innovation and the education and training system. It may also shed light on how the competitive environment, the legal system (business law and intellectual property law), the structure of the economy as a whole, mobility and their trends affect the innovation capacity and performance of the economy. Improvement of the framework conditions not examined in this report will not only contribute to fulfilment of high expectations concerning the Innovation Union, but will also have a positive effect on the development of domestic RTDI processes.

As shown by the case studies of companies, RTDI is a complex phenomenon and, to understand RTDI, it is not sufficient to process and analyze the official statistics that are relatively easy to access, despite the fact that this report has still managed to highlights some trends that have not received sufficient attention hitherto. It was a useful experience in terms of methodology that there remains a great deal to do in the field of RTDI surveys: survey and indicator methods should be improved, aggregates should be generated, and relationships between data should be identified to better understand phenomena and to allow evident-based decision making to become more widespread in questions affecting RTDI.

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TABLES

	2007		2008		2009		2011		2012	
	SII	Order	SII	Order	SII	Order	SII	Order	SII	Order
EU27	0,517		0,526		0,526		0,533		0,539	
BE	0,606	8	0,617	8	0,604	8	0,625	8	0,621	6
BG	0,173	34	0,192	33	0,205	33	0,216	32	0,239	32
CZ	0,397	18	0,404	19	0,386	21	0,4	21	0,436	20
DK	0,727	3	0,718	3	0,688	4	0,704	5	0,724	3
DE	0,66	4	0,668	4	0,693	3	0,711	3	0,7	4
EE	0,395	20	0,41	18	0,476	15	0,492	15	0,496	16
IE	0,576	9	0,597	9	0,574	12	0,571	12	0,582	12
GR	0,329	22	0,355	22	0,343	23	0,339	23	0,343	23
ES	0,397	18	0,404	19	0,408	20	0,41	20	0,406	21
FR	0,505	13	0,515	13	0,531	13	0,54	13	0,558	13
IT	0,413	17	0,423	17	0,424	18	0,429	18	0,441	18
CY	0,418	16	0,474	14	0,474	16	0,483	17	0,509	15
LV	0,191	32	0,205	32	0,215	32	0,213	33	0,23	33
LT	0,265	27	0,272	27	0,242	30	0,258	30	0,255	30
LU	0,61	7	0,622	7	0,624	6	0,651	6	0,595	10
HU	0,314	23	0,316	23	0,32	24	0,333	24	0,352	22
MT	0,292	25	0,312	24	0,345	22	0,383	22	0,34	24
NL	0,57	11	0,575	11	0,59	10	0,595	11	0,596	9
AT	0,576	9	0,593	10	0,613	7	0,626	7	0,595	10
PL	0,284	26	0,293	26	0,292	26	0,304	26	0,296	27
PT	0,34	21	0,372	21	0,412	19	0,426	19	0,438	19
RO	0,226	30	0,242	30	0,265	28	0,259	29	0,263	29
SI	0,431	15	0,454	16	0,485	14	0,499	14	0,521	14
SK	0,295	24	0,309	25	0,307	25	0,322	25	0,305	26
FI	0,643	5	0,642	5	0,687	5	0,708	4	0,691	5
SE	0,746	2	0,767	2	0,753	2	0,766	2	0,755	2
UK	0,62	6	0,625	6	0,6	9	0,599	10	0,62	7
HR	0,26	28	0,269	28	0,283	27	0,281	28	0,31	25
TR	0,181	33	0,191	34	0,2	34	0,208	34	0,213	34
IS	0,543	12	0,573	12	0,586	11	0,616	9	0,603	8
NO	0,458	14	0,471	15	0,472	17	0,485	16	0,478	17
CH	0,779	1	0,805	1	0,821	1	0,818	1	0,833	1
RS	0,252	29	0,259	29	0,257	29	0,284	27	0,282	28
MK	0,225	31	0,224	31	0,237	31	0,252	31	0,252	31

Table 1: Changes of the Summary Innovation Index (SII) between 2007 and 2011
Source: Innovation Union Scoreboard (2011)

Year	Total R&D expenditure of all research centres in HUF million	Of which:		R&D expenditure of R&D institutions and other budgetary research centres in HUF million	Of which:		R&D expenditure of research and development centres in higher education institutes in HUF million	Of which:		R&D expenditure of business enterprise sector research units in HUF million	Of which:	
		costs	investment		costs	investment		costs	investment		costs	investment
		million HUF			million HUF			million HUF			million HUF	
2000	105 388	81 356	18 152	27 494	24 472	3 022	25 310	23 123	2 187	46 704	33 761	12 943
2001	140 605	105 230	23 727	36 391	30 579	5 812	36 193	32 321	3 871	56 372	42 329	14 043
2002	171 470	134 166	26 125	56 328	47 363	8 965	43 135	37 738	5 397	60 828	49 065	11 763
2003	175 773	138 523	28 106	55 091	46 716	8 375	46 972	40 923	6 049	64 566	50 884	13 682
2004	181 525	147 708	25 188	53 640	48 731	4 909	44 615	40 343	4 272	74 641	58 635	16 006
2005	207 764	167 924	32 197	58 171	53 163	5 008	52 246	45 233	7 013	89 703	69 528	20 175
2006	237 953	191 445	41 743	60 373	55 302	5 071	57 943	51 400	6 543	114 872	84 743	30 129
2007	245 693	212 358	28 013	59 337	55 177	4 160	57 365	52 494	4 871	123 669	104 686	18 983
2008	266 388	230 596	30 464	62 314	58 065	4 249	58 704	54 476	4 228	140 042	118 055	21 987
2009	299 159	258 842	35 019	60 003	56 458	3 545	62 633	58 429	4 204	171 225	143 955	27 270
2010	310 211	269 321	35 496	57 450	50 495	6 955	61 819	56 088	5 731	185 548	162 738	22 810

Table 2: Research and development expenditure data
Source: Hungarian Central Statistical Office

	Number of research centres						
Year	Majority domestic private ownership	Majority foreign ownership	Full foreign ownership	Majority state ownership	Majority local government	Unknown or does not apply	Total
2003	496	45	45	31	10	47	674
2004	452	47	56	29	9	76	669
2005	496	44	62	34	8	105	749
2006	679	59	77	38	12	162	1 027
2007	797	62	84	34	11	137	1 125
2008	799	57	92	30	10	167	1 155
2009	936	56	111	20	9	175	1 307
2010	979	69	130	19	7	180	1 384

Table 3: Number of business enterprise units by ownership type
Source: Hungarian Central Statistical Office

	Number of researchers (FTE)						
Year	Majority domestic ownership	Majority foreign ownership	Full foreign owner-ship	Majority state ownership	Majority local government	Unknown or does not apply	Total
2003	1 471	728	1 581	345	21	336	4 482
2004	1 426	1 028	1 448	291	20	96	4 309
2005	1 855	964	1 776	230	22	161	5 008
2006	2 461	1 123	2 126	281	31	226	6 248
2007	2 841	1 180	2 425	196	18	326	6 986
2008	3 152	1 215	2 294	181	26	1 044	7 912
2009	4 090	1 417	2 856	77	15	517	8 972
2010	4 135	1 325	4 138	85	17	574	10 274

Table 4: Number of researchers in business enterprises by ownership type
Source: Hungarian Central Statistical Office

	Number of research centres					
Year	Micro-enterprises	Small enterprises	Medium-sized enterprises	Large enterprises	Unknown	Total
2001	281	101	115	133	0	630
2002	301	120	121	128	0	670
2003	280	138	124	132	0	674
2004	274	138	130	127	0	669
2005	308	155	137	131	18	749
2006	443	224	181	143	36	1 027
2007	479	259	201	147	39	1 125
2008	488	260	209	146	52	1 155
2009	603	307	212	139	46	1 307
2010	611	362	235	132	44	1 384

Table 5: Number of business enterprise research units by company size
Source: Hungarian Central Statistical Office

Year	Number of researchers (FTE)					
	Micro-enterprises	Small enterprises	Medium-sized enterprises	Large enterprises	Unknown	Total
2001	374	392	841	2 464	0	4 071
2002	444	452	729	2 719	0	4 344
2003	465	509	699	2 809	0	4 482
2004	434	596	689	2 590	0	4 309
2005	535	666	760	3 013	34	5 008
2006	768	958	1 160	3 324	38	6 248
2007	940	1 068	1 087	3 751	140	6 986
2008	1 113	1 344	1 690	3 680	85	7 912
2009	1 368	1 752	1 692	4 047	113	8 972
2010	1 487	1 783	2 041	4 794	169	10 274

Table 6: Number of enteprise researchers by company size
Source: Hungarian Central Statistical Office

Year	Financial source of R&D expenditure of business enterprise sector research units in HUF million	Of which:			
		enterprise sector	state budget	other domestic source (e.g. NGO)	foreign
		source, million HUF			
2000	46 704	35 414	2 837	425	8 027
2001	56 372	42 658	3 430	774	9 510
2002	60 828	42 230	4 378	482	13 738
2003	64 566	45 788	4 109	233	14 435
2004	74 641	57 759	3 101	89	13 692
2005	89 703	69 815	3 516	93	16 279
2006	114 872	86 860	9 665	100	18 247
2007	123 669	92 583	11 901	218	18 967
2008	140 042	111 810	12 036	229	15 967
2009	171 225	121 596	26 496	231	22 902
2010	185 548	131 298	25 922	479	27 849

Table 7: Sources of enterprise research and development expenditure (million HUF)
Source: Hungarian Central Statistical Office

	Number of grant applications	Number of awarded grants	Amount of awarded grants in EUR million	Success rate (right axis)	Amount of awarded grants defined as a percentage of the project amount
Belgium	13 272	3 556	1 062,27	26,79%	24,54%
Sweden	11 270	2 720	935,24	24,13%	21,36%
Austria	9 561	2 078	645,00	21,73%	20,73%
Greece	13 977	2 303	603,82	16,48%	13,72%
Poland	7 845	1 502	276,32	19,15%	13,69%
Portugal	6 818	1 318	269,30	19,33%	15,23%
Hungary	5 098	1 042	168,33	20,44%	14,38%
Czech Republic	4 390	899	161,80	20,48%	16,55%
Slovakia	1 729	337	45,67	19,49%	12,45%
Total for EU Member States	**313 604**	**69 433**	**21 808,66**	**22,14%**	**20,68%**

Table 8: Hungarian results as compared to international results in the Seventh Framework Programme of the EU
Source: ECORDA

METHODOLOGY OF THE COMMUNITY INNOVATION SURVEY (CIS, 2006-2008)

The Hungarian Central Statistical Office has been collecting data about innovation since 2000. In 2009, for the sixth time, it conducted a survey on the basis of fully and internationally harmonized methodology as required by the National Statistical Data Collection Programme (Országos Statisztikai Adatgyűjtési Program) since 2005. From the population of around 20,000 companies (operating in certain sub-sectors of the mining sector, the industry and the service sector) with at least 10 employees, nearly 6,400 were included in the sample. Of companies with more than 99 employees, all were included, and 25% of companies of smaller sizes. In total, nearly one third of companies were selected. Of these 85% of responded, which is a higher number than in previous surveys. Since more than 5,000 enterprises provided data, the available information is reliable.

Kaleidoszkóp

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