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Measurement of Innovation Activity at Hungarian Companies

Ph.D. Dissertation

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INTRODUCTION

I started my career as an economist at the research-development department of a big socialist enterprise. Here I had the possibility to observe how the results of applied projects are born and how they do *not* become products. I could gain many more practical experiences from the fields of industrial research and enterprise innovations at another company and a bank what financed innovations. Enterprise attitude and industrial development stand in the centre of my activities as an economic researcher. In the last decade I regularly ran into the situation that the companies adapted themselves to the changing conditions – they survived changes of the market and owners –, they kept regenerating, growing, and at the same time, they cut back the former research institutions, departments and they didn't even make use of the knowledge of the existing research yards. For this reason, Hungarian enterprises are not considered to be innovative. This contradiction has appeared one after the other in a considerably big number of researches based on collection of data, made by GKI Economic Research Co. Ltd. I feel the more and more urging need of reviewing and reconsidering the opinions formed about innovations and also the experiences obtained in this field. This internal claim has coincided with the appreciation of its role in the increase of innovation at the turn of the century, in the mentality of both theoretical and business economics.

The suspicion that one reason for this contradiction is that the different participants do not agree in the interpretation of innovation, arises inevitably. Such episodes have led here as the remark of the director of a relatively small rural brickyard. During an interview in an environmental topic, he mentioned that they neither do researches, nor innovations, but they try mixing the remains of different agricultural plants into the clay of the bricks. These catch fire during the burning process, the generated heat results in savings of the gas used for burning the bricks, and the emission coming from this process doesn't add up to the company's carbon-dioxide quota. When I drove his attention on the fact that this really was an innovation and he could be proud of it, he answered that they would still keep it in secret since they would need to fill in several forms. My attention was turned to broader connections by the account of a fellow researcher's experiences about their field trip in the USA, where they were taken to a remote village to learn about a subsidy project of innovation at successful small

enterprises. Here the innovation was that the local textile film printing company changed the pattern on the T-shirts for teenagers from a former shape to the portrait of Britney Spears. First I was amazed of it but later I had to realize that this activity had all the important features of innovation: they have bought knowledge (the right to use the photo), they developed its printing onto textile, they set the printing frame and the colours, and it resulted in a more suitable, renewed product that met the demands of the customers.

Under such influence did I start to deal with the specialized literature and the documents of innovation politics, and I found that there actually are many arguments concerning the concept of innovation. It was also obvious from the works of economic historians, macroeconomists, and business economists that the interpretation and management of innovation, and also the innovative results, have been embedded firmly into the social environment, thus the above mentioned example of T-shirts was so amazing due to the difference between the American practice-oriented mentality and the European mentality which rather respects science. Moreover, the example of the brick factory reflected on the differences of the theoretical and enterprise approaches. Due to my past activities and the research field where I work, the most interesting issues are the macroeconomic effects of enterprise behaviour, and it was obvious for me to examine this area more thoroughly.

I am in the lucky position to enjoy the support of a background rich in information, since my work place, GKI Economic Research Co. regularly analyses enterprise behaviour and attitudes, and I could use their results in my project. I could also learn more about researches of non-enterprise innovations.

Of course, this thesis is no more than a stop on a very long road, the result of the above mentioned motives. I discuss the knowledge and experiences that have already been collected and I present my findings and ideas about where to continue my research. I didn't cover this passage of the road alone, I owe thanks to a lot of people. First of all, to my mentor, *Gábor Papanek*, who supported me to move on with my career from an enterprise economist to become a researcher; and also to my supervisor, *Erzsébet Czakó*, who contributed to the birth of this work. Similarly to them, *Miklós Szanyi* and *Ernő Tari*, the judges of the dissertation draft helped me a lot, considerably broadening

the material with their constructive suggestions. I am grateful to fellow-researchers and the representatives of this profession, *Balázs Borsi*, *Mária Major*, *Mrs. Dezséri, Raymund Petz*, *Mária Vanicsek*, *Erzsébet Viszt* among others, who advanced my work in the most diverse ways. Finally, I express my thanks to the directors of my work place, GKI Economic Research Co., namely to *László Akar*, *Gábor Karsai*, *László Molnár* and *András Vértes*, who discharged me from my other duties as far as possible, allowing me to concentrate on this work, and they permitted me to use the resources and instruments of GKI to arrange this research.

CHAPTER I

THE PROCESS OF THE RESEARCH AND THE STRUCTURE OF THIS THESIS

The findings presented in the Introduction required the review the specialized literature in connection with the interpretation of innovation, in the first place. It helped me to find my way through the vast amount of essays that I strictly insisted on examining how enterprise innovations contribute to growth, thus I avoided the issues of scientific politics, and I concentrated only on the section of those theories which are in relation with innovations materialized or not in the business sphere. It was inevitable for me to think of national economies, though even the amateurs know that there is no other conception that could pass geographical and political borders more easily and quickly than novelty. It was an easy task to make a decision regarding the problems of defining; I chose to adapt the OECD definition that is most widely accepted in Europe.

This decision revealed one possible reason for the contradiction presented in the Introduction: the definition of innovation and activities in the field of research-innovation often mix. The reason for it is very practical: the latter one seems to be measurable on the level of macroeconomics, it is suitable for statistic analysis, it can be built in econometric models, so it is often used as an indicator of innovation. Even economic politicians prefer using it and this often ends up in choosing not efficient solutions in the name of stimulating innovation.

Of course, there were several attempts made for measuring innovation, and the bulk of them used the method of enterprise assessment. Thus I had the opportunity to perform secondary analysis leaning on the examinations made by European and Hungarian researchers – and also on the accomplishments of my colleagues and myself. I found that the results of innovation measures are very responsive to how these assessments are carried out, and to the available statistic data that are included in the complex indexes.

The effects of the social environment were examined several times, various components were emphasized and researchers tried to map the relation of these components to

innovation. My starting-point was my basic conviction that the latest developments (IT revolution, global crisis) haven't made the old textbooks useless and disposable, according to which the welfare of nations depended from the success of their enterprises, from the accomplishments reached at the market during the competition. Since corruption has become a more and more pressing issue of our world recently, I sought and found relations on macro level due to the destructive results of corruption in Hungarian public life and mainly in the course of economic growth, as a modest contribution to the mapping of the diverse relationship between social environment and enterprise behaviour. This secondary analysis was based on data of different surveys. Furthermore, I discuss the role of state subsidy, and the relationship of competition conditions and enterprise innovations.

I wished to check the statements made on the basis of the specialized literature and secondary analyses with empirical examination – i.e. with an enterprise survey compiled particularly for this purpose. However, I got to a special situation. I examined the relation of innovation and economic growth in such a period (i.e. the spring of 2009), when the greatest economic crisis of the last decades has reached its either local or absolute nadir. So, I measured enterprise innovativeness in a recessional environment.

Enterprises respond to such and external shock in different ways. The first one is the cutback of expenses, the pressure of liquidation management – at least most enterprises answered this to the questions of the GKI survey on the economic situation in December 2008. But still there were indications that certain groups of enterprises (especially in the manufacturing) plan escaping and want to manage to get out of the situation with the help of innovations. I examined this phenomenon more properly with a new questionnaire. Since the earlier surveys revealed that the innovativeness of enterprises are motivated primarily by the benefit coming from innovation investments, it arose the curiosity that the former network of relationships split up in the crisis, when the market is disturbed – the companies consider innovative activity either to be a risk that should be reduced, or the instrument of recovery in the crisis. The result of the examination can be some contribution to the chapter of crisis management actualized by all means based on the present critical situation, which allowed the formulation of a

proposition that hasn't been planned. Furthermore, I tested previous suspicions and deductions.

The researches that were carried out set the target to verify the following propositions:

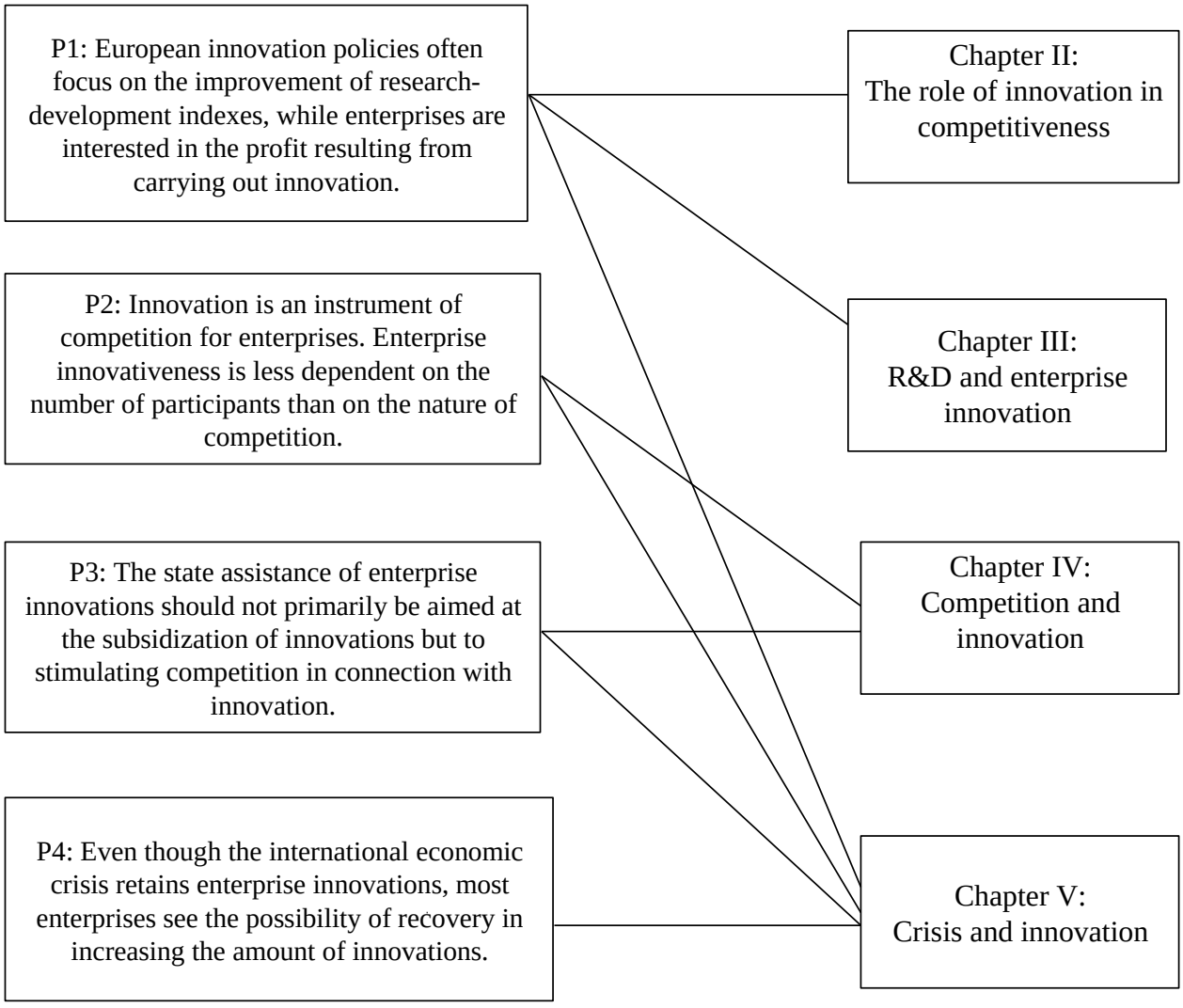
> P1: European innovation policies often focus on the improvement of research-development indexes, while enterprises are interested in the profit resulting from carrying out innovation.
>
> P2: Innovation is an instrument of competition for enterprises. Enterprise innovativeness is less dependent on the number of participants than on the nature in the competition.
>
> P3: The state assistance of enterprise innovations should not primarily be aimed at the subsidization of innovations but to stimulating competition in connection with innovation.
>
> P4: Even though the international economic crisis retains enterprise innovations, most enterprises see the possibility of recovery in increasing the amount of innovations.

The structure of my thesis is the following: in the second chapter I review the role of innovation in growth and competitiveness, mainly on the basis of scientific literary sources. I also define the concept of innovation and its types here. The third chapter deals with measuring innovative efficiency and with the inadequate choice of indicators. At this part I don't only consider the scientific literature but also the results of the international and national empirical researches. The fourth chapter discusses how innovativeness is related to the efficiency of enterprises and to their ability to cope with competition. I add my own estimates to the former methods. The fourth chapter represents the result of an empirical research from the year 2009, where I examined the sphere of Hungarian enterprises concerning the question of what improves and what obstructs enterprise innovations, and what effect global crisis has on the innovative ambitions of inland firms. I summarize the most important forces in a logit model.

In the summary, I review which propositions I managed and which I didn't manage to justify.

The structure doesn't justify the propositions linearly. Though there are certain analogies between the main massages of certain chapters and the propositions, arguments and counterarguments to these propositions appear in each chapter, too. The fifth chapter implicitly tries to support every proposition on an empirical basis.

1. **Figure** **The relationship of propositions and chapters**



CHAPTER II

THE ROLE OF INNOVATION IN COMPETITIVENESS

Adam Smith [1776] saw the welfare of nations in the division of labour and he joined the concept of growth to its depth. "This great increase of the quantity of work which, in consequence of the division of labour, the same number of people are capable of performing, is owing to three different circumstances; first to the increase of dexterity in every particular workman; secondly, to the saving of the time which is commonly lost in passing from one species of work to another; and lastly, to the invention of a great number of machines which facilitate and abridge labour, and enable one man to do the work of many." (p. 18.) We have to realize that here not only the improvement of the processing machines acts as innovation increasing productivity but also the workers' competence and the change in the organization of work.

The latter theories of increase tried to integrate the technical progress into the models. The Austrian *Joseph Schumpeter* [1911] based his conception of growth totally on the existence of innovation. The economic historian *Mokyr* [1990] regards the field based on Smith's division of labour and trade and on Schumpeter's technical development to as two separate ways of growth, though he acknowledges that these often transform into each other, and also into a third, Solow-type growth resulted from capital increase per labour unit, and vice versa. (pp. 17-19.)

With the development of econometrics, the attempts resulted in numerous achievements. *Károly Lóránt* [2003] gives a good review of them. As time went by, it became more and more obvious that growth – which is mainly measured in GDP – is not equal to development, especially not to maintainable development. *Zoltán Román* [1977] introduced this idea to the Hungarian professional mentality already in the 1970s. Development also means a change in quality, which is mostly materialized in the use of scientific results. There were attempts made for building technological development into econometric models, though they haven't had any convincing results in Hungary. (See in details: *Tamás Révész* [2005])

Innovation has become a fashionable and current topic. As *Bakács* [2006] reports, "the 'new growth theories' appeared in the 1980s have something in common: they have ended up the so much neoclassical supposition that the pace of technical development is an external feature, determined independently from the economy. (…) New growth theories place the so called endogen technical development into focus, and they actually search the answer for the question: what the most important resources of technical development are. (…) Among the issues of new growth theories many wish to reason the differences of income of certain countries examining the issues of research-development and the spread of knowledge." (*Bakács* [2006] p. 1., my trans.)

In the last decade of the last century, another concept gained popularity in connection with growth, and that is competitiveness. Though it was a category of enterprise economy first – the most famous piece of work in this topic is *Michael Porter*'s 'Competitive Strategy' [1980] – but later also the competitiveness of national economies became the object of analysis. On the level of national economies, Porter himself regarded productivity to be an index proper for comparing competitiveness of different countries, though in his work titled Competitive Advantage he calls our attention several times on the fact that, in reality, national companies compete on the global market that became internationally competitive due to the favourable conditions of inland industry. Furthermore, the aspect of renewing and developing their products, their activities and the industry itself had determinative role in this.

The annual world competitiveness yearbook of WEF (World Economic Forum), which is edited by Michael E. Porter and his fellow editor in chief, differentiates three stages in the development of countries, on the basis of GDP per capita.

1. **Table** **Income extremes of the phases of development**

Phase of development	GDP per 1 person (USD/per capita)
1st phase: factor-driven	<2000
Transition from 1st phase to 2nd phase	2000-3000
2nd phase: efficiency-driven	3000-9000
Transition from 2nd phase to 3rd phase	9000-17000
3rd phase: innovation-driven	>17000

Source: World Economic Forum [2008] p. 8.

WEF arranges the factors examined in every country into 12 pillars of competitiveness; every pillar has different weigh in certain phases of development. In the factor-driven phase, the so-called basic requirements (i.e. institutions, infrastructure, macroeconomic stability, healthcare and basic education) have the greatest importance. In the efficiency-driven phase, the importance of these factors is moderated, but the factors enhancing efficiency (i.e. higher education and training, goods market efficiency, labour market efficiency, financial market sophistication and technological readiness) and the factors showing how refined enterprise functioning and strategy are (i.e. business sophistication and innovation) are taken into account alike. In the phase determined by innovation, this last group has the most important role.

The yearbook of 2008-2009 places Hungary in the transition of the second and third phases. The most important question regarding future developments is when and in what way we can get to the next stage, or possibly standstill here and fall behind in the competition. This is not only the problem of the Hungarian economy. The USA, Japan and the member states of the Union can be found in the phase determined by innovation (and we can list here some new member states, too, like Cyprus, the Czech Republic, Malta and Slovenia); most of the states having entered the Union simultaneously to us are in the transition phase, just like us; and Bulgaria and Romania are in the second phase. China is between the phases determined by factor and efficiency. (World Economic Forum [2008] p. 9.)

The research series, which is going on since 1995 in the Competitiveness Research Centre of the Corvinus University, Budapest, is called „Connection between macro and micro level competitiveness" and has reached significant results in the national research of competitiveness. The book of *Attila Chikán* and *Erzsébet Czakó* [2009] demonstrate the nature and results of this research in details, and the examinations related to enterprise innovation are outlined by Appendix 1 – among many other practices measuring innovation.

The competition going on between the world's three leading economies – also referred to as Triad –, i.e. Europe, North-America, Japan and the Far East, has been determined for a long time by the accomplishments they can reach in the field of technological

development. The importance of research and innovation is a well-known trivial issue for the developed economies.

According to the study of *Robert J. Gordon* (*Gordon* [2004]) the more favourable world economic position of the USA, compared to Europe, can be traced back to the exploitation of great inventions of the end of the 19th century (automobile, electricity, telephone, photography, aviation). It is worth noting that he emphasized not the inventions themselves – a part of which was made in the Old Continent – but their use, and that the advantage of the American productivity is the result of the spread of these inventions. Europe was not able to go through such a development due to being torn into parts after World War I. The difference in productiveness was moderated only in the period after World War II by the delayed application of these great inventions. After 1995, the productivity of the USA began to increase faster again than that of Europe, which Gordon attributes to the cooperation of fruitful government, universities and industry. Of course, this was materialized spectacularly in the technological development of information-communication in the first place. Gordon calls the attention on the fact that not only the spread of such business chains as Walmart and Home Depot, but also the supply of small family businesses with laser bar code scanners – which were often connected to a wholesale store – lead to the efficiency of retail trade. Thus not only the existence of these technologies but also their extensive use served as the source of competitive advantage.

On the turn of the millennium, it came to light that the successful and fast adaptation of developed technologies can set out even the underdeveloped countries for a new and very fast growing, which seems to be permanent. The first example was given by the Asian tigers what can be regarded distant exotica but the appearance of the "Celtic tiger" has already brought recovery in one of Europe's stagnant spherical countries.

In our present time, the rise of China and India suggests that the Triad is going to be Quadrat soon, if the European Union doesn't fall behind the rapidly developing South-Asian area fatally. Tough the source of economic growth in these two big countries was the cheap labour available, but it is characteristic for both countries that they join the modern industries more and more dynamically, not only as the employers of a knowledge produced somewhere else, but also as the generator of separate ideas and

solutions. Of course, it is difficult to adjudge if the quick growth is not only the result of starting from a low level, which could be succeeded by slowness and recession in the latter phase of closing up. However, opinions, according to which the rapid growth of China and India is generated by the widely spread innovativeness of entrepreneurs, are gaining much emphasis.[1]

The crisis that evolved at the end of 2008 has affected these countries in a smaller degree than how it affected the developed regions of the world. This suggests that today the source of their rapid growth is not only mass production based on cheap labour any more.

Innovation is a concept about which everybody talks but they interpret it in different ways. *Earl Babbie* [1998], in his excellent methodological book titled 'The Practice of Social Research', states that we can measure anything that exists. He presents a funny dialogue about how difficult it is to determine whether a common concept or thing exists or not in reality. (*Babbie* [1998] p. 139.) Babbie absolves the above-mentioned conflict by stating that we have to conceptualise every concept and then we can determine the indicators which verify the existence or absence of the examined concept. If we miss these steps, we can easily get into a situation where the incorrectly chosen indicator measures something else, and not what we are curious about.

Concerning enterprise innovation, our starting point must be *Joseph Alois Schumpeter*'s lifework. Though this excellent Austrian economist formed a concept of general economic development in his famous work edited in 1911 (*Schumpeter,* 1911), his reputation is still due to one of the ideas explained in this work, i.e. the definition of innovation. In the first chapter he presents a very simple economic cycle of reproduction. "Technically, as economically, producing means to combine things and forces that are within our command. Each production method represents a specific combination." (p. 54) In the second chapter he goes on and searches an explanation for growing. He comes to the conclusion that certain people, i.e. the entrepreneurs, employ

[1] During the joint research of ICEG European Center and the Institution for Prospective Technological Studies a conference was held in September, 2006, under the title of "Knowledge economy: innovation and growth in Europe". Four lectures dealt with the role of change in the Chinese economic policy in its fast growing lane. It was an important element of the new policy to moderate enterprise possibilities, to do research and innovation, and to urge enterprise innovation. See in details: *Bradley* [2006], *Bianchi* [2006], *Lovelock* [2006] and *von Tunzelmann* [2006] in: ICEG [2006].

the already existing resources ("the service of land and labour", p. 57) in a new way and thus they produce surplus goods and income. "Production means the combination of existing things and forces. To produce something else or the same thing but in a different way means the different combination of these things. (…) Thus development in our interpretation is the materialization of new combinations." (pp. 110-111., my trans.) This is enough for *Schumpeter* to trace back enterprise profit, interest and even business periods.

From the topic's point of view the important thing is that according to *Schumpeter*, the key figure of economic development is the entrepreneur who carries out innovation (i.e. new ways of combining resources). "We call the materialization of new combinations 'enterprises', and the people whose function is to carry out these new combinations are 'entrepreneurs'. (p. 120, my trans.).[2] In the meantime he doesn't concern every manager to be entrepreneurs: "anyone can become entrepreneur but only when they in deed deal with the 'materialization of new combinations'; and they lose their quality of an entrepreneur as soon as they pass on to managing the enterprise they have created" (p. 125., my trans.)

So, innovation is always a new solution according to *Schumpeter*. He also classifies the types of enterprise innovations:

> "This concept includes the following five cases:
>
> 1. The production of new (i.e. not known to costumers) goods or new qualities of certain goods.

[2] This definition is appropriate also to call the attention on the phrasing laxity having been spread in the last 15 years – and in it I join the recommendation stressed by *Zoltán Román* (see: *Román* [2006]): the Hungarian expressions 'vállalat' and 'vállalkozás' are often used as synonyms, not like the differentiated expressions in German ('Unternehmen' and 'Unternehmung') or in English ('enterprise' and ''entrepreneurship'). The first one is an economic organizational unit, the latest – at least in the Schumpeterian interpretation – is an attitude. 'Vállalkozás', i.e. entrepreneurship, is starting something new regarding both its risks and possible benefits, the field of which could be even an enterprise. If the richness of Hungarian language allows such a distinction, it would worth keeping the two different meanings of these words, we shouldn't mix them up. 'Micro-enterprise' and 'small enterprise' indicate the size of enterprises – and it is strange that Hungarians don't say 'nagyvállalkozás', i.e. 'big enterprise'. Private enterprise is not only a form of company but also an activity, moreover, a life style, too. Here we have to choose the correct expression: if we want to emphasize the economic data and legal regulations of a certain form of company with a given size, then they are apparently enterprises; but if their sociological relationships are important, then rather their character of entrepreneurship is emphasized.

2. The introduction of a new method of production, i.e. not known to the industry practically, which need not be based on scientific discovery, and which might be a new commercial process connected to a certain good.
3. The opening of a new market, where the given industry of a given country hasn't been introduced yet, whether the market was already existing or not.
4. Conquest of a new source of supply of raw materials or half-manufactured goods, not depending from the former existence of the resource (if it hasn't been realized, it hasn't been regarded to as appropriate or it had to be developed first).
5. The realization of a new organization – e.g. creating monopoly by trusting or ceasing it." (p. 111., my trans.)

The starting points originating from Schumpeter are the following: innovation is a new type of combination of resources, and it is carried out by the entrepreneur. Not even the most excellent scientific result of research institutions could be regarded to as innovation until someone doesn't undertake to apply it. Of course, we are speaking about enterprise innovation, but innovation can be materialized in any kind of organization where people work.

There were many attempts made for defining the concept of innovation but these attempts couldn't break away from the Schumpeterian basis, they were rather led by the intention of enriching due to modernization and new phenomena. *Miklós Szanyi* (*Szanyi* [1990]) gives a wide review of these ideas – especially of the development of theoretical approaches. In the following, I present some definitions that are relevant to enterprise innovation.

Since the enterprise is the important field of carrying out innovation, it was necessary for the representatives of business economies to deal with innovation. *Peter F. Drucker*, an excellent American representative of management studies devoted a whole book to the relationship of innovation and enterprises. (*Drucker* [1985]) According to him, "innovation is nothing else but the alternation of the value of profit coming from the (re)sources, and thus a more perfect satisfaction of costumer demands." (p. 42., my trans.)

The possible sources of innovation can be:

- Unexpected success or failure, an external event
- A contradiction of reality and the plans that have been made
- The requirements of the process
- The change of the structure of industry or market
- Demography, a change in the population
- The approach, mood and change of meaning
- The appearance of new knowledge (scientific and non-scientific) (p. 44.)

Drucker actually sees the facility and necessity of enterprise innovation to be on the agenda when a divergence appears in the processes.

It is worth emphasizing the work of *Attila Chikán* among the Hungarian authors. In his book 'Enterprise Economics Studies' he devotes a separate chapter (*Chikán* [2005] pp. 213-248.) to discussing the place of innovation and its role in enterprise strategy. His definitions are very brief: according to him innovation is "the gratification of the costumer's demands on a new and higher quality level." (*Chikán* [2005] p. 215., my trans.) This definition recalls the approach of Drucker.

For the measuring of enterprise innovation, as a modern interpretation, the most widely accepted definition is the one settled in the Oslo Manual, which was published in the joint edition of OECD and EUROSTAT, the statistic office of the European Union.

In 1992, amid the technical revolution, the OECD felt it necessary to form a framework for expressions and methodology to interpret and analyze the processes of research-development and innovation. This was the Frascati Manual and the Oslo Manual; thus, the two concepts were basically differentiated right at an early stage. The Oslo Manual has been revised two times so far, the third edition was published in December, 2005. The main reason for it was that, at the beginning, the emphasis was on the aspects of innovation, which were close to technology. So it is not an accident that also professionals tend to mix up the concepts of innovation and research-development. According to the apt phrasing of *Katona* [2006] the first edition of the Oslo Manual

"focused on the technical product and process innovation of manufacturing industry (TPP). Later the assessments lead to the further improvement of the structure of the Oslo Manual and in 1997 the second edition was published which extended the analysis to the supply section, too, among others. (…) Since then, the results of the assessments and the changing necessities of politics lead to the subsequent revision of the manual, the result of which was a third edition." (*Katona* [2006] p. 3., my trans.) Thus, now the following definition of innovation is regarded as internationally accepted:

> **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."** (OECD [2005] p. 46.)

This definition means an obvious return to the Schumpeterian interpretation of innovation.

There were two laws put into force in Hungary to urge the activity of enterprise innovation. These are the law of 2004, CXXXIV. regarding technological research and technological innovation (Itv) and the 2003. XC. law about the Research and Technological Innovative Fund (Atv) –called as innovation tax law as well - that aimed incentive the enterprise innovation activity.

The Hungarian innovation law[3] follows the international interpretation (Itv 4 § 2.):

> "… technological innovation: the improvement of the efficiency of economic activity and profitability, and the complex of scientific, technological, organizational, management and commercial operations done in the interest of reaching scientific, technological and environmental effects, as the result of which new or significantly improved products, processes, and services come to existence; new or significantly improved methods, adaptation and the introduction of new technologies to the market take place, including those

[3] See the law and the cited regulations in Chapter 3.3 in details.

> alternations that can be qualified as novelty only in a given branch or at a given organization.” (my trans.)

The types of innovation according to the third edition of the Oslo Manual (OECD [2005] pp. 16-17.):

1. product innovations
2. process innovations
3. organizational innovations
4. marketing innovations

The extension of the concept was obviously due to the changes following the publishing of the manual’s second edition, 1997. It could have had an effect of global enterprises and Internet markets’ ground gaining. As we can see, only the new raw materials, half-manufactured goods and sources of supply are missing from Schumpeter’s five innovation types. I wouldn’t be surprised if further alternations were introduced in the internationally accepted interpretation of innovation, by the development of bio- and nanotechnics and the use of alternative energy resources, and if the fifth type was also involved.

The above mentioned types of innovation are often distinguished and referred to as technological and non non-technological innovations. Technological innovations include product and process innovations, non-technological innovations include organizational and marketing innovations.

The classification of R&D based and non R&D based innovations is not equal to the classification of technological and non-technological innovations since non-technological innovations are often based on scientific results – just recon the example of results achieved in the field of management art, or the utilization of psychological researches in the form of organizational innovations. The same can take place in the field of marketing innovations where sociological accomplishments are often utilized. Non-technological innovations often use the achievements of technologies, too, e.g. in the field of information technology.

The new Oslo Manual also defines the categories of novelty [OECD 2005. p. 57.]. Regarding the former editions there is no change here.

- Novelty to the world
- Novelty to the market
- Novelty to the firm

It is conventional to speak about incremental and radical innovations. The first one means a gradual development that is attained in small steps, e.g. when a setting is changed in the manufacturing process, the supplementary equipments are placed differently, etc. A product can also go under such an incremental development when there are small modifications carried out on it. Radical innovation means an important novelty bearing decisive significance, e.g. concerning the former examples, the setting of a new machine or material moving system, investing a product with new functions or making it appropriate for meeting the demands of new customers. The Oslo Manual doesn't differentiate incremental and radical innovations as types, it doesn't even consider the first one as innovation, but it calls the attention many times that the chain of incremental changes can lead to reform, thus to radical innovation. (OECD [2005], pp. 40, 47.)

So there are several kinds of innovations existing. The product resulting from a great research and from introducing organizational solutions seen at other firms can be regarded as innovation. Not only a new method created on the basis of a new scientific accomplishment but also the chain of small market processing steps lead to innovation. This diversity might be unacceptable for the European approach which considers mainly the results produced by scientific workshops to be innovation, while strict criteria define what can be regarded to as scientific. *János Kornai* wrote in connection with the diversity of the socialist regimes that "there are many kinds of dogs. It is almost unbelievable and unacceptable that both a small Pekingese and a huge Saint Bernard, which have different build, way of walking, colour, look, and nature, are to be called dog (*canis familiaris* in latin). It is not decided by the taste of the dog-fancier and non-fancier people which dog breed they are willing to acknowledge as dog and which they are not. There's something common in every dog that is different from that of other animal breeds. The zoologist can describe accurately what is common in dogs and with

which positive criteria we can define if an animal belongs to the breed of dogs – or not" (*Kornai* [2007] p. 114., my trans.) The "zoologist" of innovation is the Oslo Manual, the interpretation, definition and typology laid in this book are accepted worldwide by innovation researchers.

CHAPTER III

R&D AND ENTERPRISE INNOVATION

Since it is generally accepted that enterprise innovation is the determinative source of economic growth, governments – and the European Union itself – make hard efforts and put considerable resources into encouraging it. These efforts, however, don't always achieve their purpose.

The leaders of the European Union have realized pretty long time ago that the innovative arrears have brought the region at a disadvantageous position in the competition compared to the other developed areas of the world. However, a huge gap evolved mainly between science and practice in Europe, in the last 50 years. The European region excels mainly in basic researches and producing theoretical results, but in the production of marketable products it falls behind its rivals. Though there are numerous publications about the new scientific achievements, they spread slowly and with difficulties. This is called 'the European paradox'. This paradox is more explicit in Hungary than in the other developed countries of the continent. In their articles, *Papanek* [2003], *Török* [2006/b and 2006/c], *Borsi* [2006] and *Varga* [2008] describe this phenomenon in more details.

In order to overcome this situation, the leading organizations of the European Union have decided to pass the former research mechanisms and they accepted the so called 'Lisbon strategy' in 2000, which can be considered to be the Union's economic improvement program.

The Lisbon strategy resulted from the fact that the economic growth of the European Union has lagged behind the growth of America due to the slower spread of R&D results, especially modern information technologies. The program, which was accepted in 2000, set the target to "to become the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion." (EC [2000] point 5.)

This is the reason why the stimulation of innovative activity was placed in focus, which advances mainly but not exclusively the formation and spread of innovation. It was typical that such a measurable input was marked as the innovative target of the Lisbon strategy that, according to the previous chapter, isn't connected to innovation but to the creation of new knowledge:

"… *overall spending on R&D and innovation in the Union should be increased with the aim of approaching 3% of GDP by 2010*." (EC [2002] point 47.)

It was obvious right at the half-time that reaching these goals was impossible. On behalf of the European Commission, an expert committee was founded with the leadership of *Esko Aho*, and in January, 2006 they published a report which stated that "It is well-known that the 3% target cannot be approached without a very substantial increase in business investment in R&D and innovation.." (p. 5.) For this goal, they urged efforts in three fields:

1. The formation of innovation-friendly market for enterprises. This necessitates some regulations, the approval of standards, public procurement, the defense of intellectual properties and the culture that favours innovation. Large scale strategic actions and demand production have to be carried out, primarily in the following fields: e-healthcare, medicine industry, energy, environment, transportation and logistics, security and digital content.
2. Measures have to be done to increase the resources that could be put into excellent science, industrial R&D and science-industrial relations. The productivity of R&D has to be improved.
3. There's a need for a greater mobility in the field of human resources, finances and the stream of knowledge inside the Union. (p. VII., my summary.)

Török [2005] presents another criticism of the Lisbon program. Since that time, we know that most measures urged in the Aho report have been put into effect, but the innovative efficiency and competitiveness of the European Union haven't approached the results of its fellow competitors. The target itself was incorrect. *Barysh* and his companions present the ideas of *Michael Schrange*, MIT manager, USA, in their

analysis that construes the statements of the 8th Lisbon assessment in a separate, emphasized section, under the title ‘Is R&D a meaningful measure of innovative capacity?’ “Yet seemingly rational policy-makers across Europe seriously argue that European countries and companies would be so much more competitive if only they would increase their spending on research and development (R&D)..” The Boston scholar brings up a bunch of examples for verifying that spending more on R&D doesn’t go hand in hand with greater enterprise success. Of course, he doesn’t state either that R&D expenditures would be in vein. He says only that “If policy-makers believe that sustainable innovation is key to economic growth and prosperity then industrial rivalry and competitive intensity are far better indicators than R&D intensity..” Even more information about the profitability of R&D investment could improve the situation a lot. (*Barysh* et al. [2008] pp. 29-31.)

Thus, we are facing a problem of measuring. Though the index set can be defined and measured easily (by general agreement), the indicator – i.e. the rate of R&D expenditures related to GDP – doesn’t give information about reaching the real goal.

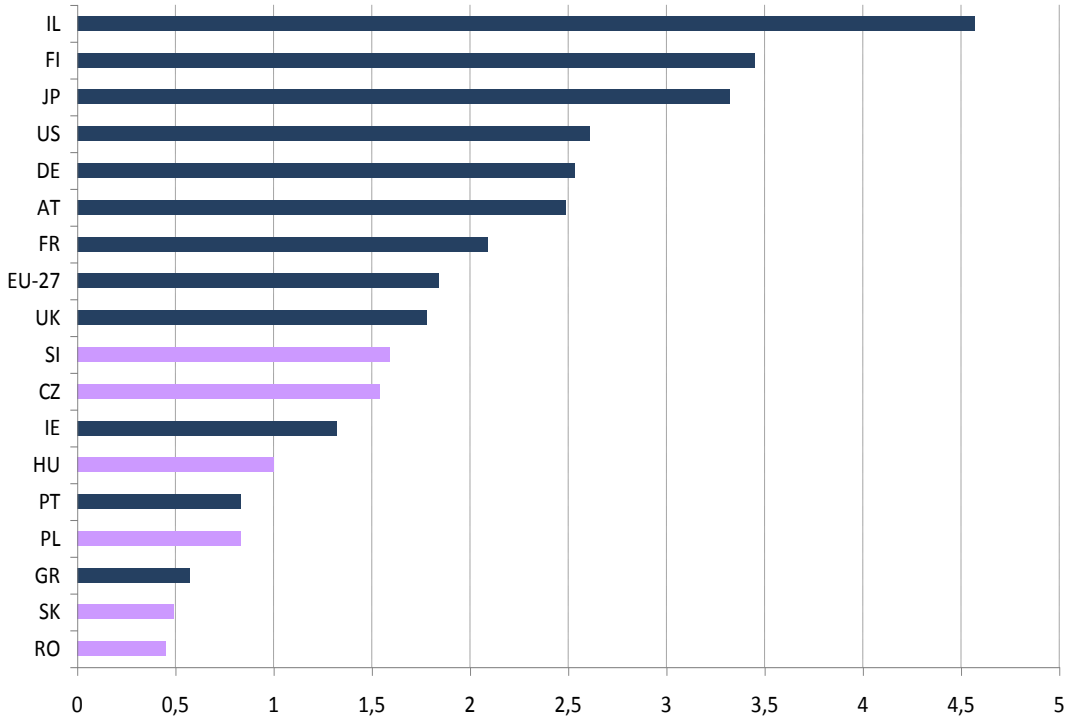
3.1. The R&D intensity index

In most of cases the rate of R&D expenditure compared to GDP, i.e. the so called R&D intensity, is used for measuring innovative activity and for comparing it internationally. The index is also known as GERD (Gross Domestic Expenditure on R&D). R&D expenditures are not usually classified according to the field of use or science particularly but to financers. According to it, we can differentiate the expenses of the government, the business sector and foreign lands. The R&D expenditure of the business sector has a separate name, too, i.e. BERD (Business Expenditure on R&D). The abbreviation of GOVERD is less widely known but it is generally used for state-financed expenditures.

The tables and figures demonstrating R&D intensity deal with how much certain countries spend on creating new knowledge to the best of their power. A lot of new inventions are carried out where a lot of money is spent on creating new knowledge and these inventions are utilized in the given country – this supposition seems to conceal behind the popularity of these tables and indexes. Hungary doesn’t have a good position

in this list with its 1% in 2006, this is one reason why Hungarian innovative efficiency is concerned to be weak. Of course, the Union has reached only 1.6%, which is a lot behind the 2005 indexes of Japan (3.3%) and USA (2.6%).

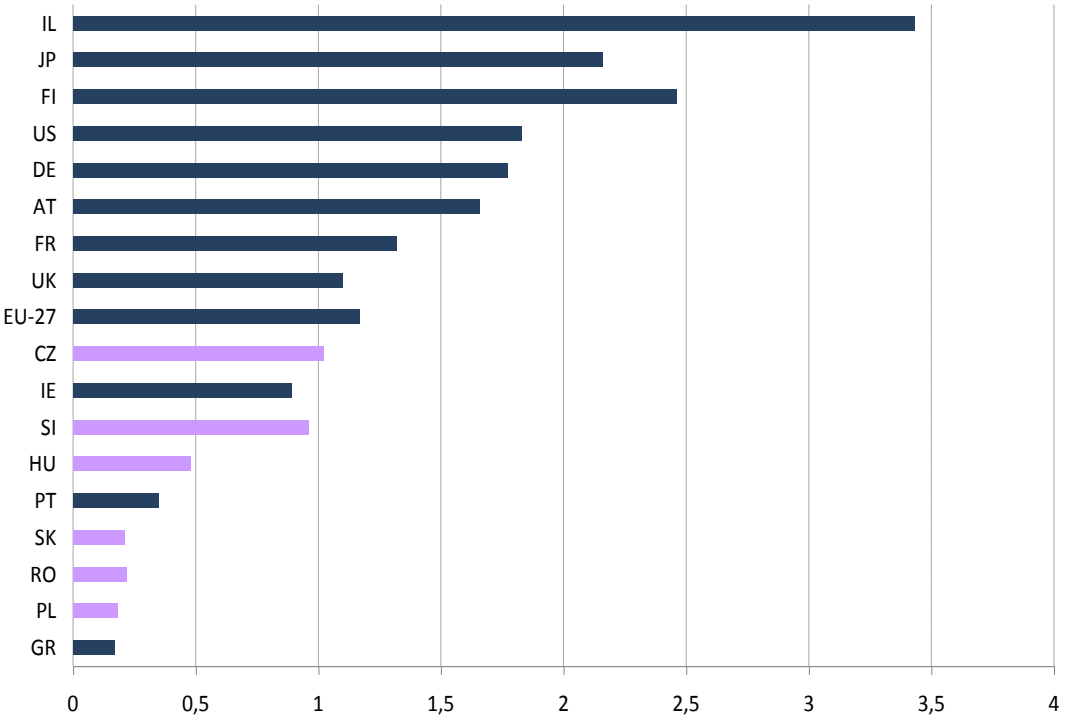
2. Figure **R&D expenditures in proportion to GDP, 2006**



Source: *Viszt* [2008] p.115

The Hungarian firms took part in R&D financing at a much lower GDP rate (0.48%) compared to the European Union's 1.17% average in 2006. (This level is low even if we take into consideration that GDP goes under a larger scale centralization.) This is the other reason why Hungarian companies are regarded to show low innovative aptitude. It is quite understandable that the government wants to force them to order more active R&D with the innovation tax law that will be presented later. Of course, the question is the following: how can these research results financed this way be utilized as the combination of new, efficiency-improving factors, and as a new way of satisfaction for customers' demands. After all, the final aim would be this, not the survival of some academic institutions.

3. **Figure** **Enterprise R&D expenditures in proportion to GPD**



Source: *Viszt* [2008] p.116.

It is a favourable phenomenon that the rate of BERD in Hungary has been growing in the last few years. This suggests that the companies are dealing with the acquisition of new knowledge more actively, and perhaps with its utilization, too. This is due to multinational corporations that establish an activity of a higher knowledge level. The law of innovation tax could cause additional charges in the enterprise sector in Hungarian possession because of the possibility to deduct the sum of their own innovative expenditures, at good chance resulting in a real renewal of functioning.

2. Table Financial sources of research-development expenditures

	Enterprise	State	Other
2000	38%	50%	13%
2001	35%	54%	12%
2002	30%	59%	12%
2003	31%	58%	11%
2004	37%	52%	11%
2005	39%	49%	11%
2006	43%	45%	12%
2007	44%	44%	12%

Source: CSO, STADAT tables

GERD and BERD indexes have several beneficial features. First of all, they can be calculated from statistic data, and their content is more or less unified in the different counties. There can certainly be numerous objections brought up against the data. I don't mention the methodological problems of measuring GDP, but we can be sure only in the position of R&D expenditures granted by the state, not more; even though the Frascati Manual extensively deals with the topic of R&D interpretation and measuring.[4] Whether the enterprises collect and report such expenses separately or not, it strongly depends on the tax allowance applied in the country and on the accountancy rules. And the most important objection against the indexes showing R&D intensity is that they say nothing about whether the amount of money results in accomplishments and whether anyone can use them for anything. The press publishes amusing compilations at around the end of the year about what useless results come from research expenses. The periodical Annals of Improvable Research has even established an award for them known as IgNobel. (See: http://improbable.com/) The increase of GERD index doesn't certainly increase the innovativeness of a given country or region.

Schumpeter emphatically calls the attention when interpreting innovation that the entrepreneur is not a scholar, innovation is not a result of research. "As long as they are not carried into practice, inventions are economically irrelevant. And to carry any improvement into effect is a task entirely different from the inventing of it, and a task, moreover, requiring entirely different kinds of aptitudes. Although entrepreneurs of course may be inventors just as they may be capitalists, they are inventors not by nature

[4] Of course, it can be argued whether all the expenses of state-financed institutions can be concerned to be R&D expenditures. E.g. in the case of welfare institutions of the Hungarian Academy of Sciences; the sum of money given to institutions of higher education.

of their function but by coincidence and vica versa. Besides, the innovations which it is the function of entrepreneurs to carry out need not necessarily be any inventions at all." (*Schumpeter* [1980] p. 137.)

Of course, Schumpeter doesn't underrate the importance of inventions and new technological phenomena but he supposes that their invention (their application in combinations) require other considerations. "In practical life it is characteristic in deed that technological viewpoints have to be overshadowed if they conflict with economic viewpoints. However, we can't deduce from it that the opinion of the engineer doesn't exist and operate, and that his opinion doesn't have a rational core. Nevertheless, it is worth considering under what conditions would the steam engine perform more and with how much excess, what developments do our present knowledge allow, etc. Since in this case these measures can be prepared for the time when they become beneficial. Moreover, it is worth to oppose this ideal picture to the real situation in order to renounce these possibilities on the basis of careful economic considerations, and not because we don't know them." (p. 52-53., my trans.)

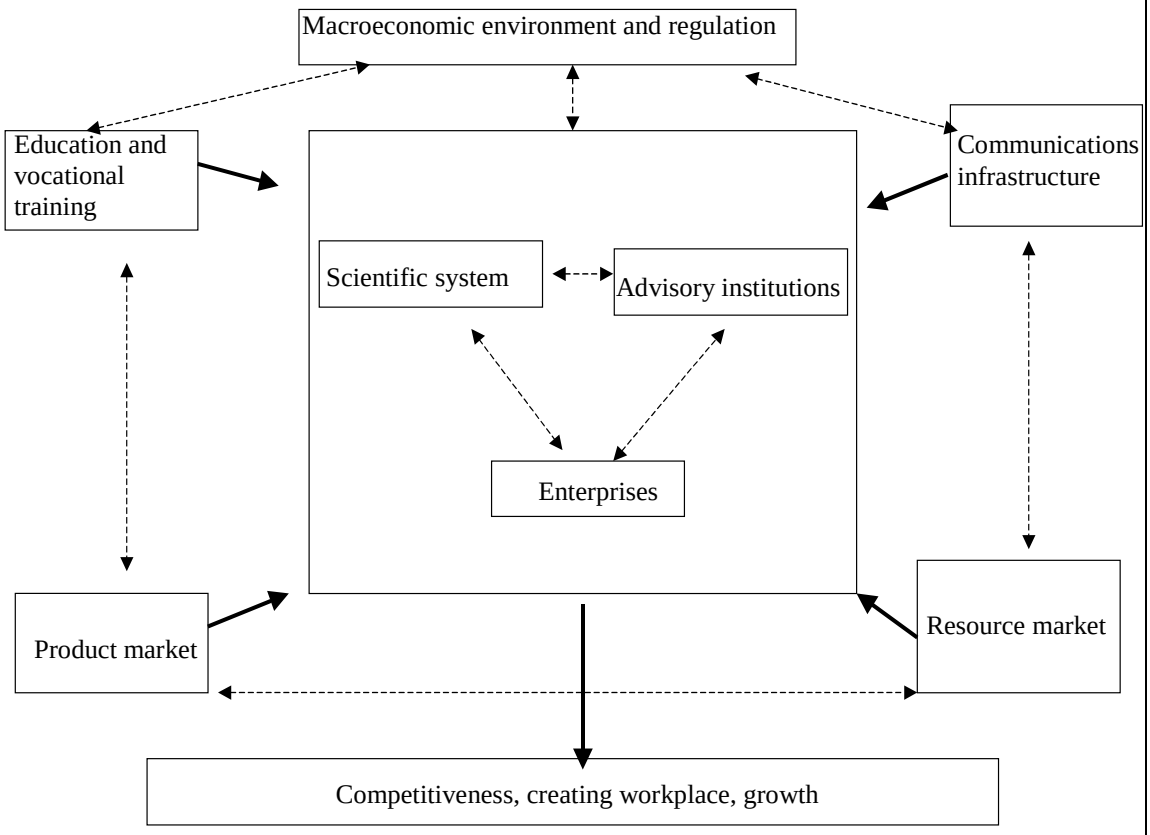
Drucker, in his cited piece of work, considers the appearance of new knowledge to be one of the seven possible sources of enterprise innovation, moreover, he did not only mean R&D results by it. (*Drucker* [1985] p. 44.)

It doesn't mean that R&D activity would have been of no interest from the viewpoint of enterprise innovation. As Mokyr says, "without invention, innovation will eventually slow down and grind to a half, and static will result. Without innovation, inventors will lack focus and have little economic inventive to pursue new ideas." (p. 25.) R&D is crucial part of the national innovation system. Under research innovation I mean the making of new knowledge, and innovation means their application.

The OECD worked out the definition of national innovation system more than 10 years ago during its task to clarify the concept regarding innovation, and it was included in the technical literature. In the study volume presenting our national innovation system (*Papanek* [1999/a]) we also adopted the definition of OECD:

"National Innovation System is the sub-system of economic (producing-distributing-consuming) processes; such a system that – in accordance with the interpretations of *C. Freeman*, *B. A. Lundwall* (OECD, 1997) and *S. Metcalfe* (OECD, 1998) – accomplishes the scientific-technological progress in economical processes, and that can be interpreted as the complex network of institutions and their relationship contributing to the existence and spread of innovations." (*Papanek* [1999] p. 10., my trans.)

4. Figure **The national innovation system and its relationships**



Source: *Papanek* [1999] p. 11.

The national innovation system is also defined by the innovation law: It is "the collection of those institutions, enterprises, other organizations, resources, regulations, conditions and actions in a country that influence the formation, transmission, spread and utilization of new knowledge and technology." (2004. CXXXIV. Act, my trans.)

In today's globalized world, where at least information and knowledge spread quickly and freely between the different parts of the world, the technological knowledge needed for innovation is obtainable from anywhere, and, of course, the producers of scientific results can find users anywhere. Thus, the national innovation systems can be interpreted only within more and more permeable barriers. This thesis focuses on only one segment of the above demonstrated figure: that one labelled "Enterprises".

3.2. Attempts made for synthesizing R&D based and other innovation measures

We can not measure only something that can be expressed in natural quantity or money. Several other kinds of techniques have been developed to search social phenomena (demonstrated in *Babbie* [1998]). Assessment is a method similar to fact-finding, but still significantly different from it. A crowd relatively big in numbers can be addressed by a survey, and the techniques of questioning allow the researcher to summarize such opinions and attitudes that can't be qualified in themselves. Since R&D intensity (R&D expenditures in relation to GDP) is not adequate for measuring enterprise innovativeness, there were several attempts made for approaching this phenomenon in a different way. An EIU monitoring, what I present in the Annex 1, is an example for this assessment. One of the most well-known monitoring is carried out in the European Union, concerning us, too.

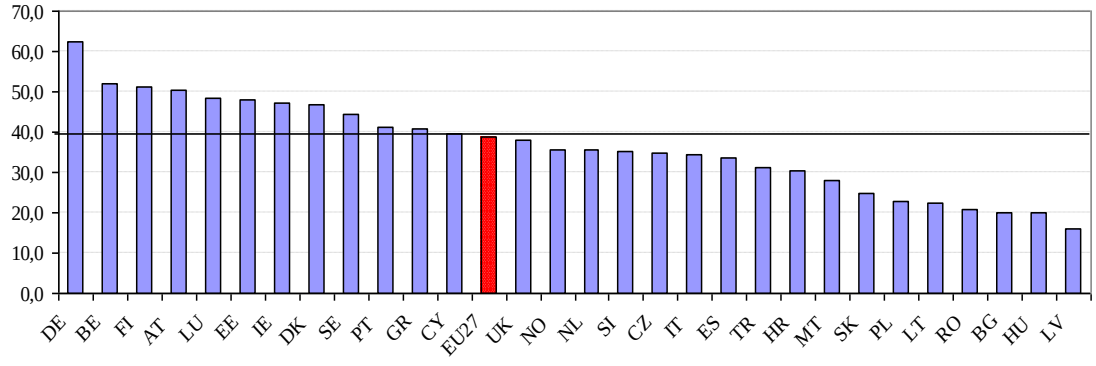
The European Union is making more severe efforts, sensing the lag in the field of innovation, to appreciate the nature of the problems. For this reason, a regular series of surveying was started at the turn of the millennium in the sphere of enterprises of the member countries. This is the Community Innovation Survey. In every two years a unified questionnaire is addressed to each member state based on a representative model. The definitions and methodological recommendations are enclosed to the questionnaire in order to allow the comparison of the results. The last survey was CIS2006 (Eurostat [2009])[5].

[5] I present the inference of innovation measuring practices of many organizations in this thesis. Since describing all the methodological features of these practices would break up the original strain of thought, the description of measuring practices can be found in Appendix 1, together with CIS2006 survey.

The inquiry of 2006 was based on the 1997 second edition of the Oslo Manual, so only the technological innovations were measured.

According to the first published result, the innovative efficiency of the Hungarian enterprises is very weak compared to the rest of Europe. The rate of innovations was lower only among the enterprises in Latvia.

5. Figure **The rate of innovative enterprises according to the survey of CIS2006**



Source: EUROSTAT [2009]

Regarding the rate of companies that carried out own research-development, Hungary reached a much better position among the innovating companies. We are at the 7th place among the 24 countries that provided such data. Regarding the rate of countries entering into external R&D we got only the 18th position in the same group of countries. However, in other innovative cooperation we do well again: we are at the 7th position from the 24 countries, but still we had the 10th position in the totality of all 31 countries. It seems that the inland firms are not really willing to cooperate with the scientific sphere in order to create new knowledge, but they gladly enter into other innovative cooperation.

According to the CSO – Central Statistic Office, the Hungarian statistic authority - CIS2006 survey, 17.7% of Hungarian companies proved to be innovative between 2004 and 2006. 14% of companies working with staff under 50 people, 30% of medium-size companies and 55% of big companies have carried out some kind of innovation. Of course, R&D and the branch of computer studies proved to be the most innovative at a

rate of 53%, and it was followed by chemical industry including medicine production (48%). The most amazing result was the third innovative sector: the financial mediation where banking sector belongs to (40%). This exceeded even the 37% reached by vehicle production. Financial institutions have introduced various new financial products in effect in the last few years; the spread of online banking has resulted in significant organizational reforms and several alternations happened in the field of reaching customers either at banks, at insurance companies, and also at other companies of the financial sphere. Moreover, it is quite probable that less innovation would have been carried out if the companies of this sector weren't obligated to pay innovation tax.[6] We could even assign innovation-stimulating effect to this action. It is much more characteristic for the fifth best sector: energy. There wasn't such a breakthrough between 2004 and 2006 that would justify that 26% of the companies reported innovation while the rate of innovative companies was only 21% in the medicine industry that exports high tech products.

A more alive activity can be in progress at inland companies than innovations shown by the official statistics. The CIS survey is frightfully long, it is often easier for the directors to fill in right at the beginning that they haven't carried out innovation, than to complete all the questions some of which even demand special calculations. This is what *Inzelt* and *Szerb* (2003) suggest after having surveyed companies in Baranya County, focusing mainly on small-size companies. As far as their model is concerned, 61% of the respondents reported product or technological innovations (or both), but selection had a great role in this result since a certain part of whom were contacted, were among those companies that were applying for the Technological Innovation Fund of year 1999. However, several innovative companies of each size category were successfully involved in the examination.

Katalin Szabó [2009] presents seven innovative cases to illustrate that the so called "barefooted innovations" going on in enterprises don't appear in the measured innovative accomplishments (the concept was introduced in an earlier piece of work by her and her fellow-author). These solutions are not the result of systematic research,

[6] Companies are trying to spend the sum of contribution regarded to be "lost" within doors instead of inpayment, partially in hope of gaining some useful information, partially using it for cultivating their social relationships.

they didn't even arise in research departments but in production – or the staff found an effective solution for a certain problem. "Examining barefooted innovations going on in Hungarian small- and medium-size companies it was striking that in several cases innovations were to surmount the lack of something" (*Szabó* [2009] p. 13., my trans.) The tinkered gadgets used in this way don't substitute the workers who are experts of science or technology, or the patent activity and other deficiencies of creating knowledge.

There were various adaptations made from the data of CIS surveys. The EU Committee and Directorate-General for Enterprise and Industry handles enterprise innovations as a special policy. (It is the Directorate-General for Research that handles technological development and research, thus the issue of R&D and enterprise innovation are organizationally differentiated in the Union.) Even a separate organization was established for it. The initiative Pro Inno prepares the European Innovation Scoreboard, which carries out an annual survey called Innometer, and makes an analysis of the countries' innovation policy on the basis of the Innometer and other statistic data.

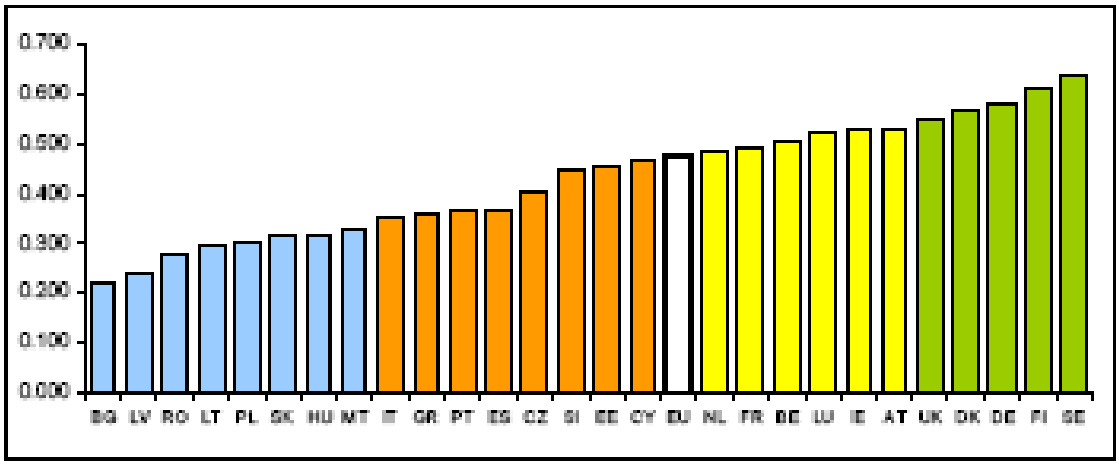
The first European Innovation Scoreboard was created as an experimental project in 2000. It aimed at measuring the innovative efficiency of the member states and the whole Union with a complex index number, and it also wished to correlate its result to that of other companies in competition. The Scoreboard underwent a lot of changes in the last few years. The output of the board is the Summary Innovation Index that is a synthetic indicator of statistic data and the data of CIS, innovation examinations of the Union. The starting index of 2000 contained 16 indicators in 4 groups (dimensions), but later, in 2007 it already took 25 indicators into consideration in 5 dimensions. The number of data from CIS surveys has risen from week to week. The changes of the European Innovation Scoreboard are shown by Appendix 2 and 3.

The former structure of the Innovation Scoreboard was severely criticized throughout a series of professional disputes. There are also many documents on the topic. Based on the experiences, the Scoreboard of year 2008 underwent notable modifications. The detailed criticisms can be seen in Appendix 1, at the presentation of the European Innovation Scoreboard.

> One basic direction of the criticisms and changes is that the Scoreboard should take the new forms of innovation into consideration, not only those that are based on science or research. The European concept of innovation – in spite of the fact that Schumpeter was Austrian – was strongly characterized (and in non-professional mentality it is still characterized) by regarding the production of new scientific results and their transformation into products to as innovation.

Hungary remained in the closing-up (i.e. the weakest) group according to the Scoreboard. We approach the EU average mainly in the index group of economic outputs, especially due to the high rate knowledge-intensive export. We are the weakest in the index group of innovators, almost in every aspect but particularly in the rate of innovation saving labour expenses. However, the degree of improvement shown in the last few years has exceeded the union average, mainly due to the increase in the number of trademarks and models, in the increase of knowledge-intensive export and in bringing new products to market. Still, the value of the index group for innovators has deteriorated during this time (it includes the rate of small- and medium-size companies using technological and non-technological innovations, and companies reducing the costs of labour). (EIS 2008. p. 37.)

6. Figure **Summary Innovation Index 2008**



Source: EIS 2008 p. 2.

Besides the Summary Innovation Index, the EU registers a Global Innovation Scoreboard, too, that has much limited content but it compares the data of more countries. The World Economic Forum, the World Bank, the UNIDO and the UNCTAD have a composite innovation index. I present them in Appendix 4, based on the work of

Archibugi and his companions [2009]. Hungary reached the best position (10th place) with the UNIDO Technological-Advance Index among the 45 countries having been examined in each survey, and got the worst rating (31st place) with the Coco ArCo Index of *Archibugi*. This squares with our evaluation on the European Innovation Scoreboard: we are still at a lower level but the country's innovative efficiency is quickly increasing.

3. Table **Positions of Hungary in the innovation order of 45 countries**

Tech WEF	TechRead WEF	TechInnov WEF	GSSI EU Committee	KI World Bank	ArCo Archibugi CoCo	TAI UNC-TAD	TechAdv UNIDO	Average
25	30	27	29	29	31	2727	10	26

Source: *Archibugi and his companions* [2009] p. 19.

I present further European innovation examinations and our position based on these survey in Appendix 1.

The cited work of *Archibugi and his companions* [2009] carried out a very interesting examination of global innovation indexes: it counted co-relational rates according to the countries' presented indexes and their positions based on R&D intensity (GERD/GDP).

4. Table **The co-relation of R&D intensity and composite innovation indexes**

Index	45 countries	First 22 countries*	Second 23 countries*
Tech	0,81	0,64	0,21
TechRead	0,77	0,48	0,32
TechInnov	0,89	0,74	0,66
EU SSI***	0,93	0,86	0,55
GSSI	0,91	0,82	0,78
KI	0,61	0,27	0,22
ArCo	0,81	0,63	0,15
TAI	0,77	0,6	0,35
TechAdv	0,62	0,33	0,59
Average	0,79	0,60	0,42

Source: *Archibugi and his companions* [2009] p. 25.

* countries falling to the first half of the order based on the average of the indexes

** countries falling to the second half of the order based on the average of the indexes

*** calculated for the available 34 countries

So the R&D index explains the differences between countries quite well in case of a big, heterogeneous group of countries, and not of composite indexes. However, it is not suitable for showing the differences within a more heterogeneous group of countries; it shows that the co-relational factor calculated for countries falling to the first half (i.e. having high R&D intensity) and to the second half (i.e. having low R&D intensity) is already a lot lower. But if we have a look at the structure of composite indexes, it is not surprising that they have similar results to that of R&D intensity. These indexes wish to examine technological capability; they join data and information measuring research and technological aptitudes. If we measure innovativeness with the new knowledge producible in a country, then R&D intensity is an enough factor. There are only a few indicators in composite indexes showing a weaker co-relation, that relate to the research. Even the authors call the attention on the fact that the importance of non-technical innovations and non R&D factors are ever increasing in manufacturing and in service sector, and also in such developing sectors as the creative industries. The question rises in connection with composite indexes based on technological viewpoints: is it likely that we underrate an important part of the innovative activity and capability

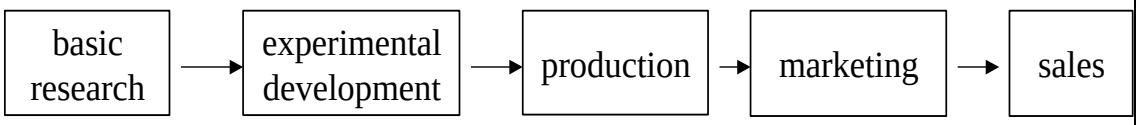
of certain countries? It is suggested to take this aspect into consideration when improving the indexes. (p. 48.)

3.3. Non R&D based innovations

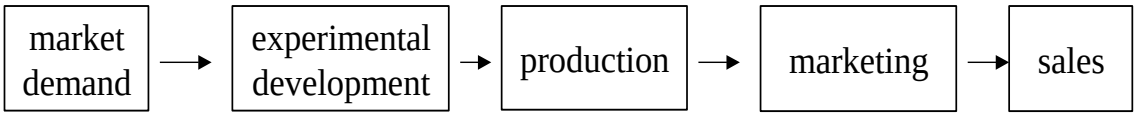
Research-development didn't get into the focus of innovation policy by chance. The traditional concept of innovation (just like that of Schumpeter's) interprets enterprise innovation in a linear model. According to it, prototypes come into being as a result of scientific researches, the development of technology forms the conditions of reducibility, the product is made having been verified in experimental plants, and finally, it is sold at the market. A more modern approach starts the chain from the demands.

7. Figure **Linear innovation models**

a) The push of scientific-technological results (technology push)



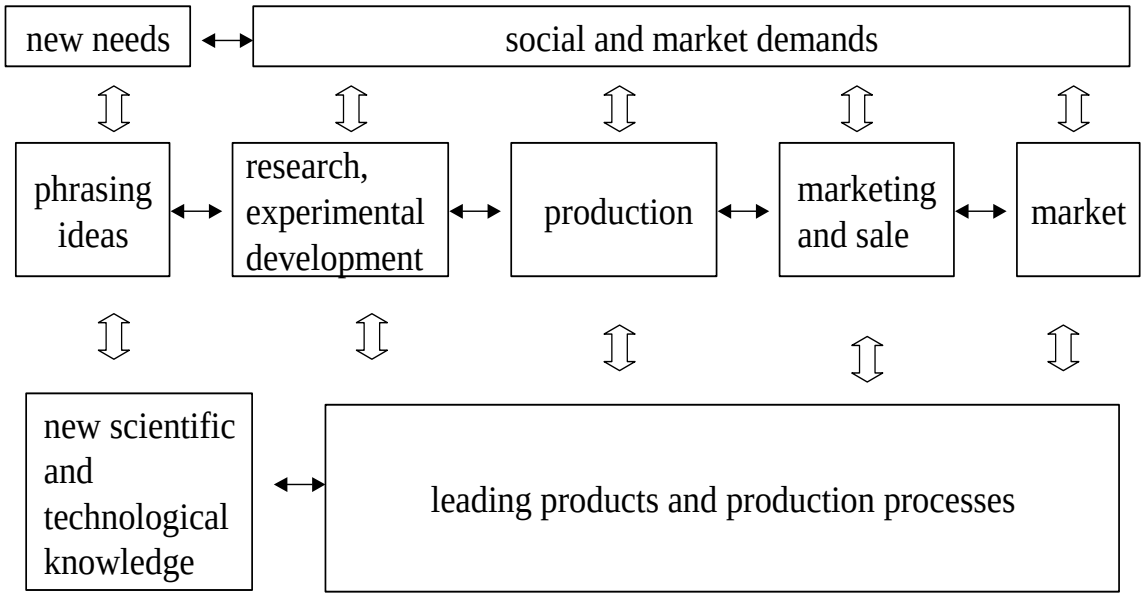
b) The pulling effect of demand for new products and processes (demand pull)



Source: *Havas* [2007] p. 6. based on *Rothwell* [1994]

The newest theories reveal that the birth of novelties is not at all such a linear process, the relations are settled in complex figures laced with back and forth references (circle, three spirals, random, etc.). (See in details: *Lundwall* [1992], *Nelson* [1993], *Papanek* [1999/a], *Török*, *Borsi and Telcs* [2005])

8. Figure **The feedback model of innovation**



Source: *Havas* [2007] p. 6. based on *Rothwell* [1994]

By this time, the innovation being materialized in the enterprise has already broken away from the time and place of R&D. I have cited Gordon's example in the first chapter that not only the spread of huge hypermarket chains has contributed to the growth in American commercial efficiency but also the introduction of several modern information-technological instruments and solutions in small shops. Of course, these instruments were the result of very serious theoretical and practical researches, but the small shops obviously didn't spend a penny directly on these researches, their additional contribution paid by buying equipments, the software, and network relations doesn't appear in the BERD index. In their case, the introduction of the barcode laser was not an innovation based on R&D.

Non R&D based innovations are quite common in the life of enterprises, even though they often don't even realize them.

The analysis of the European Innovation Scoreboard of year 2007 called the attention on the fact that innovative companies carry can out innovation (e.g. organizational or marketing innovation) without any own or purchased research-development. "R&D is important as driver of productivity increases and often been the focus, both by policy makers and academics, of measuring innovation. However, an analysis of European

innovative firms shows that almost half of these innovate without doing any R&D, for example through organizational or marketing innovations. It is therefore important to understand if these are different behaviours and needs between non R&D and R&D innovators in order to improve the effectiveness of public policies to stimulate innovation." (EIS [2007] p. 6)

According to the CSO CIS2006 examination, in case of Hungarian companies, the combination of product and process innovations was carried out in most of cases between 2004 and 2006. (Organizational and marketing innovations were not represented.)

5. Table **The number and distribution of innovative enterprises based on the type of innovation**

Type of innovation carried out	Number of companies implementing	Rate of companies among total innovative
Only product	906	26,7
Only process	768	22,6
Product and process	1366	40,2
Not finished or cancelled	359	10,6
Total innovative	3399	100,0

Source: CSO [2008], p. 247.

In the cited analysis of enterprises in Baranya County, done by *Inzelt* and *Szerb* [2003], one of the most astonishing result was the co-relational connection they had found between the nature of the firm and the type of innovation carried out. "This means that belonging to a technological-demanding sector, compared to traditional departments, meant a significantly higher level of product development. At the same time, technological development was more dynamic in the traditional technology departments, regarding the period between 1998 and 2000. The phenomenon is worth considering as we have also checked the sizes of enterprises." (p. 1010., my trans.) Size didn't influence their relationship; it had an effect on product innovation. Also the age of the enterprise influenced the relation at a higher significance level: "the elder enterprises were more willing to develop their products, than the younger ones. This is true in the case of belonging to technological sector, not only in general." (p. 1010., my trans.) (This is quite reasonable: the product and technology of a younger company are

new, the urge for changing appears only after some time.) The increase of the enterprise's size effected innovativeness positively, however, it had a reversed effect on income. "To word it in a different way: the innovation of companies belonging to the same size category and having higher income was lower that that of companies having lower income." (p. 1012, my trans.) The greater rate of employees having higher qualification had a positive effect on technological innovations, and it didn't show unambiguous connection with product innovation. There was no evidence for the effect of foreign or native owner. State subsidy and taking part in innovative cooperation had some relation, but it can be the influence of the mentioned group of selection (state support program applicant companies).

Two years later, in his study about the results of GEM research, *Szerb* [2005] still agreed that inland enterprises excel in the field of technological rather than product innovations. "Examining inland innovative processes, one of the biggest problems is the renewal of products and services, but there was a shift in technological reformation, and we are not at a bad position regarding companies with a growth potential higher than average. However, if we compare ourselves to the international results, the number of enterprises competing in a given field is very high." (p. 19., my trans.)

It was discovered in the course of research program 'Connection between macro and micro level competitiveness', Corvinus University of Budapest, that between 1992 and 1995 60% of the respondent companies introduced new products, 52% between 1996 and 1998, and 60% between 2001 and 2003. These numbers are close to the result of *Inzelt* and *Szerb* of year 2003. The rate of companies introducing new producing technology was a bit lower, 57%, in the first period, 51% in the second, and 45% in the third period. These rates are a lot more favourable compared to the result of CSO CIS surveys.

The GKI examined the innovative activity of enterprises in two questionnaire related to the monthly business survey in 2005. In this survey, the respondents proved to be a lot more innovative than in CIS examinations and they were closer to the results found by the mentioned researchers. The further difference is that according to the data of CSO the most innovative companies were among the big enterprises in 2004 and 2006; however, the results of GKI showed a large-scale innovative activity of small-size

enterprises. I call the attention on the fact that the small-size companies having been questioned in the business surveys of GKI about the economic situation employed at least 20 people.[7] However, it is the same in the two surveys that industrial enterprises were innovative in a greater number than suppliers. Surprisingly many companies indicated doing innovative activity, even though marketing innovation wasn't involved in the analysis at that time. This was the period of recovery in world economy, following the IT crisis. For the Hungarian companies, this meant a particularly favourable economic situation lasting for many years: those German partners, the supplier of which these Hungarian companies were, reached a prospering export by serving with technology delivery the quick growth of economies in the Far East (like China and India). The result agreeing the CIS2006 survey shows the high rate of product and process innovations among the types of innovations, which explains the recovery bringing product changes.

6. Table **Has your company introduced… in the last two years?**
Rate of companies answering with yes (%)

	New			Improved		
	Product, service	Technology	Organizational method	Product, service	Technology	Organizational method
Total	69	46	38	39	37	37
Small-size companies	66	39	31	32	30	32
Medium-size companies	76	57	47	49	25	45
Big companies	69	57	49	62	56	45
Stat majority	51	38	41	37	26	43
Native privately owner	69	45	36	36	36	34
Foreign majority	81	52	48	57	46	51
Industry	78	57	37	52	53	39
Construction	45	43	33	18	27	25
Trade	81	37	42	41	32	41
Services	57	39	40	33	23	38

Source: *Mrs. Németh* [2006]

In the summer of 2008, the Economist Intelligence Unit, London, published an analysis on the innovative activity of Central and Eastern European countries (EIU [2008]) in which the main problem seemed to be that principally the multinational companies

[7] The different enterprise surveys of GKI are presented also in Appendix 1.

settled in these countries do enterprise innovation, while the native companies do less. The main difficulty of enterprise innovation is said to be the unfriendly environment in their point of view. A further problem is that there seems to be a lack of highly educated professionals, and there is a severe competition among the companies for seizing the talented ones. [pp. 2.] The Hungarian respondents indicated the lack of macroeconomic stability (chosen by 77% of the respondents) and the tax system (chosen by 74%) as the principal problem. The companies regard themselves successful mainly in using and integrating the newest foreign technologies (89% of the respondents said), thus the innovative activity of inland companies is primarily imitation. [pp. 28] Altogether, the institution's evaluation of Hungarian innovative efficiency – based on the number of international patent – stands on the second place among the 10 countries that joined the EU in 2004, only Slovenia precedes us. Factors helping innovation are better only in Estonia, so the innovative environment, which we underrate so much, was ranked at the second position. [pp. 10] Concerning all the imitations, we could see a more optional picture than when we focus not only on creating and using knew knowledge (R&D). In the last section of my thesis I will show that imitations were really marked in a greater proportion among Hungarian enterprises than the other two groups, according to the respondents of a spring, 2009 survey.

The cited work of *Drucker* [1985] presents many innovations carried out in America, among which we can find several non-technological solutions. *Drucker* refers to them as social innovations. He also calls the attention on the differences between research-development and innovation: "A major reason, perhaps the major one, is the prevailing belief that innovation has to do with things and is based on science or technology. And the Japanese, so the common belief has held (in Japan as well a sin the West, by the way) are not innovators, but imitators. The Japanese have not, by and large, produced outstanding technical or scientific innovations. Their success is based on social innovation." (*Drucker* [1985] p. 41.)

Of course, *Drucker* didn't underrate the Japanese innovative activities, moreover, he did write about them in an appreciative way, but he defined social innovation (modernization) as its essence. Since then Japanese technological innovations have achieved the appreciation of the world. It is a good example for the fact that it is not the results of researches that are decisive in the materialization of innovations but the

absorptional ability of the environment. By the way, *Drucker* qualified knowledge based innovations (i.e. the ones that are based on R&D) as risks from the enterprise's point of view. He reasoned his statement with the very long – approximately 25-35 years of - runoff time and the uncertainty of availability of supplementary knowledge. (pp. 117-125.)

Makó and his companions [2008] found through the experiences gained from the European Competitiveness Report and other analyses that "the advantage of the USA's growth of productiveness is not at all due to the high level innovations, opposed to the public belief. American enterprises are leading in organizational, management and marketing innovations. The integration of new business models, innovative supplier methods, product- and brand management, etc. play a key role in the introduction of technological innovations to the market. The so called non-technological innovations represent the missing link that interferes in the European utilization of facilities resulting from the new technologies." (p. 1077., my trans.)

Schmidt and *Rammer* [2007] did an extensive analysis of the relationship of technological and non-technological innovations on the basis of the Mannheim Innovation Panel. Their main observation was that the number of non-technological innovators exceeded the number of technological innovators. The most important observations, however, showed the relationship of the two innovations in an enterprise. The authors found that 13% of the respondents carried out only technological innovations between 2002 and 2004, 24% carried out only non-technological innovations and 34% did both. These rates were 16%, 16% and 44% in the manufacturing. (p. 12.) Product and process innovations often went hand in hand with organizational innovations (in more that half of the cases). (p. 14., 22.)

The fact that innovative processes don't demand R&D activity by all means has already been explained by *Kline* and *Rosenberg* [1986] and also by *Evangelista and his companions* [1998]. This was not only the consideration of the question "Whether to do or buy?" According to Kline and Rosenberg, if the company meets the demand of innovating something, it monitors its existing set of knowledge first, and, in case it couldn't find an appropriate solution, it has to decide whether it is worth spending on acquiring the missing knowledge, or rather giving up the project. *Sterlacchini* [1999]

called the attention that the Union's innovation survey (CIS) came into being in order to fulfill the appeal that has been stressed in the literature for so long and to collect information about the types of innovation above R&D.

Arundel, Borody and *Kanerva* [2008] examined the characteristics of such innovations on the basis of the data of the Innobarometer of year 2007. In their study they differentiate the following types of innovations without R&D:

- Adapting technology. The knowledge that forms the basis of innovation comes from an external source, it is simply received. This is the most common method, in the setting of new machines and equipment this is carried out most of the time. The authors involve the utilization of organizational solutions adopted from other companies.
- Smaller alternations of products and processes, additional changes, including the utilization of the already existing engineering knowledge. The enterprise carries it out on purchased goods, technologies or their own developments. According to the estimations of *Lhuillery and Borges* [2006], 15% of the reductions of expenses come from such incremental innovations.
- Imitation and copying. There are several possibilities for reproducing products, for working out new production methods even with avoiding patents. This solution is quite common among the developing countries. (My own note: even Hungary practiced this solution in the 80s e.g. in the innovations of pharmaceutical industry or computer technology.)
- The new combination of the existing knowledge. Most of the product and production planning processes are involved here. Basically, it is the basis for the efficiency of the clusters: enterprises and institutions functioning in each other's environment establish a common tacit knowledge basis the elements of which can be utilized to the best of their knowledge. The authors also include the adaptation of solutions created by the users.

It is obvious that less formal innovative solutions (such as alternations, incremental innovations, process optimalization, etc.) spread in the low and medium technologic industries, and it is characteristic for small-size enterprises, too. High tech companies and big enterprises rather carry out explicit R&D activity. Furthermore, in the service

sector constant incremental development is characteristic, research and development is mainly the feature of industry.

Arundel and his companions [2008], based on the results of CIS survey in year 2007, found that half of the enterprises do innovative activity without R&D. It meant 55% of small-size enterprises (10-49 people) and 25% of big enterprises (more than 250 people). 46% of enterprises in manufacturing and 53% of suppliers did innovation but no R&D. The sector differences could have also been observed in the manufacturing: 22% of high tech and 60% of low tech companies did innovation without research-development. (p. 9.)

Among the firms innovating without R&D, there were more small-size companies and low tech suppliers proportionally to all of the innovators; many of them sold their products directly to the consumers and they were situated in an underdeveloped country (regarding innovative efficiency on the basis of the Scoreboard). Hungary belongs to these countries. (p. 15.) 82% of innovators who didn't do R&D carried out process innovations on the first place, 68% did product innovation, and 49% did organizational innovation. (p. 18.) The source of innovative ideas, just like in the case of R&D innovators, was primarily management. This was followed by the marketing department, then came product technology and the technological department. (p. 20.) 70% of enterprises innovating without R&D guaranteed training for the employees in order to be able to carry out the innovations – if we regard the total of innovators, this rate is not a lot more: 74%. (p. 26.)

Researchers of ETH-KOF had a very bad experience: that the functioning of the national innovation system is difficult not only in the Central-Eastern European countries, which stem from planned economy. The ETH-KOF, which deals with the Swiss innovation panel, presented the results of their examination regarding university research places in an international conference (*Arvantis,* [2006]). 28% of the examined firms carried out knowledge and technology transfers between 2002 and 2004. Tacit knowledge stream (e.g.: participating in conferences, reading and referring to specialized literature, informal relationship with university researchers, applying university students for R&D works, participating in courses, etc.) was more important for them than official formalities like joint research projects, long term research

contracts, or the common use of technical infrastructure. The main obstruct of the spread of knowledge and technology originating from research places was said to be their bad connection. Many companies taking part in such transfers thought that the research issues that were important for them, were not important for academic researchers. Others said that the directions of researches done by scientific institutions were not suitable for their adaptation-oriented interest. (*Arvantis* [2006] p. 16.)

Reichstein, Salter and Gann [2008] observed the innovative activity of non high tech industries in connection with British building industry. This branch of industry is generally considered to be non innovative, i.e. it operates with well-tried routines, and where innovations are generated only by the suppliers by the creation of new materials. Construction spends few money on research-development in reality, they introduce few patents, thus this area is neglected by the researchers who exam enterprise innovations on the basis of R&D and such indexes – even though the activities of building industries consist of almost constant innovations. It often happens that fast, unique, and expenditure efficient solutions need to be invented right at the building spot. (p. 605.) It turned out when examining the results of the British CIS of year 2001 that construction is characterized by organizational and process innovations. The essence of organizational innovation here is that they establish temporary coalitions and they organize a joint work for solving special tasks. Several innovations appear due to the effect of costumer demands, but the technologies and components offered by the suppliers are also very important. Product innovations are the results of costumer needs, while process innovations are mainly induced by the suppliers. (p. 620.)

Maskell [1998] detected innovative activities in the non research-development intensive industrial fields of Danish furniture industry, *Edgerton* [1999] in that of the British plumbing and *Consoli* [2008] in British commercial banks.

Rammer and his companions [2008] went on with the examination of this phenomenon. They reviewed when can small- and medium-size companies, which don’t carry out own research-development, materialize successful innovations. They deviated from the traditional standards of measuring innovative successes. They didn’t use R&D expenditures or the numbers of patents for measuring. It is customary to examine the incomes coming for new products, which are good indicators in case of product

innovations but they don't really concern the other kinds of innovation. The authors measured innovative success with the following elements, relying on the already mentioned database of ZEW surveys on innovation:

- In case of product innovations: the rate of products as market novelty compared, and the rate of new products for the enterprise compared to income.
- In case of process innovations: the degree of reduction of expenses reached due to innovations increasing efficiency, and the increase of income reached due to innovations improving quality. (p. 13-14)

They didn't use index numbers for the results of marketing and organizational innovations. They classified the innovative small- and medium-size companies into three groups: those who carry out constant research-development, those who do temporary research-development, and those who do other kinds of innovative activities. In their examination they reviewed the instruments of innovation management used at enterprises:

- Human resource management (HRM): the improvement of colleagues' knowledge and abilities, preferring such workers who bring new ideas to the firm, etc.
- Group work, the promotion of supported knowledge sharing
- The conscious search for external innovative resources (the exploration, identification and utilization of impulses coming from costumers, suppliers, fellow competitors and institutions creating knowledge)
- Cooperation and other partnerships in order to attain external knowledge. (p. 11.)

The result of the modelling was that innovative success of small- and medium-size companies could be reached by own research-development combined with an external knowledge (search or cooperation). Those companies which don't do own R&D can have similar results if they apply the appropriate strategy. In their case, the initiation of the external knowledge is a promising approach, while occasional research-development is not. However, HRM and group work can help small- and medium-size companies in

reaching successes, despite not doing any research, similar to the successes of those companies who do research, especially if they include external knowledge. Neither the combined use of all four innovative management instruments, nor relying on only external knowledge can be successful strategy. (p. 30.)

Millot [2009] referred to the increasing role of non-technological innovations and to their close connection with technological ones, when he suggested using the number of trade marks registered by the company as an innovation index number. Trade marks are connected at several points to the innovative activity of an enterprise: when introducing a new product to the market, gaining new costumers – thus when carrying out product and marketing innovation. Compared to R&D and patent indexes, indicators based on trade marks have an advantage: they are connected to the market side of innovation, thus commercial viewpoints are emphasized and not the technological ones.

Since 2004, the Boston Consulting Group, the famous American management institution, has been examining whether company directors measure innovative efforts, and if they do, how exactly. In 2009, the indexes used most often for measuring the components of innovation were the following elements: profitability (79%), costumer satisfaction (75%), incremental revenue (73%). The other elements were present at a lower rate: the time of reaching the market (59%), idea generation (55%), R&D efficiency (49%), portfolio health (43%), lifecycle performance (41%). All these indexes are output indicators, and only R&D efficiency is based on research. Special index numbers were such indexes as total fund invested in growth project (65%), revenue from new offerings (65%), allocation of investments across projects (62%), projected versus actual performance (62%), average development time per project (60%). At a smaller rate they mentioned the number of projects that meet planned target (50%), the percentage of ideas funded (31%), the number of projects killed or tabled at each milestone (30%), and cannibalisation of existing product sales by new offerings (25%). More than 50% of the respondents used 5 or less indexes, and 25% of them used 6-10 indexes. (*Andrew and his companions* [2009]).

The reason for underrating the inclination for enterprise innovation is often that only successful innovations, world or market novelties are in the focus during such examinations, and the succeeding novelties are not at all regarded as innovation by

many people. However, *Sofka and Schmidt* [2004] pointed out that an extra profit is often assigned to the one entering the market first, but this is supported only by some episodic examples. It is possible that they mean only the tip of the iceberg of those who move first, and under them is the crowd of the fallen to be found. As *Bolton* [1993] says, "The economic landscape is littered with the bones of bankrupt innovators" (cited by *Sofka and Schmidt* [2004] p. 1.). They refer to the list of *Schnaars* [1994] who counts 28 groups of products – from white beer to the commercial airplane – the succeeding producers of which were much more successful than those who introduced them to market.

Sofka and Schmidt differentiate three groups of advantages that successors may enjoy:

- The freeloader use of investments of the ones entering the market first. The pioneers invest in the qualification of workers and costumers, they might build market or other kind of infrastructure that the successors can use much cheaper. They refer to the estimation of Mansfield and his companions [1981] according to which the imitators work with an average 65% expense level and 70% time outlay compared to the original inventors.
- The moderation of technological and market risks. The successors can wait for the advance of the original inventors and they can learn from their experiences.
- The impotence of those already being in the process. The hands of the original inventors are tied by the expenses of investments, they can be afraid that the development of innovations may push the existing product range, it may break the well-functioning structures, thus they react on the market demands for innovation less than the successors. (p. 5.)

Imitations, the succeeding innovations might be more successful not only for enterprises but for whole national economies and regions, compared to the production of scientific results. *Mokyr* [1990] compared the early medieval Islam and Christian world, and he concluded that around year 900 the knowledge and achievements of Arabic scholars were a lot richer than that of the Europeans'. However, the residents of the European continent (and, at that time, not only in its Western part) adopted the Arabic knowledge successfully after having used them in their relations. They have spread and utilized those Arabic knowledge and around 1200 Europe became a successful successor

innovator, from which new accomplishments resulted by the time of the Renaissance. (pp. 52-83.)

CHAPTER IV

COMPETITION AND INNOVATION

In this chapter I examine the effect of environment on enterprise innovations. Since it is a very broad research area, I narrow my observations from the target of research on some relevant aspects of social environment from the enterprises' point of view: the limits of political system, I emphasized the very special phenomenon of corruption and its effects. Another extensively discussed topics are the role and ways of state subsidies and the relations of competition conditions and enterprise innovations.

The Competitiveness Research Centre of Corvinus University, Budapest, might have the most experiences in enterprise competitiveness researches, since it has been carrying out theoretical and practical researches in this topic for almost one and a half decades. In the already mentioned book of *Chikán and Czakó* [2009] the authors define the concept of enterprise competitiveness as follows: "the competitiveness of enterprises means the offering of products keeping the social norms, in a way that costumers would be willing to pay a price that guarantees a greater profitability. The condition for this is that enterprises have to be able to conform to external and internal changes in a way that the can fulfil the criteria of the competition more favourably than their fellow competitors." (p. 78., my trans.) So the commitment in the competition demands **conformity** from the enterprises, and that can rarely happen without the realization of some of the previously mentioned forms of innovation. The frame for this is the traditions and norms of the society surrounding these enterprises.

4.1. The influence of social environment on innovation

The most important precondition of enterprise innovation is not the creation of knowledge but the freedom of launching an enterprise. It is not only a question of law but something more. Entrepreneurs need to have possibilities for creating and testing new combinations that can't take place without being open to their own novelties, readiness for adaptation and financial resources. Thus, an innovation friendly

environment allows free allocations; the owners can make decisions based on their own reasons. Enterprises can be established on any kind in vain if the stream of resources is determined by central considerations, including financial regulations, too, not only the directives. It is obvious that there's a need for free labour force that is able to carry out new types of tasks and are not qualified only for the routines. Furthermore, partners are also needed, both from the knowledge creating and from the business sphere. If the scientific sphere is separated from the world of entrepreneurs by invisible obstacles based on tradition and internal arguments, then we can't expect for the practical use of knowledge. Last but not least, the creation of new combinations doesn't necessarily result in success. The entrepreneurs must take the possibility of failure into account. This is partially legal-financial question, partially a socio-cultural one.

In societies based on network of obligations there is no enterprise innovation, since either the access to factors is not free, or the system can tolerate failure only from participants having the appropriate background. János Kornai, based on Schumpeter, emphasized that the field of carrying out innovation is capitalism. "The literature of technical development could fill whole libraries. The phenomenon itself can be sensed by anyone. However, many people forget that these phenomena are the results of the capitalist regime. The change of regime, which means quitting the socialist system that wasn't able to realize any of the civil innovations in half a century's time, at best only imitated them with great delay, and that we entered the capitalist system that carried out all of these innovations." (*Kornai* [2008] p. 384., my trans.) Of course, also Kornai acknowledges that there were several excellent researchers living and working in socialist countries and who did important discoveries. "But the economic environment was not able to utilize them. The entrepreneur, who would create innovation from the inventions of scholars or engineers, and who would introduce and spread its production and use, was missing." (*Kornai* [2008] p. 384., my trans.) Also Kornai regards financial success to be the reward of the innovative entrepreneur resulting from competition, and he sees the suppression of innovations in anti-capitalism opposing profit.

If we consider all the above mentioned statements, we realize that the social and economic system suitable for innovation is the democratic market economy. Civil and entrepreneur independence is an important condition for the economy to absorb knowledge and to materialize development based on innovations. *Acemoglu* deducted

from model calculations that oligarchic societies, in which the political power is in the hands of big manufacturers, despite their initial successes, they lagged behind the democratic societies. (*Acemoglu* [2008]) The reason for this was that oligarchs could create high entrance limits for those who entered the market newly, they can redistribute incomes for themselves through the tax and regulation system, and thus they prevent the establishment of other enterprises and interfere in the activity of more effective entrepreneurs. They primarily keep maintaining their own business activities in view, and in the lack of competition, they are not urged for innovating or to start new activities – thus their growth slows down. "According to another notable inference of the model, democracies are more able to exploit the benefits coming from new technologies. This is possible because democracy allows that participants, bearing the benefits that are comparative in new technologies, can launch enterprises, while the system of oligarchy hinders entrance." (*Acemoglu* [2008] p. 625., my trans.) Acemoglu gives the example of the USA and the oligarchic states based on Caribbean plantations. These oligarchic states were among the richest areas in the 17^{th} and 18^{th} centuries, but later they lagged behind the United States and similar more democratic societies, since those could gain advantage from investing in industrial development.

In his work of technologic-economic history, *Mokyr* [1990] examines why the technological creativity appears in certain societies and why it leads or doesn't lead to economic development. The comparative analysis of Ancient, Medieval and Modern Europe and the of Arabic, Chinese and European technological development draw the conclusion that, even though it lead to wars, European fragmentation allowed that new thoughts and nonconformist thinkers find shelter somewhere – if not elsewhere than in a small dukedom or principality – from the despotic, bigot or any other kinds of regimes that obstruct innovations any way. However, the more and more rigid Islamic world and the bureaucratic Chinese empire, despite their early excellent results, stopped on the way of technological development, since inventions didn't spread and didn't improve in practice, some even decline. Even though Chinese invented gunpowder much before Europeans, they couldn't defend themselves from Mongol conquerors, they had to purchase cannons from Europeans. Even though they invented paper and printing, they didn't become the instrument of their extensive spread of knowledge, and he goes on giving examples. (p.289-328.) The chemistry results of Arabic scholars, tympanum,

methods of textile production, etc., all these inventions stopped at the level of mystic and luxury. (p. 62-67.)

Japan has also become significant innovator (first successor, then leader) when it carried out the social innovations appreciated by *Drucker* [1985] that meant the joining of world economic competition. But don't go so far: in vein had a Hungarian invented ball-point pen, computer, the Rubik-cube, the glory and the profit were won by other economies.

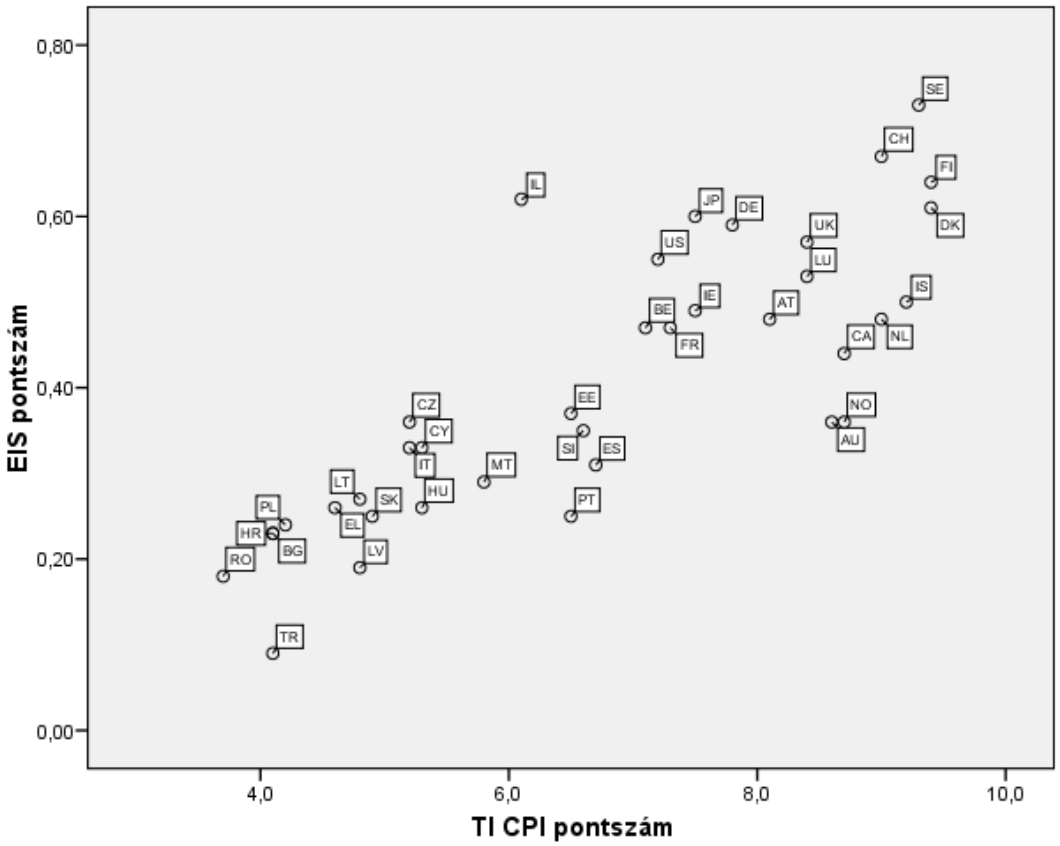
The 2009 study of the OECD about Hungarian innovation policy considers a great importance in its 1990 dynamic productivity growth to the "certain forms of innovation". He reckons here overtake of the institutions of world economy and the introduction of best marketing practices learned from foreign companies. (OECD [2009] p. 11.) Of course, also this study regards the innovative efficiency of the country to as unimproved regarding the possibilities. He starts his suggestions with the recommendations made for the improvement of frame conditions of innovations, which urge macroeconomic stability, positive attitude to competition, regulations assisting innovation, the reduction of enterprise administrative charges, the more effective realization of regulations in connection with intellectual properties, the encouragement of mobilizing the financial sector and the improvement of the frame conditions moderating other small- and medium-size enterprises. Recommendations regarding specifically technology and innovation policy concern only these.

Zander and Kogut [1995] have demonstrated that duplicating new knowledge is very difficult in the lack of a suitable social community. The European Innovation Scoreborad of year 2007 cites the findings of a study (*Hollanders and Arundel* [2007]) written in the topic for Enterprise and Industrial Directorate General, which examined the reasons of differences shown in innovative efficiency in social economic and regulative environment. For this, they have used the data of several different kinds of international comparative surveys. **Social capital** and the **spread of technology** showed the greatest reasoning force; these are factors moving relatively independently from GDP. (*Hollanders and Arundel* [2007] p. 2.) They meant public confidence and corruption under the idea of social capital. They measured the first one with the data taken from they surveys of Eurobarometer. For the question of "Whether we can trust

people or can we be careful enough with them?", respondent could choose from three options: the answer depends from the fact that we can trust most people and we can't be careful enough. They used the CPI (Corruption Perception Index) of Transparency International to measure corruption. They have examined the stream of intellectuals, the ability for absorbing technology on company level and the industry-university cooperation for examining the flow of technology and knowledge (World Economic Forum 6.17, 7.02 and 9.03 indexes). The stream of intellectuals showed a weak relation to the efficiency measured by the innovation index of the Union (SII) but the others were closely connected to it, even at a very low significance level. Those societies showed high innovative efficiency where public confidence was high and corruption was low, and where companies absorbed new technologies aggressively and cooperated intensively with universities. According to the authors, for low innovative efficiency countries those policies could be successful which encourage trust and cooperation.

My own calculations, where I compared the corruption index (CPI) of Transparency International, 2007, and the data of European Innovation Scoreboard, 2007, shown for every country, confirm this assumption. The less corrupt a certain country is supposed to be, the higher the value of CPI is.

9. **Figure** **European Innovation Index and TI corruption index in 2007**



Source: EIS 2007, homepage of Transparent International

The two indexes obviously show a very close relation that is confirmed by statistic calculations. A Pearson co-relational factor higher than 80% is regarded to be very strong in case of the examination of social processes.

7. Table **Symmetry calculations**

		Value	Asymp. Std. Error(a)	Approx. T(b)	Approx. Sig.
Ordinal by Ordinal	Kendall's tau-b	,668	,071	9,411	,000
	Kendall's tau-c	,665	,071	9,411	,000
	Gamma	,678	,072	9,411	,000
	Spearman Correlation	,840	,064	9,167	,000(c)
Interval by Interval	Pearson's R	,819	,056	8,456	,000(c)
N of Valid Cases		37			

According to the index numbers measuring causal connections, we can't determine which index can be regarded as dependant and non-dependant variable. The European innovation index and the impression of corruption got almost the same value. We can realize without any mathematical help that the reduction of corruption can urge enterprises for an increased innovative activity, and the opposite is not probable. Even though the close correlation supposes the possibility of creating a regression equation for this relation, I reject it. Both of our indexes is a synthetic indicator resulting from the combination of opinions and measured data. It would be a exaggeration to account that the 1 point improvement of CPI index would improve the value of EIS with 80%, since the alternation of these indexes come from the different movement of their factors; it might be reasonable to search regression among the single components. In the lack of proportional data, I didn't carry out this.

8. Table **Index calculations**

			Value	Asymp. Std. Error(a)	Approx. T(b)	Approx. Sig.
Ordinal by Ordinal	Somers' d	Symmetric	,668	,071	9,411	,000
		EIS pontszám Dependent	,670	,072	9,411	,000
		TI CPI pontszám Dependent	,667	,070	9,411	,000

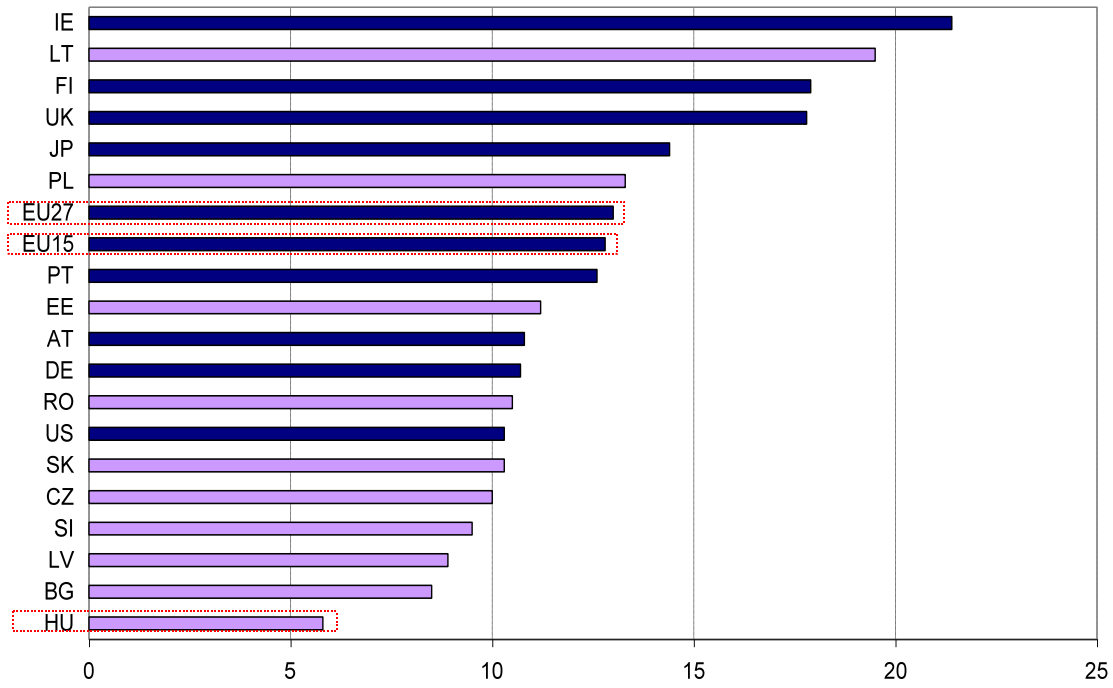
Corruption restricts enterprise innovation activity in several ways (see in details: *Némethné* [2008]): on the one hand, it doesn't require a broader explanation because of the distortion of competition. If better businesses can be attained through corruption, than with the improvement of enterprise efficiency, then it is obvious where the company is going to focus its resources and efforts. This increases the efficiency of the company but it definitely damages efficiency on macro level. These are true from the viewpoint of risk: when corruption is prospering and has been spread in the functioning of an economy, then the possibility for being caught and the losses resulting from it can be less than the consequences of an unsuccessful innovation.

However, orders coming from corruption mean that the company sells its goods and services above the market price (otherwise it wouldn't be worth participating in breaking the law), thus its budgetary limits loosen up. And, on the basis of *Kornai* we

know it very well, this doesn't encourage enterprises for renewal, but rather for the maintenance of old, well-functioning methods. "The fact that budgetary limits soften, obstruct destruction where it would be realized by market selection. In symmetry to the phenomena emphasized by Schumpeter, the phenomenon of a loose budgetary limit conserves long-standing products, technologies and organizational forms, and also the insistence on former markets even where these should have already been changed for newer ones. Hindering elimination permanently holds such resources that would be released for the aims of a new and more effective utilization of market selection. (…) If the enterprise is certain that it would be compensated for the losses, and neither insolvency is threatening, nor is it sensitive for price and expenditure, i.e. it doesn't consider it important to react on the relative changes of prices and expenditures with the alternation of technology and product sets." (*Kornai*, [1997] p. 945., my translation) So, spending on innovations is not only less lucrative for an enterprise in a corrupt environment, but also useless. Thus corruption not only restrains competition in the present but also limits the possibilities of a future competition.

However, the spread of corruption has another special effect that influences the ability for absorbing knowledge and technology and also the human resources essential for innovation: in those societies where corruption induces the spread of free-dodger behaviour, human resources are moved by rather redistributive tricks than the consideration of productivity. As a symptom, the discovery and harnessing of the holes in law system, the higher income coming from the chase of unexpected profit and the prestige diverts students from technological career, as a legal education promises better prospects. *Tanzi and Dawoodi* [2001] found relations between law and engineer students and corruption in international comparative studies. Unfortunately, we are not in a good situation in this field, too, either from this or other reason; sociological examinations might reveal the truth.

10. Figure **The number of scientific and technological qualifications among population aged 20-29, 2006**
people / 1000 people



Resource: *Viszt* [2008] p. 152.

4.2. State subsidy and innovation

In the order of growth obstacles the uncertainties of market and economic environment have always played a more important role than technological problems. The Oslo Manual emphasizes, too, that "If firms do not believe that there is sufficient demand for new products in their market, they may decide either not to innovate or to delay innovation activities.." (OECD [2005] p. 43.) So they would spend more on research-development in vein, e.g. under the influence of financial stimulations introduced by the government, more innovations wouldn't be materialized.

The question of state subsidy is especially delicate. Basically, every financial assistance given to enterprises from the state contradict the Treaty of Rome, thus they are forbidden in the member states of the European Union. (Of course, there are exceptions and exemptions.) On the other hand, the Lisbon strategy is aiming right at influencing

enterprise mentality in several terms, one of which is the considerable field of increasing enterprise innovativeness (or rather only the increase of BERD index, see in details: *Török* [2006/c.]). Regularly much money is spent on it.

In connection with the previous topic I have already explained that R&D based innovation supporting doesn't really result in the increase of competitiveness. The following section will regard the issue that state subventions given to enterprises don't stimulate innovation effectively because of their competition distorting nature.

ZEW surveys have made it clear that generally those enterprises claim state subsidy which would carry out innovation in any way, thus they reduce their expenditures – i.e. state subsidies have a sort of exhorting effect on financing innovations (see: *Hujer – Radic* [2005]). Of course, we can experience the very opposite, too: the researches of *Czarnitzky* proved that, as a result of state subsidies, Easter German enterprises started innovations but they didn't use any other sources for it and their results lagged behind that of the Western German companies which used other sources for the financing of their innovations (see: *Czarnitzky – Hussinger* [2004] and *Czarnitzky – Licht* [2004]).

The researchers of ZEW distinguished four types of state innovation subsidies in their recent study (*Aschoff and Sofka* [2008]). (See: Table 5.)

The authors found that (non-military) public acquisition and knowledge creating infrastructure have widespread innovation supporting effect on the success of enterprise innovations. The editors of European Innovation Scoreboard have showed, examining the social economic and regulative environment of innovations, that state acquisitions and regulations regarding demand have determinative importance concerning the differences of innovative efficiency of certain countries. (EIS [2007] p. 22.)

9. Table Characteristics of the four policy instruments from a firm's perspective

Aiding instrument / Features	**Public procurement**	**Regulation**	**Research institutions & universities**	**Public R&D subsidies**
Input	money	none	knowledge	money
Primary participation incentive for firms	sales	mandatory	access to knowledge	cost/risk sharing
Selection by	state	none	firm	state
Effect on success	market risk reduction	market risk reduction	Technological opportunity	cost reduction
Inherent risk	Idiosyncratic demand	"egalitarianism"	idiosyncratic knowledge	crowding out of private R&D investments

Source: *Aschoff and Sofka* [2008] p. 6.

Arundel and his companions (*Arundel and his companions* [2008]) found the biggest difference in aids used for innovations, among enterprises carrying out and omitting R&D.

10. Table Policy use by R&D status

(percent of firms by R&D status that have applied for or received support from each publicly funded scheme)

	No R&D	In-house R&D	Contract R&D	Total
Number of firms	1996	2093	306	4395
Any R&D based programme	4,3	27,2	15,8	14,3
Any non R&D based programme	32,6	47,2	60,7	40,5
Any programme	35,3	55,3	63,4	45,4

Source: *Arundel and his companions* [2008] p. 27.

Whether the suppport are appropriate and efficient or not, we can learn more from the positive answers given for the question: "Was the support so important for the company that innovation could not have been carried out without it?": 26,3% among companies carrying out own R&D, 25,5% among companies buying contractual R&D results, and 20,3% among companies innovating without R&D.

The results were similar overseas, too. *Brander and his companions* [2008] compared the effectiveness of companies taking part in Canadian venture capital programs to the private venture capital programs. Among the several advantages of private venture capital they have showed companies financed by state venture capital registered less patents and they appeared at a lower rate in high tech sector than the companies that used private resources.

The professional opinion doesn't reject state role in supporting innovation, but it suggests more refined solutions than subventionalizing: solutions that, being the part of economic development programs, support relationship between enterprises and cooperation with institutions creating knowledge. These instruments are particularly important in developing economies, as it is shown in a very recent study (*Szanyi* [2009]).

The Hungarian innovation supporting policy chose a special solution: it urges enterprises to carry out innovation so that it punishes those who don't innovate with the proper method. The law of Hungarian Innovation Fund (Atv) specifies that except the smallest ones enterprises have to pay a portion of their income – 0.3% from 2006 – into the Innovation Fund through the tax authorities. They can deduct their own innovative expenditures from this sum. "9. § The Fund is used for improving the competitiveness and the innovative efficiency of the Hungarian economy. The money of the Fund must be used for the improvement of research and technological efficiency realized directly or indirectly by economic associations." (Atv) The interpretation of innovation is very important in this case because the enterprises deduct their innovation expenditures form their contribution obligation. Especially at the beginning, many companies had difficulties at the examinations of tax authorities when they deducted not only research-development expenditures. At some applications there were many problems because the National Office for Research and Technology (NKTH) didn't acknowledge e.g. market research as innovation.

This logic is difficult for an economist to understand: the government takes some money from the enterprises and then, though an organization (i. e. NKTH, National Office for Research and Technology), it redistributes it hoping that more enterprises

would innovate this way than if the money had been left in the sector. Not even speaking about the strongly obscure targets of the announced applications. (Utilizing music- and theatrical researches of Ányos Jedlik program, 2005, or James Joyce text corpse examinations of 2006 are for instance very doubtful.) It seems that here the issue is not the stimulation of enterprise technological innovations but the financing of the formal budgetary research sphere with enterprise sphere.

The statements of the State Audit Office (ÁSZ) strongly suggest that the utilization of the innovation fund has rather been occasional and the improvement of enterprise competitiveness was not expected from it. The Audit Office published an extensive report about the functioning of the economic innovation system in 2008. The report had a very bad opinion about the outstandingly important element of the Lisbon strategy. "Regarding R&D and innovation based on purely national resources there was no medium-term strategy in years 2004-2006 that would have supported planning; determining the purpose, order and timing of assistance took place on program level, according to the decisions of the Research and Technology Innovation Council (later on: Council) providing the supervision of the fund. Even though the 3. § (1) paragraph of 133/(IV. 29.) decree orders it, no medium-term strategy about the use of the fund's financial instruments was prepared and approved by the minister enjoying the authority for it, in the examined period of time." (Audit Office (ÁSZ) [2008] 61. pp.)

Of course, neither the management of the Innovation Fund was found in order. First of all, the budget omitted the completion of the fund's income with the money legally coming from the enterprises, furthermore, they didn't really regard the supervision of the utilization. Despite the legal regulations of the National Office for Research, Innovation and Technology, only 1 person was employed as an internal supervisor, and only periodically, to control the money circulation and utilization of the fund. The NKTH couldn't present the plans for the assessment of programs, even though it should have prepared it on the basis of law, too (Audit Office [2008], 96. pp). The applications themselves are verified by the Office for Research-Development, Application and Research Utilization, but the Audit Office disapproved that the applicants could account on declaration, the content of which, in the great majority, didn't correspond with the separate registry (Audit Office [2008], 85. pp).

The enterprise surveys of the research series ‘Connection between macro and micro level competitiveness’, Corvinus University, Budapest, mentioned to what kind of factors enterprises assigned the innovation-supporting role, giving scores on a list of 12 elements. In each of the three years, the support of the top management got the first place, highly qualified employees got the second place, and cooperation with the customers got the third. At the last four positions, the changing the person of the owner, the requisition of counsellors, cooperation with research institutions and universities, and state subsidy stood.

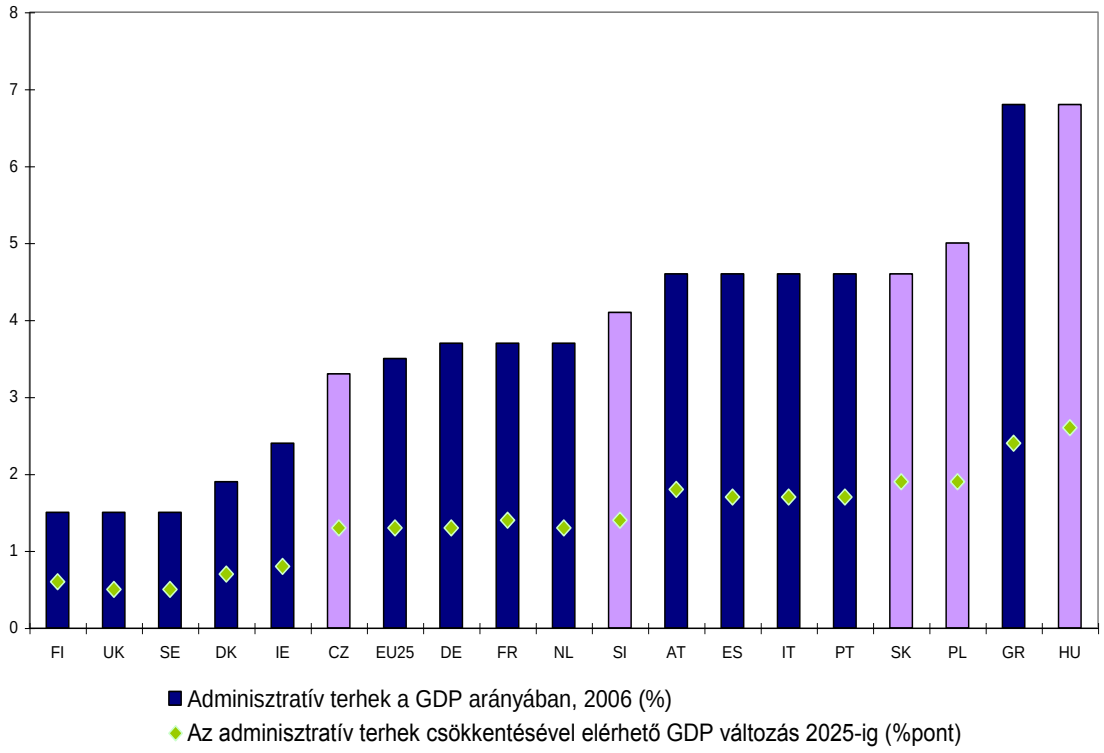
There was a similar examination carried out about the obstructive factors, with scores on a list of 16 elements. In all these three years, the first position was of the lack of financial resources, the second and third positions were of the small private innovation potential and taxation, legal regulations. The least points were given to former innovations that made newer ones unnecessary, the lack of facilities for cooperation and the lack of external technological services.

The noticeable contradiction of these two lists is that the lack of financial resources is the most important obstruct in the way of innovations but state subsidies had very little supporting role according to the respondents. This suggests that enterprises can neither form their own resources, nor can they receive credit for carrying out innovations because they are not profitable enough. State subsidy can’t urge them to innovate without a partial self-financing, particularly if there is no possibility for improving profitability through innovating. Regulation, that has always been regarded to as too complicated (since public money needed to be accounted), had a great role in it, but also the experiences of surveys done by ZEW according to which enterprises don’t innovate unless competition forces them to do so, but in this case they do it on their own interest anyway. Then, state subsidy helps the realization of intentions but other resources are required, too.

The more ground state interventions have in the stimulation of the competition. In connection with the social environment and innovation, the issues of chapter 3.1. are continuously important tasks of the governments: the demolition of obstacles in front of the freedom of the enterprise, hindering their re-formation is a never ending struggle since the participants of the competition hate nothing more than the competition itself:

everybody wants to be in the directing position at the market. At the same time, governments tend to intervene in the competition instead of defending it, sometimes as the result of overregulation and not with the intention of appointing the winners in advance. The following figure shows that the Hungarian government could be able to raise the resources of innovation at enterprises more efficiently, without using the public money.

11. Figure **The rate of administrative burdens int he GDP (%) and the increase in GDP reached by the 25% reduction of these burdens, until 2025**
(percentage point)



Source: Viszt [2008] p. 78.

The database 'Doing Business', World Bank, which compares countries according to the obstacles of launching an enterprise or of their growth, functioning and closure, has always given bad marks to the efficiency of the Hungarian state. *Borsi* [2009] found notable relation between the rank countries had in the database 'Doing Business' and the rate of innovative enterprises. (p. 293-294.) According to the most recent report of Doing Business (i.e. of year 2010), Hungary has the 47th position among 183 countries. We had especially bad rating (122 position) for taxation, where we had a much worse

result compared to the OECD average regarding either the working hours used for establishing and declaring taxability, the number of tax payments, and the rate of taxes (including social insurance and other contributions). Regarding the defense of investors, we have only a little better position (119). This holds back enterprise innovations a lot, since if share holders don't get the appropriate information, and the managers can't be held responsible for the losses of the owners, the possibility and sum of damage resulting from always risky innovations grows, too.

4.3. The participants of the competition and the relation of other market features and enterprise innovations

Competitiveness researches have proved that innovation is the basic element of enterprise competitiveness, those who lead the market enjoy benefit and extra profit.

Michael E. *Porter*, the already quoted scholar of the theory of economic competition, and who originally approached the issues of market competition from theoretical economic viewpoint, lists product, marketing and production process innovation (including the changes of these processes, i.e. organizational innovation) among the factors of industrial development in his book, Competitive Strategy, 1980 (*Porter* [2006] pp. 174-176.). Even though he doesn't emphasize the acquisition of new supply resources as a relevant innovation in connection with the development of industry; one of the points of the basic competition analyzing frame (the so called Porter diamond model) is the examination of suppliers and their negotiation position. Five years later, in his work about the advantage of nations in the competition, he regards innovation even more important: "Companies achieve competitive advantage through actions of innovation. They approach innovation in its broadest sense, including both new technologies and new ways of doing things." (*Porter* [1998] p. 45.) Porter distinguishes five forms of innovation: changing product, changing process, new marketing, new forms of distribution and the concept of new field of functioning. Just like Schumpeter, Porter also counts two non-technological fields (marketing and functioning) besides the technological phenomena (product and technology), but he omits supply resources.

However, the relation works the other way around, too. An enterprise innovates when the market competition forces it to do so. The broader environment greatly affects how willing a given community is to carry out innovations, and companies are not exceptional.

According to the Aho-report, European enterprises regard the lack of innovation-friendly market to as the greatest reason of lower-rate investments in research-development and innovations. One reason for it is the European market still too fragmented compared to the American or Chinese markets. This is particularly great problem for the innovative activity of the service sector. (*Aho* [2006] p. 5.)

There's a strange contradiction in the judgment of whether the multi-participant, free competition or rather the defended, monopol-oligopol market is a more favourable environment for enterprise innovations. According to Schumpeter (see: *Schmidt and Rammer* [2007] p. 15. or *Szűcs* [2009] p. 6.), monopoly guaranteed a better stimulus for enterprise innovativeness, since monopoly could enjoy the profits coming from innovative expenditures, while in a free competition, the fellow competitors can quickly copy novelties and thus the extra profit ceases to exist.

In reality, *Schumpeter* doesn't make such a comparison in his book Capitalism, socialism and Democracy, published in 1942 and referred to as the source of the above mentioned ideas (Schumpeter [1986]. He calls the attention that big enterprises all establish departments for developing where employees work on inventing new solutions (p. 158.). Big enterprises and market monopolists have better opportunities for creating novelty and bringing it to the market in a way that the previously invested capitals would be returned with quick depreciation or other defending processes. Don't forget that Schumpeter wrote these on the experiences he gained in the United States of America in the period between the two World Wars, about the growth and unbelievably rapid technological development in the world of concerns. At this time, monopolies could only be temporary ones, concerns competed with each other, and the period of crisis and recovery meant a limit in the demand concerning any price increase. They were totally different monopolies than the ones that evolved in the defended markets of small-sized national economies. According to the theory of the Industrial Organization, which is not about industrial organization, innovation should decrease with the increase

in the competition, since the more competition reduces the rewards of successful innovators, i.e. the monopoly profit. (See in details: *Dasgupta-Stiglitz* [1980], *Aghion-Howitt* [1992], and *Cabarello-Jaffe* [1993].)

The other extremity is regarded to be *Arrow's*, who saw a greater stimulus for enterprise innovation in the extra profit resulting from innovation, in the circumstances of free competition. (*Arrow* [1962]) In reality, Arrow, in his equilibrium model, didn't examine innovations, but the distribution of resources supporting the invention. He means the creation of knowledge under the concept of invention; the model examines who gains profit from the information. Information can difficultly be monopolized; it goes on under further exertion, without which it has no increment. Finally Arrow says that monopolists can have counter-interests in the creation of new inventions if they can't have enough profit with their utilization – i.e. at a low entry limit – but monopolization can be even greater than in cease of a competition, and then urging innovation is in interest. Eventually, however, there's no optimal resource distribution in either case; there's a need for the government or other non profit-loss oriented institution (e.g. industrial research institutions, private donations, etc.) to finance the researches, or at least a part of them (the basic researches that result in the most difficultly monopolizable information). (p. 296.) Further empirical works have found positive relation between the product market competition and innovation – e.g. *Geroski* [1955], *Nickell* [1996], *Blundell, Griffith and Van Reenen* [1999].

These two kinds of inferences have urged several other researchers to do further investigtions. There were arguments brought up at both side. *Szűcs* [2009] gives a broader review of them. *Aghion*, who previously argued for its innovation limiting effect, has dissolved the contradiction later. *Aghion and his companions* in their works [2002] and [2005], using models, found that a converse U shaped relation prevails between competition and innovation. It is worth innovating enterprises in a competitive market if they can gain benefit that way and can escape the competition. If the market participants collaborate with each other, thus the competition is small, the innovation can be the instrument of recovery and entering the market. Aghion used the number of patents in his calculations to measure innovation; he rejected R&D intensity in the lack of data.

According to *Drucker* [1984] a market ruled by only one or few producers can be extremely favourable for certain innovative activities. Since these producers often insist on long standing products, processes and customers. “First of all, they tend to ignore new entrants considering them to be insignificant or even amateur entrepreneurs. They move difficultly and they don’t plan counter-steps even if a new company wins over bigger and bigger territories from their market.” (p. 95., my trans.) His strategy ‘Hitting Them Where They Ain’t’ is based on this. According to it a smaller enterprise can enter the market of the bigger ones very successfully in such a segment that doesn’t belong to the “main stream” or means a new, not wide-spread solution. Big enterprises pay attention on great volume products and market, thus smaller enterprises can advance successfully, taking advantage of smaller initiatives, maybe until they precede the sluggish big enterprises in the new field. This can possibly transform into another strategy suggested by Drucker: to the global renovation of products, market and industry. Innovators can establish monopolies on their own with the exploitation of a special market gap which they can cover themselves since the size of one company is enough for it. (p. 95., my trans.) The centralizing strategy of *Porter* results the same thing. This strategy focuses on a certain costumer layer, the determined segment of product choice, or a geographically determined area of the market, where it wishes to serve costumers at a very high level. (*Porter* [1980] pp. 58-60.)

The researchers of the Swiss ETH-KOF carried out exciting researches in the issue of driving force of enterprise innovations. *Arvantis and Hollenstein* [1996] found that the five possible groups of factors are: size of the company, demand, supply (technological possibilities), financial limits and an own knowledge base. Among them, Swiss companies are motivated mainly by supply – the availability of the new knowledge, technological possibilities –, followed by the somewhat smaller effect of demand. In his recent research, *Wörter* [2007] found that the diversity if resources available for the enterprises (including work experiences) means a notable extra driving force for the innovation intensity of a firm. This result questions whether the experiences coming from researches done on model companies can be extended to a broader enterprise circle.

In the already mentioned study of *Schmidt and Rammer* [2007] written on technological and non-technological innovations threw light upon the fact that the high costumer

concentration among German enterprises rather holds back from innovation, at least from product, process and marketing innovations. If the majority of a company's income comes from the three most important costumers, then it strongly prevents it from product and marketing innovations. (p. 20.) At the same time, the high number of fellow competitors reduces the possibility that the enterprise would introduce a product or process innovation. This supports Schumpeter's viewpoints.

Borsi [2005] examined the market structure of enterprises in the Hungarian manufacturing. According to his analysis, oligopoly structures seem to gain ground (pp. 46-51.) As a result, most Hungarian enterprises in the manufacturing don't characteristically compete with good quality but with lower costs. (pp. 51-58.) According to it, enterprise innovative activity is needed to be primarily aimed at process and organizational innovations, since due to them we can reduce manufacturing expenses.

One main problem is that we rarely ask: why do enterprises innovate? According to the Oslo Manual: "the ultimate reason is to improve firm performance, for example by increasing demand or reducing costs. A new product or process can be a source of market advantage for the innovator." [OECD 2005. p. 29.] Of course, innovation is always accompanied with uncertainty, which holds back enterprises from taking risks, particularly, when the environment is pretty volatile. [OECD 2005. p. 30.]

In their innovation analysis of enterprises in Baranya county, *Inzelt and Szerb* [2003] examined the effect innovation has on the economic results of the companies, partially regarding the rate of new products in the income and partially regarding whether the company exports. The results were quite depressing: "Those companies, which were able to reach a higher rate in the income coming from the sale of new products, were enterprises functioning typically in a high-tech sector, supporting production development often with own R&D and carrying out close innovative cooperation with other enterprises; however, they rely on state subsidy throughout innovating. (…) Regarding export features, we can point out that the exporters of the samples decisively use the old products of industries demanding traditional, low-level technology. The manufacturing technologies of export-oriented, traditional industries, at the same time,

have significantly renewed, in which the several-hundred-million Forint investments of certain big enterprises had decisive role.” (p. 1015., my trans.)

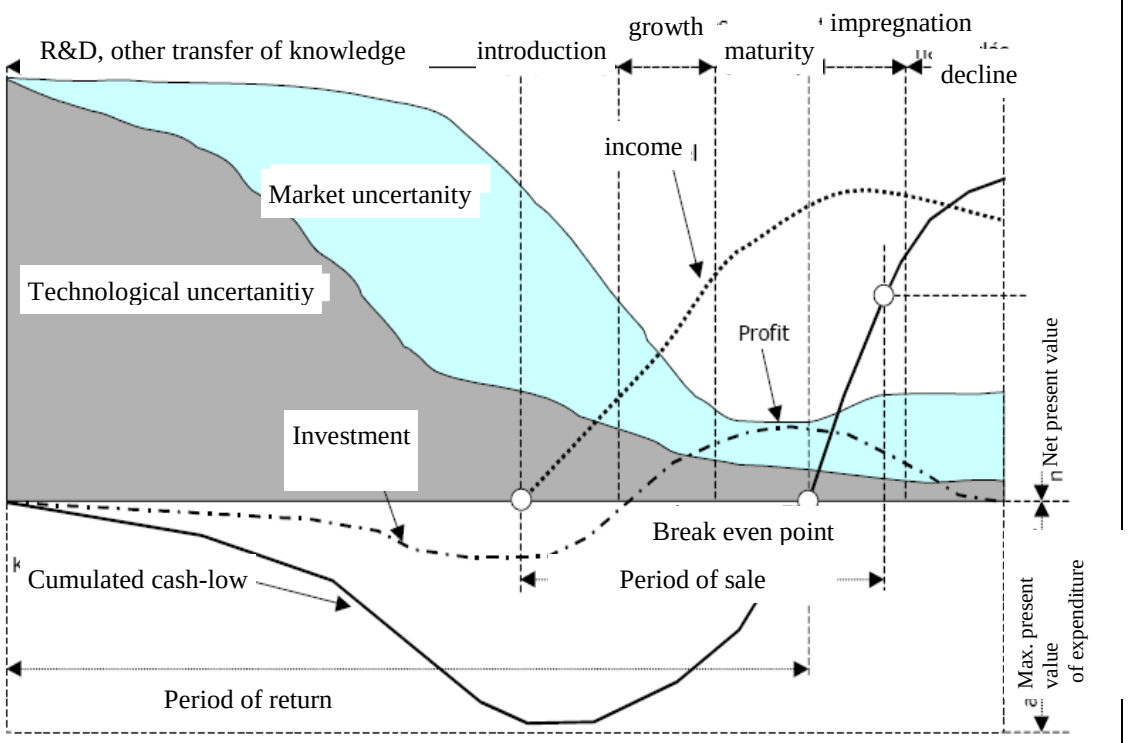
Kiss [2008a] in his survey series as part of the research series ‘In Competition with the World’ regarding enterprise competition, Corvinus University, Budapest, didn’t find any relation between the product development activities and business efficiency of certain enterprises. New products generated relatively low income and they were not connected to the other indexes of business efficiency (neither to profit in relation to income, or to the profitability compared to the strongest fellow competitors). However, a broader relation could be demonstrated: companies, which laid stress on appropriate management of product development and introduced considerably new products to the market, are successful in the business, too. Not surprisingly, these were the features of companies in foreign property or in the field of chemical industry.

Based on the further analysis of the research data, *Kiss* [2008b] showed his results on the IX. Industrial and enterprise economic conference. He fitted the features of enterprises carrying out innovation into a logit regressive model, and he found that, despite their former underrating, cooperation with research institutions and universities had close relation to the realization of innovations. The cooperation with the participants of the market showed a slightly weaker but still positive relation with enterprise innovative activity. Increase in size, foreign ownership and being export-oriented were verified to have positive effects, state subsidy was significantly related to the export of new products. The logit model showed very close relation between the introduction of a new product and enterprise profitability.

There are periods in the life of an enterprise when they are basically innovative because they need to be innovative, and there are periods when they can be efficient without innovations. At the beginning of the career of an enterprise, in the phase of knowledge transfer they probably carry out product and process innovations; in the introduction phase the company obviously focuses on marketing innovations; and in the phase of growth and maturity mainly organizational innovations come to the front. Of course, in each phases any of the four types can occur. At the beginning of the life diagram radical innovations are carried out, and they are succeeded by incremental innovations. The

phase of saturation and decline is no longer an innovative period in the life of a company, unless starting something new restarts the whole cycle from the beginning.

12. Figure **Enterprise life diagram and its main economic relations**
(the diagram of income is regarded to as the life diagram)



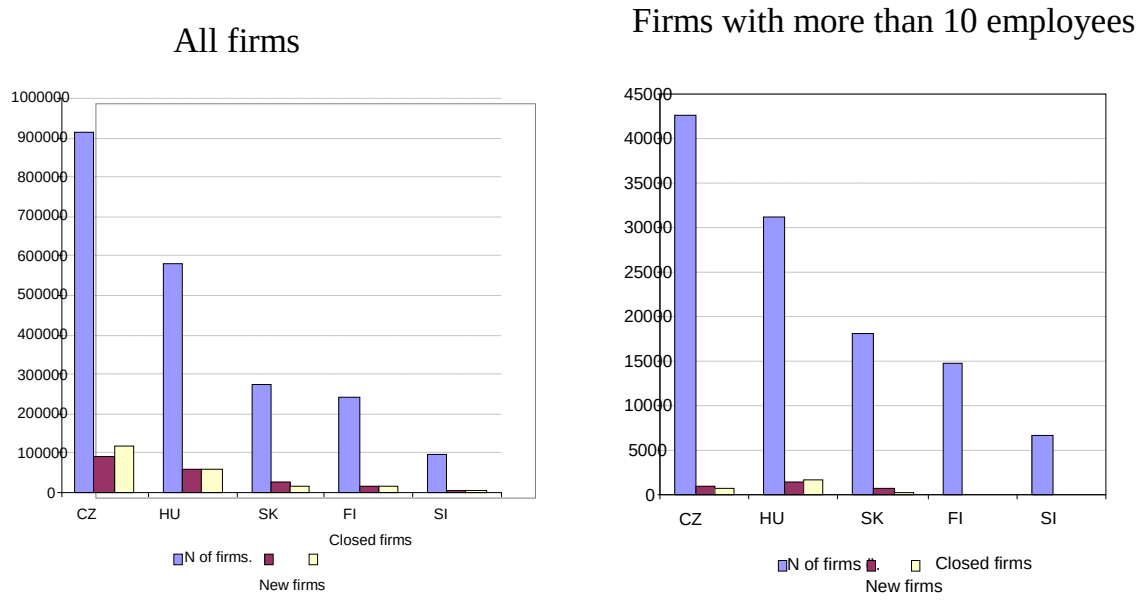
Source: OECD, 1995, p. 59.

Launching a new enterprise is undisputedly innovation, at least the fifth type of Schumpeterian innovation (organizational), but it is generally joined by something else, too, since an entrepreneur establishes a new company because he can produce something cheaper or can reach more favourable raw material resources than his fellow competitors on the market, or he wishes to acquire an unsupplied market or maybe come up with a new product. Thus the freedom of launching a company can be a basic factor urging or discouraging innovation. I managed to internationally compare enterprise launching on the basis of enterprise demographic data of Eurostat, 2004, which contained data of company closure. If we compare the data of Hungary to the surrounding countries and to Finland, which is similar to Hungary, we can see that 8-10% rate of enterprise launching is characteristic in the enterprise population. In the two more developed economic area the rate of enterprises dying is roughly similar to this, however, in Visegrád area there were more companies closing than opening.

Examining the group of enterprises working with more than 10 employees (i.e. where it was not characteristic to launch a company as workplace supplement), we could see a lower rate of opening enterprises (between 0-5%). The most intensive movement was in Hungary regarding this group and our country is different from the others in the sense that here closures were in a greater number among the bigger companies, too, than launching enterprises. According to these data, the mood for starting an enterprise and the willingness for initiative don't lag behind in Hungary compared to the similar countries, it rather exceeds the typical level of the more mature economics.

At the same time, we can't forget that launching a company is often the manifestation a different kind of "creativity" in Hungary than in traditional market economies, because it is the excellent instrument of avoiding high common charges imposed on wages, and also of the removal of properties before tax and business debits. Eventually, this can be regarded to as the manifestation of a certain Hungarian innovativeness; entrepreneurs conform to the environmental challenges with new solutions. But according to the concepts of the Oslo Manual and the literature, this kind of innovation hasn't gained appreciation, the figure should be contemplated with caution.

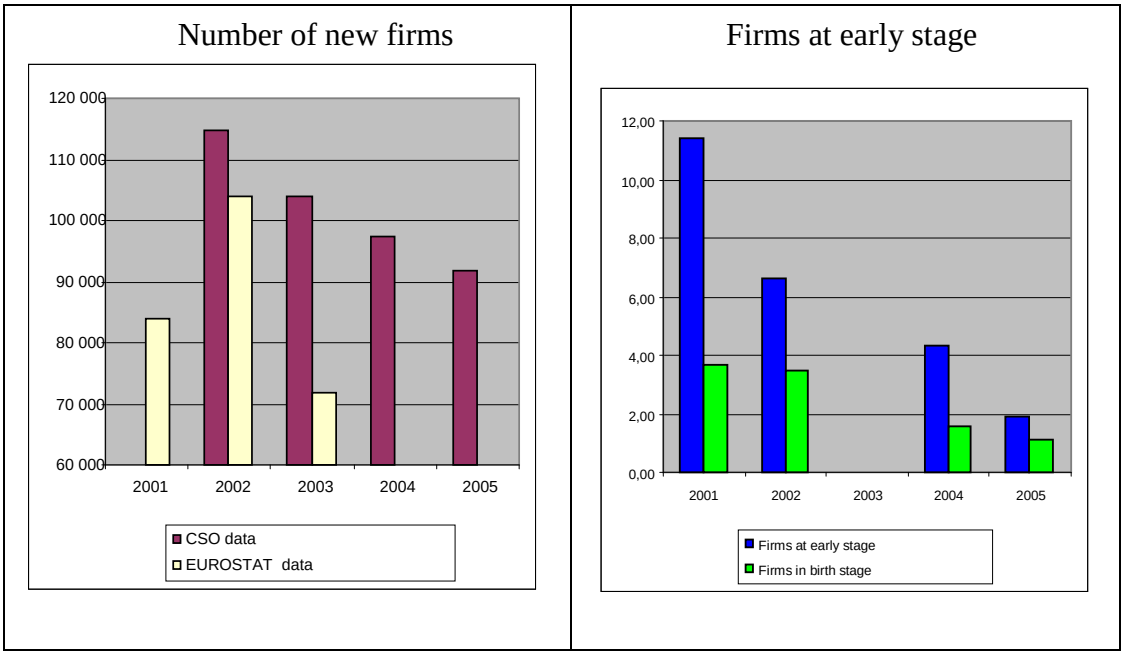
13. Figure **The number of companies, their opening and closure, 2004**



Source: Eurostat

The researches of *Szerb* [2005] carried out in the program of Global Entrepreneurship Monitor (GEM) show contradiction between the above presented cases and the formation of willingness to launch enterprises and the attitude to become entrepreneur in Hungary. According to his surveys, the willingness in Hungary has decreased in the recent years, either if we consider the newly registered or the number of companies in the phase of opening. GEM researches have found very few university students who saw good facilities for launching an enterprise. This all means that, according to the formerly presented diagrams of enterprise lives, there are few companies in the phase of knowledge transfer in the activity of which technological innovations have great role, and there are also few companies in the phase of installation which would generate marketing innovations.

14. Figure **The number of newly registered enterprises and the indexes of enterprise activity in Hungary between 2001 and 2005**



Source: *Szerb* [2005] p. 12.

There were several researches done dealing with Hungarian enterprise innovations, the obstructive and aiding factors of it. Above the already mentioned works, *Inzelt* [2001] did researches in the supplier sector which showed that the main obstacle of enterprise innovations was the lack of financial resources. Later *Mrs. Mosoni et al.* [2004] did a research in the supplier sector and found that the most obstructive factors were the small

number of users, the narrow market and its slow increase. *Papanek* [2003] had the same results when he carried out a survey for the Hungarian Innovation Association in the business sector of national economics. He showed that the main obstacle for enterprise innovations was the shortage of demand which was followed by the shortage of capital.

For the Hungarian enterprises not technological arrears seem to be the main obstruct of improvement in performance. The GKI Economic Research Co. has been surveying the attitude features of some Hungarian companies for a long time. During these examinations, an overall research was done.

We have examined the obstacles of expanding enterprise activities. At the beginning there was a list of 19 factors, then from 2001 a choice of 20 factors from which the respondents had to choose 5 factors that they considered to be an important obstacle in expanding their production and service (i.e. in enterprise growth). One respondent didn't attach importance to the order of the mentioned factors. We have summarized the answers and saw which factors how often were chosen. Thus a rank evolved, at the top of which the factor chosen by the most respondents stood. It allows a more sophisticated research if we indicate how many percents of the respondents indicated each factor as being important in the given question. In this case, the total number exceeds 100% since one respondent can mark more factors. The number of votes given for a certain factor indicates for how big proportion was that viewpoint important.

The factors of demand (inland and foreign market) and financing (lack of capital and resource inclusion) have led the list of obstacles in every year. From this we can draw a very distressing conclusion in connection with enterprise innovations: due to the low demand and financial problems companies can hardly spend resources on always risky innovations in the hope of favourable recovery. It is even more characteristic if we take into account that the unpredictability of state behaviour has been mentioned at a fairly high rate after the turn of the millennium – and in an instable regulative environment it is even more dangerous to start several-year-long innovations. Furthermore, these answers didn't indicate the internal force for renewal: the competitiveness of the products, the technological level of the already existing capacities, and the problems of management and marketing have generally been regarded to as the obstructive factors for growth only at few respondents.

11. Table The most important factors obstructing the expansion of production and service*

(frequency of being mentioned, respondents in %)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
The limits of domestic demand	58	59	59	64	66	71	66	59	56	66	48	54	58	57
Costumer's delay in paying	27	25	24	23	27	31	34	30	29	32	31	30	32	36
The unpredictability of state behaviour	26	43	35	40	29	36	30	32	26	28	27	31	31	35
Unfair competition	24	25	26	32	34	36	35	28	25	30	23	31	31	31
Lack of capital	29	35	29	27	42	40	44	37	33	34	25	31	30	20
Intense competition	25	25	23	25	36	38	43	32	29	36	32	32	28	32
Lack of qualified labour force	---	---	---	---	---	---	---	13	11	13	12	9	18	19
Limits of foreign market demand	20	16	15	11	13	19	19	14	15	21	13	16	13	9
Other problems related to labour force	10	9	8	9	15	18	23	15	10	12	9	7	11	13
Unfavourable conditions of funding	17	20	18	14	19	16	21	21	14	16	14	11	10	11
Unfavourable infrastructural conditions	9	10	9	5	9	10	11	9	8	10	8	7	9	9
Weak competitiveness of products, services	5	5	5	4	5	6	7	4	3	6	5	5	5	4
Uncertainty of owners and of management	13	13	10	11	12	14	15	12	6	9	7	5	5	6
Low technological level of existing capacities	13	8	8	10	12	13	16	14	11	14	4	4	4	8
Unsatisfactory marketing	10	11	13	13	13	9	14	11	9	10	5	4	4	4

Source: the surveys of GKI Economic Research Co., such records ended in 2008

*= more answers could have been marked, so the frequency of them being mentioned exceeds 100

As part of this research series we have asked in 1998 "Which are the main obstacles for innovation at your company?" 63% of the respondents marked the lack of capital, 53% marked the unfavourable chances of recovery. The other possible answers got much lower rate of being mentioned: the limits of capacity for own R&D got 25% just like the lack of information concerning new innovations; the weakness of the company's innovative ambitions got 22% and the weakness of inland R&D network got 8%. At this time still the first version of the Oslo Manual was in effect which definitely focused on technological innovations, as I have already mentioned it, and didn't really separated the concepts of creating and utilizing knowledge. Together with all these, these results obviously show that, even in this so dynamically developing period of the Hungarian economy, the main obstacle for the innovative activity of the companies was the lack of market possibilities, which limits recovery and reaching financial resources.

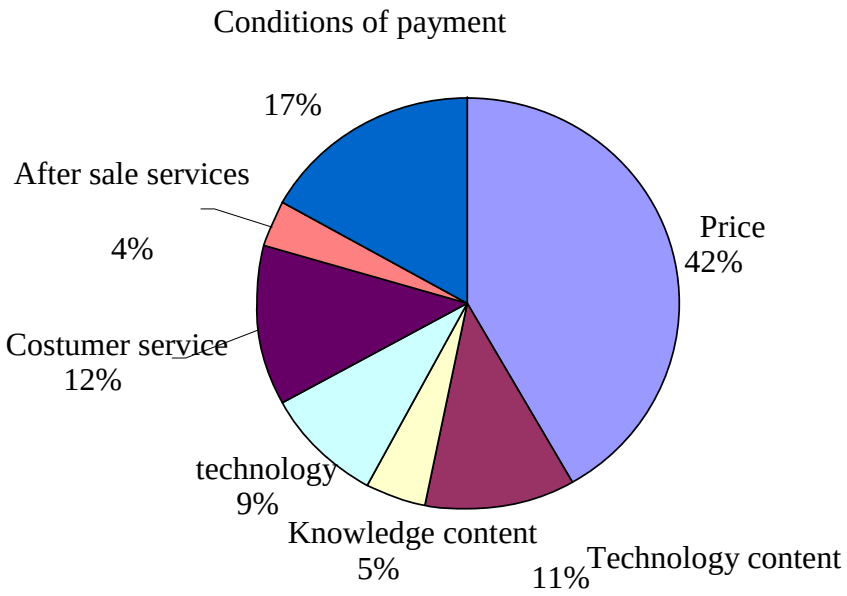
Enterprises obviously spend their resources on innovation when they regard it necessary for holding their position at the market. I refer to the Oslo Manual again, it says:

“Innovation aims at improving a firm's performance by gaining a competitive advantage (or simply maintaining competitiveness) by shifting the demand curve of the firm's products (e.g. increasing product quality, offering new products or opening up new markets or groups of customers) or a firm's cost curve (e.g. reducing unit costs of production, purchasing, distribution or), or by improving the firm's ability to innovate (e.g. increasing the ability to develop new products or processes or to gain and create new knowledge).” (OECD [2005] p. 35.)

In a competitiveness research done for the Competition Culture Centre of Hungarian Competition Authority (GVH VKK) we have asked the enterprises in the Autumn of 2007 which factors influenced the competition the most in their most important markets. (See in details: *Mrs. Németh and her companions* [2007] and *Mrs. Németh* [2009]).

Even though several answers could have been marked, not surprisingly, price got the most mentions (42%); it was followed by marketing (i.e. pay constructions, services after sale and costumer service) with its 33%; and the rate of factors in connection with technology was 25% (i.e. technology, knowledge content and technological content). Companies competing with price can decrease their expenditures with technological and, on the other hand, with organizational innovations, and as a result they can offer better prices, but the pricing itself and positioning connected to it are already the instruments of marketing. I suppose that in enterprise cost reduction organizational innovations, such as reducing the time of stock circulation and stand, placing activities out, creating cooperation, etc., play at least as big role as the utilization of more effective equipments and methods, if not even a greater role. Marketing innovations – and according to the Oslo Manual they include new marketing methods such as design, new packaging, product placement, advertising and pricing – can have a greater significance than product and technological innovations.

15. Figure **Factors of competition according to the evaluation of enterprises**
The distribution of frequency of being mentioned



Source: GKI survey [*Mrs. Németh et. al.* 2007. pp. 118.]

In the very same research it turned out that neither the too weak, nor the too rough competition (which might even mean a competition exceeding the legal limits) does good for enterprise competitiveness. Companies which were present in an average or intensified competition registered products at the highest rate which were regarded to as competitive in the market.

12. Table **The nature of the competition and the relations of enterprise competitiveness, 2007**

Distribution of responses, %

Number of those who indicated competitive products	The nature of the competition			
	Only few participants in the competition	Average competition	Intense competition	Rough competition
Competitive on the world market, too	47	65	63	46
Could be more competitive with smaller developments	44	24	23	27
Has no chance in international competition	9	11	14	27
Total	100	100	100	100

Source: GKI Co. 2007 autumn survey [*Mrs. Németh et. al.* 2007. p. 4.]

CHAPTER V

Crisis and Innovation

This chapter originally dealt with the role of enterprise innovations played in economic growth through an empirical testing – with studying theoretical works and using secondary analyses – and demonstrating my findings. The examination was carried out but due to timing it had unintended proceeds. While the former empirical examinations showed how enterprise innovative attitude changes in the time of slower or more rapid growth, my analysis was done when the greatest world economic crisis reached its nadir. Thus this survey became appropriate, besides for fulfilling its original intension, for giving picture about how Hungarian enterprises change their innovative activities in the conditions of crisis.

During autumn, 2008, an enormous crisis evolved in the world economy. Even though many people connect the outbreak of the recession to the failure of Lehman Brothers, the decay in the real sphere had already started in 2007, and it wasn't induced only by the problems of the financial sector. Firstly, hesitation occurred in the economic indexes but also investments slowed down. There haven't been any data of measuring published yet, but it is likely that other types of enterprise innovation have also dropped back.

At the same time, the way of development probably looks forward and not backwards; economies, that are able to renew themselves quickly, will get to the course of development the earliest possible, they will be the victors of recovery. The decline seemed to stop at the middle of 2009, however, there is no unity in the profession whether this period will be succeeded by a slower recovery, stagnation or possibly another decay. This way, there were only few numbers of publications analyzing the nature of the crisis, its effects and the responses given by the firms. An example for such a work is the analysis of *Angyal* [2009] about the uncontrolled organizational changes. The present crisis can definitely be regarded to as this kind of change, for the

viewpoint of the enterprises.[8] The results of examination presented in the following part contribute to learning more about the enterprise attitude in recessive conditions.

I expected from the survey of 2009 that the Hungarian companies, which fight in the grip of financial problems and struggle for survival, would report a very moderate innovativeness. The examinations were carried out mainly in May, 2009, attached to the monthly surveys of GKI about the economic situation. Since the questionnaire[9] happened to be very long, we placed it in a separate envelope and also made it accessible on the homepage of GKI. (The online questionnaire is still at an experimental phase, only 10% of the respondents chose this way of answering the survey.) Similarly to my former expectations the rate of answers was very low, partially due to the above mentioned economic environment, partially due to the length of the questionnaire.

13. **Table** **Main data of the responses, May, 2009**
Number of companies, pieces

Sector*	Number of questionnaires sent	Number of answers returned		Number of questionnaires on innovation returned		
	piece	piece	%	piece	% in the rate of questionnaires sent	% in the rate of questionnaires returned
Industry	1400	266	19,0	124	8,9	46,6
Construction	1400	208	14,9	80	5,7	38,5
Services	1300	222	17,1	66	5,1	29,7
Total	4100	696	17,0	285	7,0	40,9
Not classified				15	0,4	2,2

*= trade has emerged from the traditional survey system. This was an experimental project, questionnaires are carried out through phone calls, in which the sample companies are being searched until the necessary quantity of answers is fulfilled. The costs of this survey would have been increased by doing it with the two-page questionnaire.

Source: GKI survey

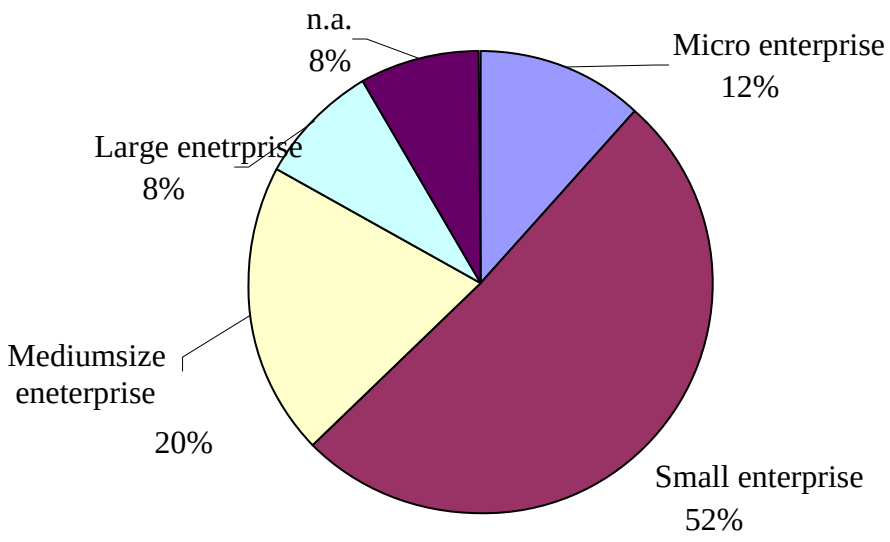
The companies of construction were over-represented among those who filled out and sent back the questionnaire on innovation, however, the supplier sector is still below the national economic rate, even if we don't consider the banking houses what are not surveyed.

[8] Angyal himself mentions crises as the characteristic examples of changes affected by external, environmental conditions. See: p. 6.
[9] Statistical Appendix 1. contains the questionnaire of the survey.

51% of the respondents were from the small-size companies working with 10-50 employees. Even though these rates of answering still differ from the nationwide rates based on the firm registry, the group of micro and small enterprises still composes the majority and this agrees the fact that the rate of big enterprises is the lowest.

Even though the firm register above 10 employees, received from CSO, form the sampling limit, micro enterprises also appear among the respondents. The reason for this is that the data of CSO reflect the status of the second quarter of 2008, while the GKI survey reflects the status of second quarter of 2009. Under the influence of the crisis many companies have reduced the number of their employees.

16. **Figure** **The distribution of respondents according to size, 2009**



Source: GKI survey

According to the income of 2008, there were great differences among the respondents. The average income was 2 billion forints, but the lowest income was 2 million, the highest income was 105 billion forints. Half of the companies reached an income less than 440 million forints last year.

14. **Table** **Income and regional statistics of the respondents**

Income data million forints		Regional distribution %	
Average income	1991,5	Central Hungary	25,6
Average difference	8325,0	West Transdanubia	11,5
Minimum	2	Central Transdanubia	15,2
Maximum	104960	South Transdanubia	6,3
1st quarter	164	North Hungary	11,1
2nd quarter	440	North Plain	17,4
3rd quarter	1100	South Plain	13,0
N	243	N	270

Source: GKI survey

I have to mention here that due to the faults of the fax machine some parts of the returned questionnaires were sometimes illegible, thus even answers for some basic questions (like last year's income or the county of the basis of the firm) were missing. In case the greater part of the text was analyzable, we didn't exclude it from the processing, but of course we encoded the given question as "no response".

5.1. The rate of innovators

I measured the innovative activity of the enterprises primarily with the four innovation types based on the Oslo Manual. More than half of the respondents indicated having carried out some kind of innovation in the last three years, so I received a much higher rate of activity again than what is shown by the survey of CIS. However, we might assume that those who sent back only the monthly questionnaire on the economic situation and not the questionnaire on innovation, did it because they haven't carried out innovation in the last three years. Thus the rate of responses is only 23,6% that is close to the rate of CIS2006 survey.

This rate is much lower than our result in the 2005 survey, even though there marketing innovations were not yet present and it regarded only the innovations of the last two years. The low innovativeness shown by the survey can have several reasons. Unfortunately, losing information is quite possible, since even though a certain part of the illegible answers concerning the realization of innovations can be substituted with the answers of further questions regarding successful innovations, still it wasn't possible in case of every inaccurate questionnaires. However, the number of these was very low. The length of the questionnaire (it used to be one-page-long, now it is two-page-long) played a great role in the low willingness of responding it and might have frightened some managers from filling it in.

Still the main reason for the low innovativeness was the difference of the two periods: in summer, 2005, we asked questions about the innovations of a recovery period; and in May, 2009, we examined the period of three such years (2006-2009) at the middle of which was the outburst of credit crisis on the American secondary mortgage market (summer of 2007), the increasing uncertainty of economic environment and prospects of this time, and the credit crisis that grew world-wide in autumn, 2008. It seems that companies held in from innovations being afraid of and then also sensing the tilt of market equilibrium. The results of CIS2006 presented the period between 2003 and 2006, too, thus they measured the innovativeness of the top period.

Opposite to my expectations based on results of the previously mentioned survey done for 2007 GVH VKK, innovators carried out technological innovations in a greater proportion than non technological ones. Again, product innovators were in majority compared to our survey of year 2005. This agrees to the results of CSO CIS2006, but disagrees the inferences drawn from the analysis of *Borsi* [2005], that companies competing with low costs on oligopoly markets carry out mainly process and organizational innovations.

15. **Table** **Innovators in the survey**

Innovation type	Number of those who carried it out	Rate of those who carried it out , %
Product	115	40,4
Process	95	33,3
Market	53	18,6
Organizational	69	24,2
Indicated some kind of innovation	164	57,5
N	285	

Source: GKI survey

Companies functioning in Hungary, when innovating, carried out more or less not just one type of innovation but several types, similar to the German and the CIS2006 Hungarian experiences. Product innovations accompanied mainly process innovations. This agrees the findings of CSO.

16. **Table** **The number and rate of innovators carrying out two kinds of innovation, in pairs**

	Product innovator	Process innovator	Market innovator	Organizational innovator
Product innovator		72	38	41
Process innovator	43,9%		35	37
Market innovator	23,2%	21,3%		30
Organizational innovator	25,0%	22,6%	18,3%	

Source: GKI survey N=164

Very few companies carried out even more kinds of innovation.

17. Table **The number and rate of innovators carrying out more than two kinds of innovation**

How many kinds of innovation have you carried out?	Number of companies	Their rate, %
All 4 kinds	18	11,0
Product, process and market	29	17,7
Product, process and organizational	30	18,3
Product, market and organizational	23	14,0
Process, market and organizational	21	12,8
N	164	

Source: GKI survey

From the viewpoint of economic sectors, the survey didn't have surprising results: companies working in the fields of industry and services indicated at the greatest rate to have carried out any of the four types of innovation in the last three years. We can see the same in the group based on staff number: it matched the former expectation that together with the size of the enterprise grows innovative activity, too. This accords the results of CIS2006 survey but differs from our examination carried out in 2005.

18. **Table** **The rate of innovators according to sector and size**

National economy	%	N	Staff number category	%	N
Industry	66,1	82	Micro enterprise	39,4	13
Construction	47,1	32	Small-size enterprise	57,5	84
Services	50,0	6	Big enterprise	65,5	38
Trade	62,1	41	Medium-size enterprise	75,0	18
Not classified	20,0	3	Not classified	45,8	11

Source: GKI survey

Beyond the innovation types of the Oslo Manual I have questioned two issues that might suggest that a renewal or a change has been done at the firm. One of them is the Schumpeterian purchasing side, the other one is the vocational training mentioned several times in the literature. *Schumpeter* ([19911] p. 11.) defined five types of innovation for of which have already been introduced in the Oslo Manual.

1. The production of new (i.e. not known to costumers) goods or new qualities of certain goods.
2. The introduction of a new method of production, i.e. not known to the industry practically, which need not be based on scientific discovery, and which might be a new commercial process connected to a certain good.
3. The opening of a new market, where the given industry of a given country hasn't been introduced yet, whether the market was already existing or not.
4. *Conquest of a new source of supply of raw materials or half-manufactured goods, not depending from the former existence of the resource (if it hasn't been realized, it hasn't been regarded to as appropriate or it had to be developed first).* [10]
5. The realization of a new organization – e.g. creating monopoly by trusting or ceasing it." (p. 111., my trans.)

The rapid development of materials engineering invested old products with new functions and qualities. For example, the same size piece of textile from cotton material is good only for erasing of moisture, from microfiber material it is good for chemical proof cleaning and a piece with silver colloidal nano-coating is good for biocide sterile wound dressing. A polyethylene plastic bag would become garbage that needs to be

[10] Italics mine.

destroyed, while the one that was produced from cellulose based plastic breaks down naturally. There were similar changes at the time of publishing Schumpeter's book, consider either the metallurgical materials, aluminium on the first place, in the production of steel or the rise of plastic materials. Thus, during innovation he assigned great significance to the input side, too. The alternation of a supplier can cause changes in the life of the company without any radical innovation since is has a certain reason: the delivered product or the terms of delivery (timing, size, packaging, price, pay conditions) might be better or it transports something that the former suppliers couldn't. Of course it often happens that the new supplier simply substitutes the former supplier and gives the same things for the same price and in the same quality. For this reason the introduction of new supply resources, raw materials and inputs can be the indication of an innovation carried out by the company – but it is not unambiguous.

The training of the employees has appeared in the literature at several places as innovative indicator. For example, *Lynch* [2007] considers it to be the indicator of organizational innovations; *Reichstein and his companions* [2008] says the same when monitoring the innovativeness of building industry. *Lewrick* [2009] builds it in his complex innovativeness model. For example, the European Summary Innovation Index contains the data of participants in post gradual, life long education. (See: Appendix 1.) Approaching from the side of the enterprise, it is obvious that the company guarantees the facilities for training that is not necessarily carried out in a public educational institution, in case it wishes to carry out a change for which new knowledge needs to be introduced to the company. That is why the questionnaire included the question whether the employees of the company took part in trainings related to innovations realized. The respondents showed a similar or a little bit even greater activity compared to the above mentioned results.

19. **Table** **Further innovative activities**

	Have you introduced new supply resources, new raw materials or other new input sin the last three years?		Have your employees received training related to the above mentioned activities?	
	Number of answers	Rate of answers	Number of answers	Rate of answers
Yes	161	56,5	108	37,9
No	96	33,7	149	52,3
Missing	28	9,8	28	9,8
N	285	100	285	100

Source: GKI survey

38% of the companies indicated that their employees participated in trainings. This is much lower than the last known (2005) statistic result of 49%.

74% of the innovator respondents introduced new supply resource, new raw material or any other new input in the last three years but many non innovators also carried out such activities. At a smaller rate, but the situation of training employees is the same. There was an average relation between the innovative activity of the respondents, according to the Oslo Manual, and the complementary innovative activities (See: Statistical Appendix 3.), and a bit stronger relation to supply innovations than that of training.

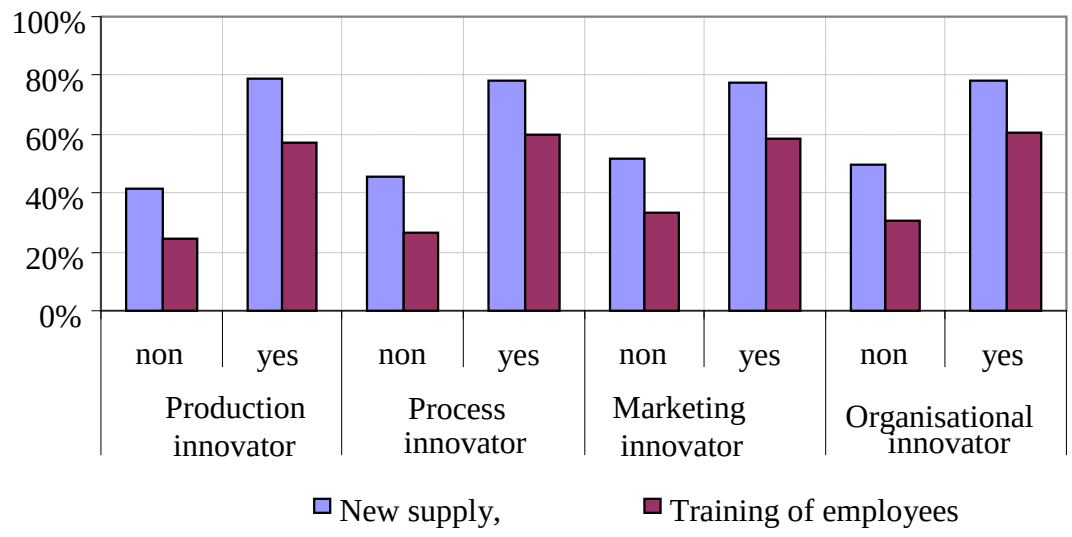
20. **Table** **The number of other innovators**

	Number of companies		Rate of companies	
	Non innovator	Innovator	Non innovator	Innovator
New supply, raw material	39	122	32,2	74,4
Training employees	21	87	17,4	53,0
	121	164	121	164

Source: GKI survey

There were no significant differences regarding the types of innovation in the case of complementary activities: almost 80% of those who carried out certain innovations based on the Oslo Manual employs new inputs and 60% entered into training their employees.

17. **Figure** **Complementary innovative activities as types of innovation**



Source: GKI survey

Technological innovations in Hungary are more frequent in industrial activities than in the other national economic branches. This agrees the former ideas and international experiences, too. However, the relation between the sector affiliation and the types of innovation carried out is very weak. (See: Statistic Appendix 5.)

21. **Table** **Types of innovation according to sectors**

	Industry	Construction	Services
Product innovator	53,2	33,8	36,4
Process innovator	44,4	26,5	30,3
Market innovator	23,4	16,2	18,2
Organizational innovator	25,0	22,1	30,3
New supply, raw material	65,3	66,2	50,0
Training of employees	41,1	47,1	36,4
N	124	68	66

Source: GKI survey

The rate of enterprise innovativeness grows roughly together with the size of the company but this relation is weak, too. However, micro enterprises showed surprisingly

high level of activity. The rate of organizational innovations is related to the staff reduction at these companies that happened in this year: they had to introduce new solutions. Still, the technological innovations, trainings and new supplies suggest that the matter of this issue is even more: companies in this size category show a real and vivid innovative activity. We shouldn't forget that these companies working with a decreased stuff number are probably not obligatory enterprises aiming to avoid taxation and contributions, and as a result of their smaller size they are able to try new solutions relatively flexibly and fast.

22. **Table** **Types of innovation according to size**
The rate of those who carried out innovation compared to the total, %

	Micro enterprises	Small-size enterprises	Medium-size enterprises	Big enterprises
Production innovator	24,2	41,1	41,4	54,2
Process innovator	18,2	34,9	39,7	50,0
Market innovator	21,2	20,5	19,0	12,5
Organizational innovator	21,2	20,5	32,8	33,3
Supply innovator	39,4	63,0	74,1	41,7
Training of employees	21,2	39,0	50,0	45,8
N	33	146	58	24

Source: GKI survey

If we examine the six activities together, 72% of the respondents carried out some kind of innovation between 2006 and 2008. 9% of them carried out five kinds, 4% carried out all six kinds of activities. Concerning trainings and new supplier innovations as indicators, 30% of the participants in May, 2009 survey of GKI proved to be innovative, including those, too, who didn't fill in the questionnaire on innovation. In each national economic branch, app. 70% was the rate of extendedly interpreted innovators. According to staff categories micro enterprises showed the lowest rate (52%), and medium-size enterprises showed the highest rate (85%).

Hereinafter, I will call those companies as indicators, which carry out innovations according to the Oslo Manual.

The answers supported my idea that Hungarian companies mainly realize imitations, i.e. most of the changes introduced are innovations that have already been carried out

somewhere else. Several companies carried out more than one type of innovation the degree of which was different. Thus the total of innovations carried out is higher than that of the innovators. Companies tended to try organizational and market solutions that proved to be well-functioning somewhere else. The rate of imitators among the total of innovators was 87%. Each of the micro enterprises introduced new solutions that were new only for the company, and the number of imitators was the lowest at the small-size enterprises: 82%.

Imitation is least characteristic for production innovations; here many introduced new products on their own market. It is worth considering in case of market innovators that a new Hungarian advertisement campaign means novelty world-widely, thus here we probably don't mean actions conquering the world market.

23. Table **Innovations according to the degree of novelty**

	Product innovation	Process innovation	Market innovation	Organizational innovation
Novelty to the world	2,6	3,2	3,8	1,4
Novelty to the marker	42,6	28,4	22,6	14,5
Novelty to the firm	74,8	84,2	92,5	92,8
N	115	95	53	69

Source: GKI survey

By May, 2009, the crisis has brought significant changes in the trend in most economic fields and it forced enterprises to change their basic attitudes. It could have been expected that it would influence the innovative activities of the respondents in a great deal, compared to the past. The survey showed that the crisis did affect the innovativeness of the enterprises and this was a lot different from the image of Hungarian companies. Less than half of the respondents thought that the crisis moderated innovative activity or even stopped their existing plans. The majority of the respondents wished to intensify their innovative activity as a consequence of the crisis. Most people were among the successful innovators who wanted to respond to the crisis with advance. In the judgment of moderating factors, the difference from average was not this outstanding.

24. **Table** **The effect of crisis on innovations**

	Non innovator	Innovator	Successful innovator
Moderates it or even stops their existing plans	43,8	44,5	48,5
Enhances it because			
they can stay in competition with new products and profile change	4,1	17,7	20,9
they can stay in competition with using new technologies	0,8	13,4	14,9
they have to sell their products and services in new market/for new costumers/with a new method	6,6	20,1	23,1
they can stay in competition with the reform of enterprise cooperation	7,4	17,1	20,1
Total enhancing		55,5	51,5
N	121	164	134

Source: GKI survey

5.2. Starting innovations

The aim of the innovations could have been determined by 4 possible given answers or by their own answer given for an open question. The survey verified that the primary aim of enterprise innovations were holding position in the market, satisfying costumer demands better with the development and expansion of the existing supply. Fewer but still many marked the reduction of expenses as the target of innovation. The mentioning of the other two answers lags far behind these answers.

There has always been a demonstrable statistic relationship between the types and the aims of innovation. (See: Statistic Appendix 7.) It was only the aim of production enlargement that had a weak relation to product, process and organizational innovations. The improvement of market efficiency was regarded to as one of the most important targets at each type of innovation. The reduction of expenses primarily motivated the organizational innovations. Those companies, for which the private use of the innovation tax they received was important (listing it to the second or third position), carried out mainly organizational innovations. The symmetry of these two viewpoints suggest that the companies don’t regard innovation allowances to as “free money”; once

they have invested time and labour into the private utilization of the money, they expect some kind of real change from it.

The respondents marked market expand, new activities and gaining advance in the market as other targets of innovation, and these were most often close to the two mentioned target types.

25. **Table** **Intent of innovation by innovation types**
Proportion of mentions**,** %

	Production innovator	Technological innovator	Market innovator	Organizational innovator	Total
Improving quality, higher efficiency in competition	61,7	67,4	67,9	65,2	59,1
Expanding production/service	62,6	64,2	66,0	46,4	56,7
Cost cutting	48,7	48,4	50,9	59,4	47,0
Own usage of innovation tax	1,7	2,1	1,9	5,8	2,4
Other	0,9	1,1	1,9	1,4	0,6
N	115	95	53	69	164

Source: GKI survey

There was no significant relation between the materialization of certain innovation types and the emerging place of innovative necessities inside a firm. A weak relation showed up between the initiative starting from the production department and process innovations, and also between the administrative department and the organizational innovations. According to the high rate of technological innovations, they started mostly from the production department, followed by the sales department. Differences occurred only after them. The administrative department was primarily the promoter of organizational innovations, but the employees also activated themselves in market innovations. Even the management and the owners initiated organizational innovations.

> Mainly companies in construction marked other starting points of innovations: it was execution in their cases, that could be matched with production department. One respondent marked logistics as the place where the necessity of innovation arises, and two respondents chose service department.

26. **Table** **The starting point of innovations according to types, %**

	Production innovator	Process innovator	Market innovator	Organizational innovator	Total
Production department	53,9	63,2	56,6	44,9	58,5
Sales department	35,7	31,6	45,3	39,1	22,0
Technology design department	13,0	14,7	9,4	15,9	17,1
Management	13,0	10,5	11,3	17,4	32,3
Administrative department	7,8	10,5	15,1	20,3	15,2
Owner, the disposition of the parent company	8,7	8,4	11,3	13,0	0,6
Other places	7,0	8,4	11,3	10,1	17,7
N	115	95	53	69	164

Source: GKI survey

The resources of knowledge used for innovating were the employees in most cases, regarding each type of innovation and also the total of answers. (However, the relation was still not statistically valuable. See: Statistic Appendix 9.) In the next place, professional forums were mentioned most often. Many also studied from their partners and fellow competitors. The fact that relatively few enterprises required knowledge resulting from cooperation with universities or research institutions confirms the already mentioned bad system of relations between the research and business spheres in Hungary. The role of bridging institutions is even weaker: only one respondent indicated that they had used such help for carrying out process, market and organizational innovations. As the source of knowledge, enterprise cooperation appeared at a lower rate than it had been expected on the base of former experiences, even though I have called the attention on the questionnaire that even the parent company is included here. This coincides with those that we have told in connection with starting an innovation: the owner and the parent company were mentioned only by few people as the initiator of innovation. We have reached that period when the companies functioning in Hungary no longer only introduce the development results of the foreign partner and parent company, but their own resources also have an important role in their activity.

27. Table **The source of knowledge used for innovation according to types of innovation, %**

	Production innovator	Procedure innovator	Market innovator	Organizational innovator	Total
Employees of the company	57,4	62,1	67,9	69,6	58,5
Professional forums	30,4	33,7	32,1	31,9	32,3
Costumers	25,2	23,2	24,5	24,6	22,0
Cooperation with universities and research institutions	14,8	18,9	18,9	11,6	17,7
Fellow competitors	15,7	21,1	20,8	20,3	17,1
Enterprise cooperation	17,4	15,8	24,5	21,7	15,2
Innovative bridging institutions	0,0	1,1	1,9	1,4	0,6
N	115	95	53	69	164

Source: GKI survey

Even though the aim of the innovation and the resource of the used knowledge hardly had any statistically valuable relation, innovators driven by the aim of production expand and quality development learned from the costumers, those who wished to reduce the expenses learned from the fellow competitors (and this was a significant relation). A weak relationship showed between the cost cutting, quality development and the knowledge coming from the colleagues of the company.

28**. Table** **The source of used knowledge according to innovative targets, %**

The aim of the innovation / The source of knowledge:	Expanding the range of products	Cost cutting	Developing quality	Own usage of innovation tax	Other	N
the employees of the company	60,4	58,3	67,7	2,1	1,0	96
professional forums, literature	52,8	58,5	67,9	1,9	0,0	53
costumers	69,4	61,1	77,8	5,6	2,8	36
cooperation with universities, research institutions	58,6	34,5	69,0	3,4	0,0	29
fellow competitors	64,3	71,4	64,3	3,6	0,0	28
enterprise cooperation	68,0	48,0	52,0	4,0	0,0	25
the source of knowledge: linking institutions	100,0	0,0	100,0	0,0	0,0	1

Source: GKI survey

When I examined where the necessity for innovation emerges and from where does the knowledge come which they used for the realization of the innovation, I found a weak but significant relation: between innovations starting from the production department and the knowledge coming from the employees of the company. It is striking that enterprise cooperation often takes place when it is the owner who initiated the innovation that suggests a network of relationship. The cooperation with universities or research institution is the most characteristic when the initiative for innovation comes from the technology design department. These are statistically weak, non significant relations.

29. Table **The source of the used knowledge according to the starting point of the innovation, %**

Starting point: / The source of knowledge:	Sales department	Production department	Technology design	Administrative department	Management	Owner	other
colleagues of the company	70,2	77,8	54,2	83,3	68,2	63,6	55,6
costumers	28,1	24,7	25,0	22,2	50,0	45,5	11,1
fellow competitors	24,6	23,5	25,0	11,1	27,3	0,0	0,0
professional forums, literature	38,6	30,9	41,7	33,3	36,4	18,2	33,3
enterprise cooperation	12,3	18,5	20,8	16,7	13,6	63,6	11,1
linking institutions	0,0	1,2	0,0	5,6	0,0	0,0	0,0
cooperation with universities or research institutions	12,3	14,8	33,3	27,8	9,1	18,2	33,3
N	57	81	24	18	22	11	9

Source: GKI survey

5.3. Financing innovations

The respondents generally took advantage of development credit (22.5% of the respondents), secondarily EU resources (20.7%) in order to finance innovations. Private resources (12.2%) preceded state resources (10.4%) Of course, we shouldn’t leave out of consideration the fact that in the background of development credits given by banks,

governmental money and programs can stand, too. It is verified again that the role of venture capital (3.7%) is unfortunately very low in the Hungarian innovation financing. In other category, the enterprise's own resources were marked. Mostly process innovators used development credits for financing innovations, which is quite natural since technological innovation generally involves investment. Production and organizational innovators relied on external private resources at a greater rate than on state assistances. These relations are statistically very weak and not always significant.

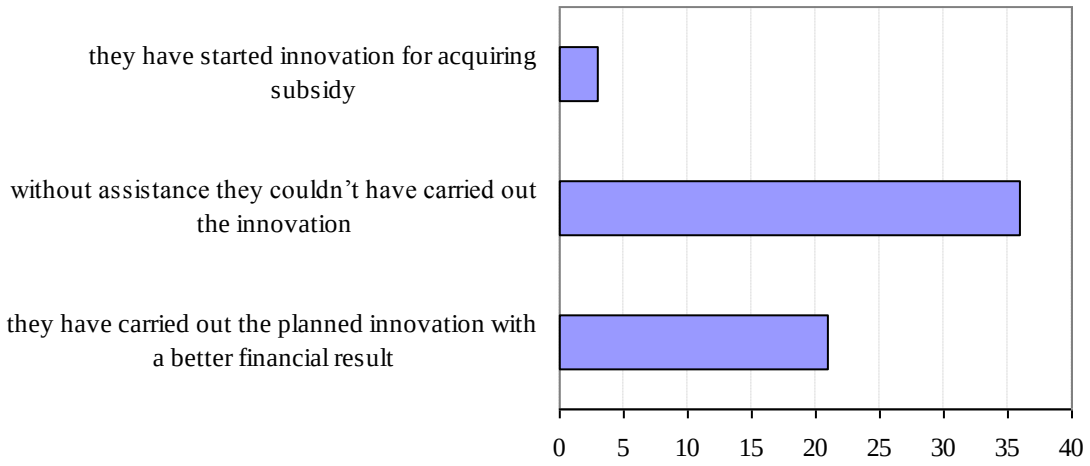
30. **Table** **Resources financing innovations according to the type of innovation, %**

	Product innovator	Process innovator	Market innovator	Organizational innovator	N
EU resource	73,5	64,7	44,1	50,0	34
Other state resource	58,8	64,7	41,2	29,4	17
Development credit	67,6	75,7	45,9	43,2	37
Venture capital	83,3	66,7	16,7	33,3	6
Financial aid: private resource	75,0	65,0	30,0	50,0	20
Other	81,0	57,1	28,6	23,8	21

Resource: GKI survey

27 % of the innovator respondents received financial assistance from the Union or the state. For many of them, this was the condition of carrying out innovation; but there very many companies (47% of whom were given assistance) who carried out planned innovation but with a better financial result. Six respondents marked both options. Three respondents admitted that they had started innovating in order to receive the assistance.

18. **Figure** **The effect of the assistance received on innovation**



Source: GKI survey N = 45

5.4. The features of successful innovations

The majority of those who started innovation achieved success. Since some companies carried out more than one innovation but not all of them was productive, 134 respondents proved to be successful innovator in a certain field, i.e. 82% of the innovator companies.

When we consider the rate of success, we have to take into consideration that in a part of the incomplete faxes we completed the number of innovations carried out with the data given for successful ones. Thus it is probable that, in the absence of this mistake, the rate of innovators would have been higher and the rate of successful innovators compared to them would have been lower.

31. Table **Number of those who carried out successful innovations among the innovators**

	Successful	Total	Rate of success
Production innovator	91	115	79,1%
Process innovator	54	95	56,8%
Market innovator	33	53	62,3%
Organizational innovator	47	69	68,1%

Source: GKI survey

For the respondents, primarily the improvement of the enterprise's competitiveness meant success. This is valid for each innovation type. The respondents valued organizational innovations as successful in solving problems arose. This was a weak, significant relation.

32. **Table** **The essence of success according to types of innovation**

	Solving the problems arose	Increase of income	Improvement of competitiveness	N
Successful production innovator	38,5	37,4	78,0	91,0
Successful process innovator	50,0	29,6	77,8	54,0
Successful market innovator	45,5	39,4	81,8	33,0
Successful organizational innovator	59,6	31,9	70,2	47

Source: GKI survey

Companies primarily started successful innovations with the object of expanding production and service, improving quality and to improve their position in the competition; secondarily, they wanted to achieve reduction of their expenses and improvement of their efficiency. The necessity of innovation arose in the order similar to all innovators: primarily in the production then in the sales departments, secondarily at technology designers and management. Also the sources of knowledge were formed similarly to all innovators, there was no substantive difference in the order and in the rates. Neither the financial assistance showed significant difference: also the successful innovators used mainly development credit and resources from the Union, as all the other innovators; these sources were followed by private resources and state subsidy finally. The presence of venture capital was insignificant in successful innovations.

5.5. Problems and failures

In the course of carrying out innovation, the main problem for the respondents of the survey was meant by financial problems. In this issue there was no significant

difference among the successful and unsuccessful innovators. Since even non innovator respondents indicated obstacles, I made a calculation also for those answers. Financial problems meant the main obstacle for them, too. Surprisingly, the second most often mentioned problem was the acquisition of specialised knowledge. The problem doesn't regard primarily the technological knowledge, however, it is not negligible; here we can see the reflection of former dissatisfaction with vocational training. It is remarkable that the resistance of the employees mean a bigger problem for successful innovators than for the others. But the relation might be reverse, too: those could carry out successful innovation who paid attention on this factor and could handle it. This can be decided only with further researches, the examination of the statistic relations between the answers didn't result such information.

33. **Table** **Rate of problems obstructing innovation, %**

	Non innovators	Innovators	Successful innovators
Financial problems	9,9	39,6	45,5
Acquisition of expertise	1,7	19,5	22,4
Acquisition of technological information	1,7	16,5	16,4
Resistance of employees	1,7	14,6	17,2
Other	0,8	1,8	2,2
Resistance of management	0,0	1,8	1,5
N	121	164	134

Source: GKI survey

There was a medium intense, significant relation between innovations starting from the production department and financial problems. In case of innovations promoted by the owner or parent company, the acquisition of expertise and technological knowledge was mentioned proportional to financial problems; they had weak, significant relationship. In case of innovations starting from the administrative department, the acquisition of expertise was as important as financial problems; the relation was very weak here.

34. **Table** **Problems of innovation according to its starting point, %**

Problem: / Starting point:	Handling financial problems	Acquiring expertise	Acquiring technological information	Resistance of employees	Resistance of management	Other	N
Sales department	50,9	14,0	21,1	15,8	0,0	3,5	57
Production department	58,0	25,9	23,5	13,6	3,7	2,5	81
Technological design	54,2	25,0	12,5	16,7	0,0	0,0	24
Administrative department	38,9	38,9	11,1	33,3	5,6	0,0	18
Management	40,9	13,6	0,0	27,3	0,0	9,1	22
Owner	45,5	45,5	45,5	9,1	9,1	0,0	11
Other	11,1	33,3	0,0	0,0	0,0	11,1	9

Source: GKI survey

If we consider the problems according to the used knowledge it is striking that financial difficulties were mentioned most often by those who carried out innovation on the basis of knowledge learnt from fellow competitors or costumers. Both were weak, significant relations. In this case, the use of own knowledge base and the knowledge coming from different kinds of cooperation meant smaller financing problems. Innovations using knowledge coming form the colleagues of the company faced with problem mainly in the acquisition of technological knowledge and handling financial problems; however, this was still a weak, significant relation. Employees opposed innovations based on knowledge coming from enterprise cooperation in a smaller degree, and were more resistant towards innovation based on knowledge coming from professional forums, literature and the colleagues of the company. This relation was weak, significant, too. Obviously, here, the confidence in the good example functioning well in practice opposed the mistrust towards “wisdom gained from books”.

The acquisition of expertise in cooperation with universities or research institutions caused surprisingly great problem since their aim was exactly the acquisition of missing knowledge. Supposedly, similar to the Swiss experiences, we can see also here that the enterprises can hardly find appropriate willingness to accept the problems that effect them at companions of the scientific institutions, even in case of willingness for cooperation. The small number of sub-patterns, however, forewarns us in accepting this inference; this is not an explanation but only a possibility worth for further researches.

35. **Table** **Problems of innovation according to the source of knowledge, %**

Problem: / Source of knowledge:	Handling financial problems	Acquiring technological information	Acquiring expertise	Resistance of employees	Resistance of management	Other	N
Colleagues of the company	46,9	21,9	17,7	18,8	2,1	2,1	96
Professional forums, literature	49,1	15,1	20,8	24,5	0,0	0,0	53
Costumers	63,9	11,1	13,9	13,9	0,0	5,6	36
Cooperation with universities and research institutions	27,6	17,2	20,7	10,3	3,4	0,0	29
Fellow competitors	75,0	21,4	17,9	14,3	3,6	3,6	28
Enterprise cooperation	40,0	28,0	32,0	4,0	4,0	4,0	25
Linking institutions	0,0	0,0	0,0	100,0	0,0	0,0	1

Source: GKI survey

Financial problems cause troubles in case of innovation financed by any kind of resources. Further innovations aided by low venture capital emerge; here the resistance of management and the acquisition of expertise were mentioned at a high rate. The former was a weak, the later was a medium strong, significant relation. It seems that in case of innovations it is worth connecting venture capital financing with other services such as management consulting and searching professional relationships.

36. **Table** **Problems of innovation according to the resource of financial aids, %**

Problem: / Financial assistance:	Handling financial problems	Acquiring technological information	Acquiring expertise	Resistance of employees	Resistance of management	Other	N
Development credit	75,7	18,9	10,8	10,8	5,4	5,4	37
Resource from the Union	38,2	11,8	20,6	17,6	2,9	5,9	34
Other	38,1	33,3	19,0	19,0	0,0	4,8	21
Private resource	60,0	15,0	15,0	10,0	0,0	5,0	20
Other state resource	64,7	11,8	23,5	23,5	0,0	5,9	17
Venture capital	83,3	16,7	66,7	16,7	33,3	0,0	6

Source: GKI survey

5.6. The features of markets and competition

The demand side of the competition is characterized by the costumers. The respondents of the survey sell their products and services primarily to other enterprises. However, often several answers were marked – two answers in 156 cases and three answers in 10 cases – and not one sector excelled among the business partner at these companies. This was related to innovativeness: those who marked several main costumer sectors were from the innovative firms. Anyway, the business sector was more important for the innovators – especially for successful innovators – than the others. At the same time, state orders got greater role, too. So, a diverse customer circle generally meant greater innovative activity at these companies.

37. **Table** **Main costumers according to sectors, %**

	Non innovator	Innovator	Successful innovator	Total
State, public sector	13,2	24,4	26,1	19,6
Business sector	58,7	75,0	83,6	68,1
Individuals	24,8	29,3	29,9	27,4
Marked more than one costumers from these	21,5	33,5	34,3	28,4
N	121	164	134	285

Source: GKI survey

The kind of the main costumer didn't result substantive difference in the type of innovation they carried out. Those companies that had more than one costumers somewhat inclined to carry out process and organizational innovations, those who sold their products and services in the business sector rather emphasized market innovations.

38. **Table** **Types of innovation according to main costumers, %**

Main costumer:	Product innovator	Process innovator	Market innovator	Organizational innovator
State	23,5	21,1	22,6	29,0
Business sector	76,5	78,9	84,9	81,2
Individuals	27,8	21,1	34,0	33,3
Several costumers	31,3	26,3	37,7	43,5
N	115	95	53	69

Source: GKI survey

The main aim of those respondents who were selling for individuals was expanding production. The suppliers of the state and public sphere innovated rather for improving quality and their position in the competition. Those who had interest in selling in the business sphere, above these two aims, concerned reducing their expenses and improving their efficiency important, too. This was the only weak but significant relation.

39. **Table** **The aim of innovation according to costumers, %**

Main costumer: / The aim of innovation:	Business sector	Individuals	State
Expanding production	61,0	62,5	52,5
Reducing expenses	52,0	37,5	37,5
Improving quality	61,8	47,9	60,0
Private utilization of innovation allowances	3,3	2,1	7,5
Other	0,0	0,0	2,5
N	123	48	40

Source: GKI survey

The change was in first row initiated by the production department in most cases, regarding any kind of costumers. In case of companies selling for individuals these were followed by management, and by technological design in case of suppliers of the business sector. These relations weren't statistically significant.

40. **Table** **The starting point of innovations according to main costumers, %**

Main costumer: / Starting point:	Business sector	Individuals	State
Production department	52,8	37,5	35,0
Technological design	17,9	10,4	15,0
Administrative department	10,6	12,5	12,5
Management	15,4	16,7	15,0
Owner	7,3	8,3	5,0
Other	4,9	4,2	10,0
N	123	48	40

Source: GKI survey

The suppliers of state costumers got state subsidy in the greatest proportion for financing innovations, proportionally to development credit. For the other suppliers the most often used assistance was development credit followed by resources of the Union from which many of those who sell for the public sphere had share. The relationship among them wasn't statistically significant either here.

41. **Table** **Financial aid received according to main costumers, %**

Main costumer: / Financial aid:	Business sector	Individuals	State
Development credit	23,6	20,8	22,5
Resource from the Union	20,3	16,7	20,0
Other	14,6	10,4	12,5
Private resource	12,2	14,6	7,5
Other state resource	11,4	10,4	22,5
Venture capital	2,4	8,3	0,0
N	123	48	40

Source: GKI survey

I examined how the supply-side competition effects innovation in the Hungarian conditions with the following two questions. My first question, as I have already presented it, was whether the companies functioning in monopoly or in free competition market were more innovative. The majority of the respondents competed in multi participant markets but this was most characteristic for successful innovators. At the same time, it is notable that the situation when there are some bigger and several smaller companies in the market, thus when the possibility for competing was restricted, was more characteristic for innovators and especially for successive innovators than for non innovators. The relation is statistically weak.

42. **Table** **The participants of the competition, %**

	Non innovators	Innovators	Successful innovators
Only participant	1,7	1,2	1,5
Some companies	6,6	17,7	18,7
Some bigger companies and several smaller ones	16,5	32,3	35,8
Several kinds of companies	46,3	38,4	44,0
N	121	164	134

Source: GKI survey

The intensity of the competition was in loose relation to the innovativeness of the respondents, it wasn't statistically valuable. The weak competition had a neutral effect, there were more innovative companies among those who were present in a vivid

competition. The intense competition dropped back their advantage, while rough competition using dishonest instruments increased it again.

43. **Table** **The rate of innovators according to the intensity of the company, %**

	Non innovator	Innovator	Successful innovator
Weak	1,7	1,2	1,5
Vivid	10,7	12,2	14,9
Intense	27,3	29,9	32,1
Using dishonest instruments	33,9	47,0	51,5
N	121	164	134,0

Source: GKI survey

As the competition became more and more hard, the respondents reacted with carrying out each type of innovation more often. The competition where dishonest instruments were used made market innovations necessary but moderated process innovations.

44. **Table** **Market competition according to types of innovation, %**

	Production innovator	Process innovator	Market innovator	Organizational innovator
Weak	2,6	3,2	3,8	4,3
Vivid	13,9	14,7	7,5	11,6
Intense	35,7	41,1	35,8	37,7
Using dishonest instruments	39,1	30,5	50,9	42,0
N	115	95	53	69

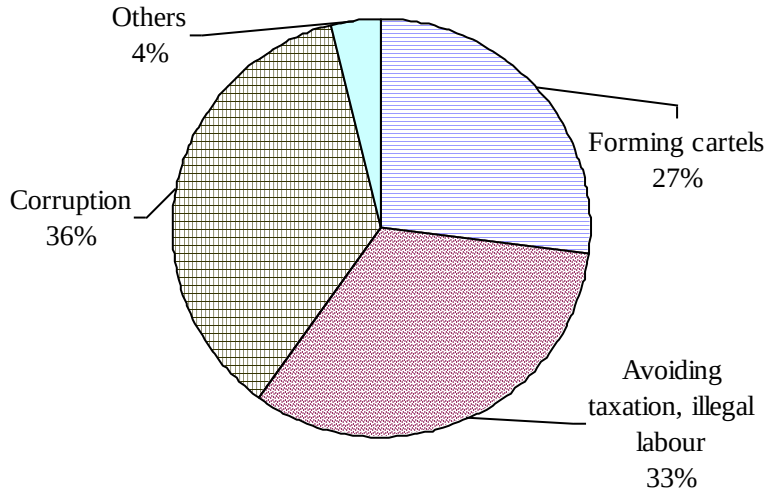
Source: GKI survey

Those respondents who indicated unfair competition marked corruption most frequently as the used incorrect instrument. Avoiding taxes, illegal labour and smuggling didn't lag behind too far. So, primarily criminal acts meant unfair competition, the real violation of the competition was much rarer. Thus, the state should take steps not only in market regulation but rather as a crime hunter in order to improve the conditions of the competition.

Many of those who indicated taking part in unfair competition mentioned that they had to compete with a state firm, public company or that governmental organizations appear

in the market as participants. The problem of abusing superior power arose in connection with business participants such as super- or hypermarkets. Many respondents indicated, that it is often impossible to fulfil the invitations to tender, they are too "tailor-made", and this might be regarded to as corruption.

19. **Figure** **The instruments of unfair competition**
The distribution of mentioned instruments according to frequency



Source: GKI survey

Corruption was indicated by innovative and non innovative companies proportionally. Typically, innovative companies functioned in markets characterized as working with agreements limiting the competition, so, regarding the ideas about the participants of the competition, it seems that Schumpeter must have been right in saying that partial monopolies favour enterprise innovativeness.

45. **Table** **The instruments of unfair competition according to innovativeness, %**

	Non innovator	Innovator	Successful innovator
Forming cartel	11,6	17,1	20,1
Avoiding taxation, illegal labour	14,9	19,5	19,4
Corruption	19,8	18,9	19,4
Other	0,8	3,0	3,7
N	121	164	134

Source: GKI survey

Unlike my expectations, corruption was not indicated by those respondents at the highest rate whose main costumer was the public sphere but those who were selling for individuals. They complained about avoiding taxation and similar illegitimacies, too.

46. **Table** **The instruments of unfair competition according to main costumers, %**

Main costumer: / Unfair competition:	State	Business sector	Individuals	More than one costumer
Forming cartel	17,9	16,5	16,7	13,6
Avoiding taxation, illegal labour	23,2	21,6	29,5	29,6
Corruption	23,2	22,7	26,9	24,7
Other	5,4	1,5	3,8	3,7
N	56	194	78	81

Source: GKI survey

Only one fifth of the respondents compete on such a market where the participants use corrupt instruments. Of course, this is a high level, a rate to be reduced, but we can't state that Hungarian companies generally need to get along struggling in the marshland of corruption. On the other hand, where the situation is like that, they still innovate – probably right because they can gain advantage in the market only that way against a corrupt fellow competitor. Innovators and non innovators have indicated at the same rate that such methods appear in their markets. Regarding most features, the innovativeness of respondents who have indicated corrupt competition didn't really differ from that of the others. I found a significant difference between the companies competing in corrupt and not corrupt markets in the regard of what kind of external financial resources innovator companies employed. Those who have experienced corruption asked for more assistance from the Union, while those who functioned in a market lacking corruption preferred development credits. It doesn't mean that the resources from the Union would have been given to companies in a corrupt way, the question considered the corrupt nature of the market competition and not of their financing. Those who indicated corrupt competition approached financial problems as

smaller troubles than the others. Here *Kornai*'s idea about soft budgetary limit appeared in the answers.

Companies competing in corrupt market had to face the resistance of the employees at a higher rate than the others. For them innovation carried out for preventing functional problems that have occurred was more important and they regarded less significance to the increase of income and the improvement of competitiveness than those who didn't experience corruption. Obviously, in the two last fields success could have been attained not only by innovation in these corrupt markets. Taking this into consideration the surprising thing is that more than half of respondents indicating corrupt competition regarded the improvement of their efficiency to as the success of their innovative activity. I found the greatest difference when two third of the companies competing in corrupt markets chose that crisis sets back their innovations while this rate was only 39% among those who didn't indicate corruption.

5.7. What has effect on innovativeness?

Even though there hardly was any statistically demonstrable significant relation between certain questions and enterprise innovativeness, and those relations were rather weak or average, I was still curious about which factors make it more probable that an enterprise would carry out innovation. A binary logistic regressive model seemed to be the appropriate instrument for demonstrating it.

Of course, the dependant variable was the respect whether the company has carried out innovation in the last three years. I took into consideration the innovations according to the Oslo Manual, again. This was a variable of two values: yes or no. The description of explanatory variables used in the model can be seen at the 27th point of Statistic Appendix. I formed them from the answers given for the survey and most of them were simple binary variables; I could form rating scale variables for data regarding size, and I could create ordinal variables from the participants of the competition and its features characterizing its intensity.

I did the calculations with the help of SPSS statistical program pack. I didn't order a constant to the model. 189 respondents had valuable data for each variable, thus the calculation considered only them. I introduced the variables with Enter method and so I got the most fitting model.

The model listed the respondents with 87% accuracy. The hit was better in case of innovators (90%); many of the non innovators were innovators according to the model, thus the accuracy of this classification was only 81%.

47. **Table** **Results of classification according to the model, %**

	Original		Calculated		
			Innovator		The rate of correct classification
			No	Yes	
Step 1	Innovator	No	54	13	80,6
		Yes	12	110	90,2
	Average rate				86,8

The cut value is 500

4 variables proved to be significant from the 41 examined variables.

48. **Table** **Explanatory variables in the model,**
p = 0.05

	B	S.E.	Wald	df	Sig.	Exp(B)
Intent of innovation: expanding production/service	1,6	0,6	7,3	1	0,01	5,2
Actors of competition	-1,0	0,4	6,8	1	0,01	0,4
Source of knowledge: co-operation with universities, research institutions	2,7	1,1	5,9	1	0,02	14,8
Funding: EU-funding	2,3	0,9	5,8	1	0,02	9,5

According to this, the chance for innovation carried out by the enterprise increases 15 times bigger if the knowledge it uses comes from cooperation with universities or research institutions, it is 10 times bigger if it receives aid from the Union, and 5 times bigger if the innovation is carried out in order to expand its products or services. At a

low rate but the number of participants and the intensity of the competition have a reverse effect, so it is least possible at a multi participant market that an enterprise would start innovating.

The results of model building verify my former ideas about what kind of inputs (scientific results, inventions, and external financing) and what kind of market conditions (protected status where the company itself profits from innovations expanding product range) help an enterprise in becoming innovative. So, common opinions about innovation are not baseless; these are the most common and most typical features.

When I regarded the limits of error less strictly and I allowed 1 deviation out of 10 choices – and what is acceptable also by social scientific researches –, then the picture was a little bit more rich.

49. **Table** **Newer explanatory variables in the model**
P = 0,1

	B	S.E.	Wald	df	Sig.	Exp(B)
The nature of the competition	0,8	0,4	3,4	1	0,1	2,2
Income, million HUF	0,0	0,0	2,7	1	0,1	1,0
Staff number	0,0	0,0	2,5	1	0,1	1,0
Starting point: sales department	1,0	0,7	2,3	1	0,1	2,7

These variables increase the chance that an enterprise is innovative: innovations starting from the sales department increased it 3 times, the more intense competition increased it twice, and income and staff number were proportional to it. These results verify that a competition for costumers have stimulating force on innovation most of the times concerning the Hungarian economy, even under unfair market conditions.

However, analyzing certain factors one by one threw light upon the fact that besides the most frequent phenomena, there can be innovations carried out from many reasons and with the use of several resources.

SUMMARY

This study made an attempt to prove the following four propositions:

> P1: European innovation policies often focus on the improvement of research-development indexes, while enterprises are interested in the profit resulting from carrying out innovation.
>
> P2: Innovation is an instrument of competition for enterprises. Enterprise innovativeness is less dependent on the number of participants than on the nature in the competition.
>
> P3: The state assistance of enterprise innovations should not primarily be aimed at the subsidization of innovations but to stimulating competition in connection with innovation.
>
> P4: Even though the international economic crisis retains enterprise innovations, most enterprises see the possibility of recovery in increasing the amount of innovations.

The first proposition was supported by the second chapter where literary sources prove that innovativeness is the basic instrument of economic growth; enterprises can improve their competitiveness through innovations. Basic documents of the Union verify that the European innovation policy excessively focuses on R&D indexes; its most well-known example is the Lisbon strategy. In the third chapter, on the basis of literary resources and documents of economic policy, I demonstrate that the governments of the Union and Hungary haven't favourably chosen R&D intensity index (the rate of research-development input compared to GDP) as the instrument of stimulating innovation. Major part of enterprise innovations were materialized not by carrying out research-development or by purchasing such results, just like patents, licenses or know-how components. At the same time, in the world – especially in the United States that is considered to be fellow competitor – non research-development type enterprise innovations attract great attention, for the measurement of which there hasn't evolved a stabile system yet. Empirical research has confirmed that Hungarian enterprises carry out many kinds of innovation. They primarily started innovating in order to improve their competitiveness and to expand their supply, and only a small proportion of the knowledge used for these innovations comes directly from the research sphere. Thus, on the one hand, this statement can inspire researchers of enterprise attitudes not to restrict

their examinations to the analysis of R&D data but to try and take innovative efforts at the companies also into consideration. On the other hand, I managed to bring forward valuable arguments for those who don't see the sense of putting the financing problems of scientific research institutions on the enterprises through tax-like deductions, since spending more on R&D doesn't necessarily become an innovation aiding growth.

My second proposition was the result of the first one. Both the literature and the secondary data analyses showed that the conditions of the competition basically influence the innovative activity of the enterprises. To the better understanding of the effects of social environment, I added the explanation of the relationship between corruption and enterprise innovations. While I found an unambiguous relation between the innovativeness and corruption-free nature of the country on macro level, the picture was more differentiated in the analysis of enterprises. One fifth of the enterprises indicated that corrupt methods also occur in the competition on their markets, at the same rate among innovator and non innovator respondents. I don't consider it as the denial of the relation on macro level. We can't disregard that, even though the experience corruption is lower than what we think when speaking about corruption, still the sense of corruption can have a serious moderating effect on enterprise activities. They might not even wish to enter such a market segment which they regard to be infected by corruption, or they don't wish to excel, emerge from the fellow competitors, being afraid that they would be forced to use bribery. Of course, these all keep them back from innovating but on the familiar markets, in the regular size, it is possible to vegetate with relatively few innovations. This is also suggested by the fact that as the effect of crisis, respondents competing on corrupt markets disclaim innovations at a higher rate than the other companies. Partially literary – economic historical and theoretical – works, econometric models and empirical researches prove that enterprises start innovations as a response to the challenges of their environment, especially their markets. The conditions of competition influence enterprise innovativeness in an ambivalent way; for example, monopoly is not by all means a barrier of it, it might rather be a successful strategy to create and preserve monopoly through innovation. However, the absence or limits of competition moderate it. Even enterprise researches proved that the conditions and terms of the competition strongly influence the innovative attitude of enterprises, since they have most frequently marked better

position in the competition as the aim of their innovations; while they regarded the improvement of competitiveness to as the success of innovating.

Even the third proposition is the outcome of the pervious ones. If innovation is the instrument of competition for enterprises, then it is a logical interference that the main aim of the state in this field is not the division of subventions but the stimulation of the competition. The low efficiency of the subventions is mainly supported by the secondary data analysis of the fourth chapter but even enterprise surveys showed that, despite the financial problems, even small numbers of competitions require direct financial assistance for innovation, and those who do so, they prefer resourced of the union to that of the Hungarian state. (Here, of course, a reverse effect can also appear: those who win resources from the Union, they do carry out innovation, and this kind of resource is simply availably in more numbers.) Where there was state subsidy used, it had a great significance for the company. The other half of the propositions couldn't be verified totally. Even though, the role of the state in guaranteeing the terms of the competition was not questioned, it was revealed from the literature that there are still more tasks to do. Through a regulation regarding demand, the state can create an urge for innovation, moreover, through its public procurements, it can even present demand for innovative activity. In my opinion the last possibility is appropriate to bring prospective solutions through such a trouble that they can spread due to problems of size resulted from small demand. For example, on the programs of the Union such as "green car" or renewing energies it would push a lot if the institutions of the Union would start acquiring electric cars or installing carbon-free heating systems. So, the state does ply an active role in urging enterprise innovation but this does not mean a simple division of money but it can even be a role of integrator, organizing market and relationships. On the necessity of later, the absence of common field of interest between the scientific and business spheres threw light.

The fourth proposition didn't evolve during research planning but generally, in life. It cleared up when we reached empirical examinations that the world goes through a global crisis that it hasn't faced lately and this leaves its mark on the innovative attitude of enterprises. Thus the examination of the first three propositions took place under the circumstances of the crisis, my fourth proposition didn't have any literary support, and a secondary analysis was out of question. However, the empirical analysis verified that,

despite the extended financing problems, the majority – more than half – of the Hungarian enterprises reacted on the crisis with increased innovative efforts, hoping to get through.

This thesis answered some questions but raised several new ones.

Even though enterprise innovation surveys are carried out on the basis of OECD recommendations in Europe, it would be good to find such a "hard" statistical datum that would have a better relation to innovations than R&D indexes, and still would be suitable for international comparison and building models, furthermore, it could be generated regularly and with low cost. There are such indicators to be found in the American literature, as a starting point, the usability of them could be tested, but also other data could be analyzed.

The relation of corruption and enterprise innovations desire further examinations. Unfortunately, corruption has become a burning question in the last few years. Even if we hope that the significance of this problem would decrease in a few years, it still wouldn't disappear soon. Knowing and understanding its functioning mechanism might strengthen the instruments of the battle against it.

It would be worth anyway to further analyze the phenomenon why enterprises use knowledge coming from the scientific sphere at such a low rate. Fellow researchers have already examined this problem but mainly from the viewpoint of research institutions, the opinion of the enterprises is less commonly known.

The thesis has revealed that globalization makes country borders, which have already been loosen up by enterprise networks, permeable for the new knowledge. It would worth reconsidering theories about national innovation systems also from the viewpoint of multinational and global enterprise empires.

Results of researches regarding the role of the state induce an examination of the real and possible role of public procurement and market regulators, concerning the stimulation of innovating. This question can bring up several edifications both on the level of the Union and Hungary.

It would be important to learn more about successor innovations realized in Hungarian enterprises. Even though imitations are accepted forms of innovation in the Oslo Manual, and historical examples also prove that societies carrying out successor innovations usually become leading technological innovators, we can not regard this process to as automatic. We can form opinion in the question of whether promoter enterprises are the result of high-rate imitations and what is necessary for the change, only in possession of more diverse information.

REFERENCES

1. 2003. XC. Law about the Technology and Innovation Fund (Atv)
2. 2004. CXXXIV. Law about Technology Research and Innovation (Itv)
3. Acemoglu, Daron [2008]: Oligarchikus és demokratikus társadalmak. Közgazdasági Szemle, 2008. július-augusztus, 622-659. o.
4. Aghion, P. – Howitt, P. [1992]: A Model of Growth trough Creative Destruction. Econometrica v. 60. 323-351.
5. Aghion, P., Bloom, N., Blundell, R., Griffith, R., Howitt, P. [2005]: Competition and Innovation: An Inverted-U Relationship, The Quarterly Journal of Economics, Number 2, 701-728
6. Aho, Esko [2006] (szerk.): Creating an Innovative Europe. A független szakértői bizottság jelentése a K+F-ről és az innovációról. Európai Bizottság, 2006. január. Luxemburg, Brüsszel. Download: http://europa.eu.int/invest-in-research/
7. Állami Számvevőszék: [2008] 0802. Jelentés a gazdaságfejlesztés állami eszközrendszere működésének ellenőrzéséről. 2008. március. Download az alábbi helyről: www.asz.hu
8. Andrew, James P. – Haanes, Knut – Michal, David C. – Sirkin, Harold L. – Taylor, Andrew [2009]: Maesuring Innovation 2009. The Need for Action. The Boston Consulting Group, Boston, April 2009.

9. Angyal Ádám [2009]: Változások irányítás nélkül. Vezetéstudomány, 2009. 9. sz. pp.2-16.
10. Archibugi, Daniele – Denni, Mario – Fillipetti, Andrea [2009]: The Global Innovation Scoreboard 2008: The Dynamics of the Innovative Performances of Countries. Pro Inno Europe, InnoMetrics. Measuring Innovation Thematic Paper March, 2009
11. Arrow, K. [1962]: Economic Welfare and the Allocation of Resources for Invention, NBER Rate and Direction of Inventive Activity, Princeton University Press. Magyarul: A gazdasági jólétet és a feltalálást szolgáló erőforrások eloszlása. In: Egyensúly és döntés. Válogatott tanulmányok. KJK, Budapest 1979.
12. Arundel, Anthony – Borody, Catalina – Kanerva, Minna [2008]: Neglected innovators: How do innovative firms that do not perform R&D innovate? INNO-Metrics Thematic Paper. March 31. 2008.
13. Arvantis, S – Hollenstein, H [1996]: Industrial Innovation in Switzerland: A Model-Based Analysis with Survey Data. In: Kleinknecht, A (ed) Determinents of Innovation, the Message From New Indicators. Macmillan Press Ltd. London: 13-62.
14. Arvantis, Spyros – Kubli, Ursina – Woerter, Martin [2006]: Determinants of Knowledge and Technology Transfer Activities between Firms and Science Institutions in Switzerland. Paper in the 28th CIRET Conference, Rome, September 2006. Session: Innovative Activity (2/2)
15. Aschhoff, Birgit – Sofka, Wolfgang [2008]: Innovation on Demand – Can public Procurement Drive Market success of Innovations. ZEW Discussion Papers 2008. No. 08-052, Download az alábbi helyről: ftp:/ftp.zew.de/pub/zew-docs/dp/dp08052.pdf
16. Aschoff, B. et al. [2008]: Innovationsverhalten der Deutschen Wirtschaft. Indikatorenbericht zur Innovationserhebung 2007. ZEW. Mannheim, Januar 2008. www.zew.de
17. Babbie, Earl [1998]: A társadalomtudományi kutatás gyakorlata. Balassi Kiadó, Budapest, 1998.
18. Bakács András [2006]: Ipar-egyetem kapcsolatok. MTA Világgazdasági Kutatóintézet, Technológiai fejlődés és új tudományos eredmények. NKTH Mecenatúra pályázat, ismeretterjesztő cikksorozat. 2006. október. www.vki.hu

19. Barysch, Katinka – Tilford, Simon – Whyte, Philip [2008]: The Lisbon scorecard VIII. Is Europe ready for an economic storm? Centre for European Reform, 2008. Download az alábbi helyről: www.cer.org.uk/pdf/p_806_lisbon08.pdf
20. Bianchi, Annaflavia [2006]: Asian Growth: Patterns and Challenges for Europe. In: ICEG [2006]
21. Blundell, R. – Griffith, R. – Van Reenen [1999]: Market Share, Market Value and Innovation in a Panel of British Manufacturing Firms. Review of Economic Studies. Vol. 66. 529-554.
22. Bolton, M. K. [1993]: Imitation Versus Innovation: Lessons to Be Learned from the Japanese. Organisational Dynamics 1993. 21 (3) pp. 30-45.
23. Borsi Balázs (szerk.) - Udvardi Attila – Viszt Erzsébet [2007]: Innovatív vállalatok Magyarországon – az innovációt hajtó legfőbb tényezők vizsgálata. Tanulmány a Gazdasági Versenyképességi Kerekasztal számára. Budapest, 2007. szeptember.
24. Borsi Balázs [2005]: Tudás, technológia és a magyar versenyképesség. Ph.D. értekezés. Budapesti Műszaki és Gazdaságtudományi Egyetem, Gazdaság- és Társadalomtudományi Kar, Műszaki Menedzsment Doktori Iskola. Budapest, 2005. július.
25. Borsi Balázs [2006]: A visegrádi országok perspektívája az Európai Kutatási és Innovációs térségben. Információs társadalom 2006. 6. évf. 3. szám, pp. 54-70. Download: www.infonia.hu/infotars/pdfs/K+F/inftars_k+f_borsi.pdf
26. Borsi Balázs [2009]: Entrepreneurship, Competitiveness and Innovation. In: Loudín, Jiri – Schuch, Klaus [2009] (szerk.): Innovation Cultures. Challenge and Learning Strategy. Filosofia, Prague, 2009.
27. Bradley, John [2006]: Asia versus Eastern Europe: FDI, R&D and relocation of industry. In: ICEG [2006].
28. Brander, James A. – Egan, Edward J. – Hellmann, Thomas F.[2008]: Government sponsored versus Private Venture Capital: Canadian Evidence. National Bureau of Economic Research. NBER Working Paper 14029, Cambridge, May 2008
29. Bryman, A. [1997]: Animating the Pioneer Versus Late Entrant Debate: An Historical Case Study, Journal of Management Studies 1997 34 (3) 415-438. old.

30. Buzás Norbert [2007]: Innováció-menedzsment a gyakorlatban. Akadémiai Kiadó, 2007. Budapest
31. Cabarello, R. – Jaffe, A. [1993]: How High are the Giants' Shoulders? An Empirical Assessment of Knowledge Spillovers and Creative Destruction in a Model of Economic Growth. NBER Macroeconomic Annual, pp. 15-74.
32. Chikán Attila – Czakó Erzsébet [2009]: Versenyben a világgal. Vállalataink versenyképessége az új évezred küszöbén. Akadémiai Kiadó, Budapest, 2009.
33. Chikán Attila [2005]: Vállalatgazdaságtan. Aula Kiadó, 2005.
34. Consoli, Davide [2008]: Systems of Innovation and industry Evolution: The Case of Retail Banking in the UK. Industry&Innovation 16:6, pp. 579-600. London, December 2008.
35. Czarnitzki, Dirk – Hussinger, Katrin [2004]: The Link Between R&D Subsidies, R&D Spending and Technological Performance. Zentrum für Europäische Wirtschaftsforschung GmbH. Discussion Papers 2004. No. 04-56. Download az alábbi helyről: ftp:/ftp.zew.de/pub/zew-docs/dp/dp0456.pdf
36. Czarnitzki, Dirk – Licht, Georg [2004]: Die Rolle der Innovationsförderung im Aufholprozess Ostdeutschlands. Zentrum für Europäische Wirtschaftsforschung GmbH. Discussion Papers 2004. No. 04-68. Download az alábbi helyről: ftp:/ftp.zew.de/pub/zew-docs/dp/dp0468.pdf
37. Dasgupta, P. – Stiglitz, J. [1980]: Industrial Structure and the Nature of Innovative Activity. Economic Journal 90. 266-293.
38. Drucker, P. F. [2003]: Az innováció lehetőségei. Harvard Business Manager, 2003. május-június, 28-34. o.
39. Drucker, Peter F. [1985]: Innováció és vállalkozás az elméletben és a gyakorlatban. Park Könyvkiadó 1993. Budapest.
40. EC [2000]: Lisbon Presidency Conclusions, Lisbon European Council, 23 and 24 March 2000
41. EC [2002]: Barcelona Presidency Conclusions, Barcelona European Council, 15 and 16 March 2002
42. Economist Intelligent Unit [2008]: A time for new ideas. Innovation in Central Eastern Europe. A white paper by the EIU sponsored by the Oracle. The Economist Intelligent Unit, 2008. Download: http://www.eiu.com/site_info.asp?info_name=oracle_innovation&page=noads

43. Edgerton, D. [1999]: From innovation to use: ten (eclectic) these on the history of technology. History and Technology 16. pp. 1-26.
44. EIS [2007]: European Innovation Scoreboard 2007. Comparative Analysis of Innovation Performance. European Commission DG for Enterprise and Industry. Pro Inno Europe. Download: www.proinno-europe.eu
45. EIS [2008]: European Innovation Scoreboard 2008. Comparative Analysis of Innovation Performance. European Commission DG for Enterprise and Industry. Pro Inno Europe. Download: www.proinno-europe.eu
46. Eurostat [2009]: Quality in the focus of innovation. First results of the 2006 Community Innovation Survey. Eurostat, Statistics in focus 33/2009
47. Evangelista, R. – Sandeven, T. – Sirrilli, G. – Smith, T. [1998]: Measuring innovation in European industry. International Journal of Economics and Business. 1998. 3 (5) pp. 311-333.
48. Gács János [2005]: A Lisszaboni Folyamat: rejtélyek, elméleti problémák és gyakorlati nehézségek. Magyar Tudományos Akadémia Közgazdaságtudományi Intézet. Műhelytanulmányok. MT.DP. 2005/1
49. Gallup [2009]: Innobarometer 2009. Flash EB Series #267. Download: http://cordis.europa.eu./innovation/en/policy/innobarometer.htm
50. Gazdasági és Közlekedési Minisztérium [2005/a]: A lisszaboni folyamat reformja. Az Európai bizottság javaslatai. Download az alábbi helyről: http://www.gkm.gov.hu/feladataink/euintegracio/eukoord/lisszaboni_folyamat_reformja.html
51. Gazdasági és Közlekedési Minisztérium [2005/b]: A lisszaboni stratégia felülvizsgálata. Download az alábbi helyről: http://www.gkm.gov.hu/data/194792/liszaboni.pdf
52. Geroski, P. [1995]: Market Structure, Corporate Performance and Innovative Activity. Oxford University Press, Oxford.
53. Gordon, Robert J. [2004]: Two Centuries of Economic Growth: Europe Chasing the American Frontier. National Bureau of Economic Research. NBER Working Paper 10662, Cambridge, August 2004
54. Havas Attila - Polgár Tamás [2009] INNO-Policy TrendChart – Policy Trends and Appraisal Report. Hungary 2008. European Commission Enterprise DG. Download: http://www.proinno-europe.eu/extranet/upload/countryreports/Country_Report_Hungary_2008.pdf

55. Havas Attila [2007]: A vállalati K+F és innovációs tevékenységek ösztönzésének lehetőségei Magyarországon. Tudomány- és Technológiapolitikai, Versenyképességi Tanácsadó Testület. Budapest, 2007. február. Download: http://4t.gov.hu/main.php?folderID=1240&articleID=5326&ctag=articlelist&iid=1
56. Hoffer Ilona – Iványi Attila Szilárd [2008]: Gondolatok az innováció működési mechanizmusáról. Vezetéstudomány, 2008. 4. szám. 51-55. old.
57. Hollanders, Hugo – Arundel, Anthony [2007]: Differences in socio-economic conditions and regulatory environment: explaining variations in national performance and policy implications. INNO-Metrics Thematic Paper, December 2007. Download: http://www.proinno-europe.eu/admin/uploaded_documents/eis_2007_Socio-economic_conditions.pdf
58. Hugo Hollanders - Adriana van Cruysen [2008]: Rethinking the European Innovation Scoreboard: A New Methodolgy for 2008-2010. Pro Inn Europe Inno Metrics, 2008. September
59. Hujer, Reinhard – Radic, Dubravko [2005]: Evaluating the Impacts of Subsidies on innovation Activities in Germany. Zentrum für Europäische Wirtschaftsforschung GmbH. Discussion Papers 2005. No. 05-43. Download az alábbi helyről: ftp:/ftp.zew.de/pub/zew-docs/dp/dp0543.pdf
60. ICEG [2006] Knowledge Economy, Innovation and Growth in Europe. Budapest, 2006. http://www.icegec.hu/eng/publications/_docs/proceedings/Knowledge_Economy_Innovation_and_Growth_in_Europe.pdf
61. Inzelt Annamária - Csonka László - Nyiri Lajos - Dr. Varga György [2009]: A kutatás-fejlesztés és az innováció naprakész információs, elemző bázisának kialakítása. (KFI szakmai elemző tudásbázis koncepciójának és megvalósíthatóságának vizsgálata). Innovációs Kutató Központ. Budapest, 2009.01.27. Download: http://www.mta.hu/index.php?id=634&no_cache=1&backPid=390&tt_news=10209&cHash=8782fff794

62. Inzelt Annamária – Szerb László [2003]: Az innovációs aktivitás vizsgálata ökonometriai módszerekkel. Közgazdasági Szemle, 2003, november, 1002-1021. old.
63. Inzelt Annamária [2000]: Bevezetés az innovációmenedzsmentbe. Műszaki Könyvkiadó, 2000. Budapest
64. Inzelt Annamária [2001]: Kísérlet az innovációk mérésére a szolgáltatási ágazatban. Külgazdaság, 2001. 11. sz.
65. Katona József [2006]: Az Oslo kézikönyv harmadik kiadásának kiértékelése. Magyar Innovációs Szövetség, 2006. május 30. Budapest. Download az alábbi helyről: www.nkth.gov.hu/main.php?folderID=466&articleID=4943&ctag=articlelist&iid=1
66. Kiss János [2006]: A magyar vállalatok innovációs tevékenysége 1992-2003 között. Versenyben a világgal 2004-2006. Gazdasági versenyképességünk vállalati nézőpontból kutatás, 33. sz. Műhelytanulmány. 2006. február
67. Kiss János [2008a]: Termékfejlesztés és üzleti teljesítmény. Vezetéstudomány, 2008. 6. szám, 27-31. o.
68. Kiss János [2008b]: A magyarországi vállalatok innovációs aktivitásának tényezői. In: A gazdasági környezet és vállalati stratégiák. A IX. Ipar- és Vállalatgazdasági Konferencia előadásai. 291-300. o. Szeged, 2008. október 30-31.
69. Kline, S. –Rosenberg, N. [1986]: An overview of innovation. In Landau, R. (ed) The positive sum strategy: Harnessing technology for economic growth. 1986. Washington: National Academy Press.
70. Kornai János [1999]: Pénzügyi fegyelem és puha költségvetési korlát. Közgazdasági Szemle, 1999. november 940-953. o.
71. Kornai János [2007]: Szocializmus, kapitalizmus, demokrácia és rendszerváltás. Akadémiai Kiadó, Budapest.
72. Kornai János [2008]: A kapitalizmus néhány rendszer specifikus vonása. Közgazdasági Szemle, LV. évf., 2008. május, 337-394. o.
73. KSH [2004]: Innováció 2004. Budapest, 2006. Download az alábbi helyről: http://portal.ksh.hu/pls/ksh/docs/hun/xftp/idoszaki/innovacio/innovacio04.pdf
74. KSH [2008]: Magyar Statisztikai Évkönyv, 2007, Budapest, 2008.

75. Lewrick, Michael [2009]: Introduction of an Evaluation Tool to Predict the Probability of Success of Companies: The Innovativeness, Capabilities and Potential Model (ICP). Journal of Technology Management & Innovation. Volume 4. Issue 1, pp. 33-47.
76. Lhuillery, S. – Borges, M. [2006]: Measuring user innovation: What can a standard innovation survey tell us? Paper presented at the International conference on Science, Technology and Innovation indicators – History and New Perspectives., Lugano, 15-17. November 2006. Idézi: Arundel és társai [2008]
77. Lóránt Károly [2003]: Az innováció hatása a nemzeti jövedelem növekedésére (a GDP növekedés részarányából az innováció hatása) nemzetközi és hazai elemzés alkalmazásával. Magyar Innovációs Szövetség, Budapest, 2003. december. Download: http://www.innovacio.hu/tanulmanyok_pdf/innovacio_hatasa.pdf
78. Loudín, Jiri – Schuch, Klaus [2009] (szerk.): Innovation Cultures. Challenge and Learning Strategy. Filosofia, Prague, 2009.
79. Lovelock, Peter: The Chinese ICT Market – Innovation & Internationalisation. In: ICEG [2006].
80. Lundvall, B-A [1992] szerk: National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning. Pinter, London.
81. Lynch, Lisa M. [2007]: The Adoption and Diffusion of Organisational Innovation: Evidence for the US Economy. NBER Working Paper 13156. National Bureau of Economic Research. 1050 Massachusetts Avenue, Cambridge, MA 02138, June 2008
82. Makó Csaba – Illéssy Miklós – Csizmadia Péter [2008]: A munkahelyi innovációk és a termelési paradigmaváltás kapcsolata. A távmunka és a mobilmunka példája. Közgazdasági Szemle, 2008. december 1075-1093. old.
83. Mansfield, E. M. – Schwartz, M. – Wagner, S. [1981]: Imitation Costs and Patents: An Empirical Study. The Economic Journal, 1981 91, pp. 907-918.
84. Maskell, P. [1998]: Successful low-tech industries in high-costs environments: the case of the Danish furniture industry. European Urban and Regional studies 5 (2) pp. 99-118.

85. Millot, Valentine [2009]: Trademarks as an Indicator of Product and Marketing Innovations. OECD Science, Technology Working Papers, 2009/6, OECD Publishing, Paris
86. Mokyr, Joel [1990]: A gazdagság gépezete. Technológiai haladás és kreativitás. Nemzeti Tankönyvkiadó, Budapest, 2004
87. Mosoniné Fried J. – Tolnai M. – Orisek A. [2004]: Kutatás-fejlesztés és innováció a szolgáltatási szektorban NKTH, Budapest, 2004.
88. Nelson, R. R. [1993]: National Innovation Systems: A Comparative Analysis. Oxford University Press, Oxford.
89. Némethné Pál Katalin – Petz Raymund [2008]: Vállalati vélemények a versenyről. Vezetéstudomány, 2008/6: 43-50. oldal.
90. Némethné Pál Katalin (szerk.) – Petz Raymund –Vanicsek Mária [2007]: Verseny és versenyképesség – ágazati nézőpontból. A Gazdasági Versenyhivatal Versenykultúra Központja számára készült tanulmány, kézirat, 2007.
91. Némethné Pál Katalin [1999]: A GKI Gazdaságkutató Rt. üzleti felmérései. Vezetéstudomány, 1999/1.
92. Némethné Pál Katalin [2006]: Mire is lövünk? A vállalati innováció állami ösztönzése. Vezetéstudomány, 2006/4. 29-38. oldal
93. Némethné Pál Katalin [2008]: A korrupció hatásai. In: Papanek Gábor (szerk) et al: A korrupció, mint társadalmi jelenség. A közbeszerzési korrupció jellemzőinek kiemelésével. Szakirodalom feldolgozás. GKI tanulmány a Közbeszerzési Tanács megbízása alapján, Budapest, 2008. kézirat.
94. Némethné Pál Katalin [2009]: Jelentések a frontvonalból – verseny és versenyképesség vállalati mélyinterjúk tükrében. Vezetéstudomány, 2009/6. 32-44. oldal
95. Nickell, S. [1996]: Competition and Corporate Performance. Journal of Political Economy, 104. 724-746.
96. NKTH [2006]: 2006. évi beszámoló. Budapest, 2007. július 3. Download: http://www.nkth.gov.hu/hivatal/beszamolok/nkth-2006-evi
97. OECD [1995]: National Systems for Financing Innovation. Ed.: Guinet, J. Paris.
98. OECD [1997]: NIS Background report. Gépirat. 1997.
99. OECD [1998]: NIS Analytical Findings. Gépirat, 1998.

100. OECD [2005]: Oslo Manual. 3rd Edition. OECD-European Commission. Download: http://www.nkth.gov.hu/hivatal/elemzesek-hatteranyagok/oecd-oslo-kezikonyv

101. OECD [2009] Innovációpolitikai országtanulmányok: Magyarország. OECD-NKTH, Budapest, 2009. augusztus. Download: http://www.nkth.gov.hu/innovaciopolitika/publikaciok-tanulmanyok/oecd-innovaciopolitikai-090831

102. Pakucs János – Papanek Gábor [2006]: Az innovációs folyamatok szervezése. Tankönyv. Magyar Innovációs Szövetség, Budapest

103. Papanek Gábor (szerk.) [1999/a]: A magyar innovációs rendszer főbb összefüggései. OMFB. Budapest, 1999.

104. Papanek Gábor (szerk.) [1999/b]: Jogbiztonság a magyar gazdasági életben. Filum. 1999. 270 oldal.

105. Papanek Gábor [2003]: Az „európai paradoxon" a magyar K+F szférában. Fejlesztés és Finanszírozás 2003/4. szám

106. Porter, Michael E. [1980]: Versenystratégia. Akadémiai Kiadó, Budapest, 2006.

107. Porter, Michael E. [1990]: The Competitive Advantage of Nations. Palgrave 1998. New York.

108. Presidency Conclusions [2000]: Lisbon European Council, 23 and 24 March 2000

109. Rammer, Christian – Czarnitzki, Dirk – Spielkamp, Alfred [2008]: Innovation Success of Non-R&D-Performers. Substituting Technology by Management in SMEs. ZEW Discussion Papers 2008. No. 08-092. Download az alábbi helyről: ftp:/ftp.zew.de/pub/zew-docs/dp/dp0892.pdf

110. Reichstein, Toke – Salter, Ammon J. – Gann, David M. [2008]: Break on Through: Sources and Determinants of Product an process Innovation Among UK Construction Firms'. Industry & Innovation. 15:6 pp.601-625, 01. London, December 2008.

111. Révész Tamás [2005]: Az innováció egyes típusainak hatása a nemzeti jövedelem növekedésére. Magyar Innovációs Szövetség, Budapest, 2005. június. Download: http://www.innovacio.hu/tanulmanyok_pdf/TFP-innov.pdf

112. Román Zoltán [1977]: Termelékenység és gazdasági növekedés. Kossuth Könyvkiadó, Budapest, 1977.

113. Román Zoltán [2006]: A kis- és középvállalatok és a vállalkozási készség. KSH időszaki kiadványok, Budapest, 2006.

114. Rothwell, Roy: [1994]: Industrial Innovation: Success, Strategy, Trends, in: Dodgson, M., Rothwell, R. (eds) [1994], pp. 33-53

115. Schmidt, Tobias – Rammer, Christian [2007]: Non-technological and Technological Innovtion: Strange Bedfellows? ZEW. Discussion Paper No. 04-052. Download az alábbi helyről: ftp:/ftp.zew.de/pub/zew-docs/dp/dp07052.pdf

116. Schumpeter, J.A. [1986]: Kapitalismus, Sozialismus und Demokratie. Wilheim Fink Verlag, München, hatodik kiadás.

117. Schumpeter, Joseph Alois [1911]: A gazdasági fejlődés elmélete. Közgazdasági és Jogi Könyvkiadó, Budapest, 1980.

118. Smith, Adam [1776]: A nemzetek gazdasága. Közgazdasági és jogi Könyvkiadó, Budapest, 1992.

119. Sofka, Wolfgang – Schmidt, Tobias [2004]: I Like the Way You Move. An Empirical Investigation into the Mechanisms behind First Mover and Follower Strategies. ZEW. Discussion Papers 2004. No. 4-87. Download az alábbi helyről: ftp:/ftp.zew.de/pub/zew-docs/dp/dp0487.pdf

120. Sterlacchinini, A. [1999]: Do innovative activities matter for to small firms in non-R&D-intensive industries? An application to export performance. Research Policy, 1999. 28. pp. 719-832.

121. Szabó Katalin – Kocsis Éva [2003]: Tanulás és felejtés vegyes vállalatokban. Oktatási Minisztérium, Budapest, 326 p.

122. Szabó Katalin [2009]: Innováció Magyarországon: felülnézetben és földközelben. Vezetéstudomány 2009. 4. PP. 2-15.

123. Szanyi Miklós [1999]: Innovációkutatás napjaink nyugati gazdaságelméletében. Közgazdasági Szemle, 1990. 3. sz. pp. 306-322.

124. Szanyi Miklós [2009]: Tudomány és innováció, avagy mit és hogyan fejlesszen az állam a kis európai országokban? Külgazdaság, LIII. évf. 2009. május-június

125. Szepesi Balázs (szerk.) [2009]: Jelentés magyarországi kapitalizmus állapotáról 2008. Közjó és Kapitalizmus Intézet. www.kozjoeskapitalizmus.hu

126. Szerb László [2005]: A vállalkozói aktivitás alakulása Magyarországon a 2000-es években. Előadás a 44. Közgazdász-Vándorgyűlés III. Vállalkozás szekciójában. Nyíregyházi Főiskola, 2005. augusztus 31. - szeptember 2.

127. Szunyogh Zsuzsa [2009]: A kutatás, fejlesztés (K+F) és innovációs statisztika jellemzői Magyarországon. Előadás a MTA Statisztikai és Vállalatgazdasági Szakosztályainak együttes ülésén. 2009. május 18. Budapest

128. Szűcs Ferenc [2009]: Verseny és innováció. Tudományos diákköri Dolgozat, Budapesti Corvinus Egyetem.

129. Tanzi, V. – Davoodi, H. [2001]: Corruption, Growth and Public Finance. In: Koin, A.K. (ed.): Political Economy of Corruption. Routledge. London. 2001.

130. Török Ádám – Borsi Balázs – Telcs András [2005] Competiveness in R&D, Comparison and Performance. Edward Elgar, Cheltenham, UK. 251 p.

131. Török Ádám [2005]: A lisszaboni program értékelése és kibontakozásának esélyei. Társadalom és gazdaság. 27. 2005 1-2, pp. 13-25.

132. Török Ádám [2006/c]: A helybenjárás alternatívái. A Magyar K+F és innovációs stratégia lehetőségei versenyképességi szemléletben. Pénzügyi Szemle 51. szám. 2006. 1.

133. Török Ádám [2006a]: A krétakör közepén: K+F és innovációs stratégiai dilemmák Magyarországon 2006-ban. Magyar Tudomány, 2006/4 432. o.

134. Török Ádám [2006b]: Elmaradottság, felzárkózás és innováció az Európán kívüli, nem OECD országokban. Közgazdasági Szemle, LIII. évf., 2006. november (1005–1022. o.)

135. Varga György [2008]: A K+F-paradoxon. Sokat kutatunk, keveset újítunk. Élet és Irodalom. 2008. március 21.

136. Viszt Erzsébet [2008]: Versenyképességi évkönyv 2008. GKI-Microsoft. Budapest, 2008.

137. von Tunzelmann, Nick: The new Asian growth dynamics: lessons for Europe. In: ICEG [2006].

138. World Bank Group [2008]: Doing Business 2008 Hungary. Washington 2007. Download az alábbi helyről: www.doingbusiness.org.

139. World Economic Forum [2008]: The Global Competitiveness Report 2008-2009. Genf, 2008.

140. Wörter, Martin [2007]: Industry Diversity and its Impact on the Innovation Performance of Firms. An Empirical analysis Based on Firm-level Panel Data. KOF Working Papers No. 165. ETH-KOF, Zürich. www.kof.ethz.ch

141. Zander, U. - Kogut, B. [1995]: Knowledge and the speed of transfer and imitation of organizational capabilities: an empirical test. Organizational Science, Vol. 6, No. 1, pp.76–92.

Annex 1: PRACTICES IN INNOVATION MEASUREMENT

Community Innovation Survey (CIS)

It is the biannual survey of the Eurostat. The main statistical unit is the enterprise as defined in the national statistical business register. The target population is all enterprises with 10 or more employees in any of the specified sectors: mining and quarrying (NACE 10-14), manufacturing (NACE 15 - 37), electricity, gas and water supply (NACE 40-41), wholesale trade (NACE 51), transport, storage and communication (NACE 60 - 64), financial intermediation (NACE 65 - 67), computer and related activities (NACE 72), architectural and engineering activities (NACE 74.2), and technical testing and analysis (NACE 74.3). Most Member States and other countries carried out CIS by means of a stratified sample survey, while a number of countries used a census or a combination of both. In certain Member States statistical offices, in others research institutions carry out the survey. For CIS 2006 the observation period covered was 2004– 2006 inclusive, i.e. the three-year period from the beginning of 2004 to the end of 2006. In the survey took part beside Member States two Candidate countries: Croatia and Turkey, moreover Norway.

European Innovation Scoreboard (EIS)

The earlier structure of the European Innovation Scoreboard got thorough criticism in row of discussions with professionals and stakeholders. There were presented more analytic papers in the topic. Applying these experiences the Scoreboard 2008 got through remarkable changes.

Indicators of the EIS 2007 and 2008 are shown in Annex 3. The changes strove indeed to loosen the excessive technology orientation, but not really took in account recommendations collected beside criticism. Proposals affected the following topics: (*Hollanders-van Cruysen* [2008] pp. 9-1.)

1. **Lack of innovation model**. The EIS lacks an underlying model of innovation that would justify the choice of innovation dimensions and indicators, and reflect underlying causalities that could be influenced by policy. It is further missing.
2. **Composite indicator**. The use of a single composite indicator and ranking table leads to "naming and shaming", while missing the complexity of the process behind one simple number. It remained.
3. **High-tech criticism**. Too many indicators measure innovation in high-tech industries. This would bias innovation performance in favour of those countries with industries specialised in high-tech industries, in particular in high-tech manufacturing. It remained.
4. **Multicollinearity.** Many of the indicators are (highly) correlated and these indicators may thus capture and measure the same underlying aspect of the innovation process. It is still may be a problem and could create a bias towards these aspects, of which one example is innovation involving R&D.
5. **Missing data and timeliness of the data**. Still existing problem, the higher number indicators even raised the problem.
6. **More is not always better**. The underlying assumption of the EIS is that a higher score on an indicator implies a better innovation performance. Assuming optimal value of certain indicators - such as the share of enterprises receiving public funding for innovation -would more appropriate.

The EIS 2007 used 5 innovation dimensions. 15 indicators reflected innovation inputs and 10 innovation outputs. Principally that country got high scores, where data of expenditure kind were high. The EIS did not avoid counting R&D data, but they were separated to governmental and business expenditures, this second one was often used as indicator of company innovativeness. There was not scant elitist naivety behind indicator of knowledge generation what measured proportion of small and medium enterprises receiving public funding for innovation.

The structure of the new EIS 2008 became more complicated. There are only three dimensions, but their content is less clear than in the previous Scoreboards. I find it without question good leaving out proportion of public fund receiving companies. It is less clear why the proportion of innovation expenditures disappeared to the turnover. It is true that the exaggerated expenditure orientation loosened but the two R&D intensities – governmental and business – remained; however it is more far from company innovation activity than innovation expenditures. Disappeared the USPTO and Triad patents they always pushed down the European results in international comparisons with result of USA and Japan. Part of new indicators mirrors revisited understanding of innovation: technological and non-technological innovators in proportion of SME-s, firm renewal (SME entries and exits). Results of innovation are more emphasised, they became extra dimension as outputs: labour costs reducing firms, material and energy use reducing firms, knowledge-intensive services exports and I consider such Technology Balance of Payments flows from an another dimension. I cannot enlist the indicator "Public-private co-publications per million populations". Obviously it wants measure the cooperation of academic and business sectors, but I strongly doubt expressiveness of this indicator.

The comparison is extended to non-member European countries ad to some countries in other continents (USA, Canada, Australia, Japan). Data are not always available. These are complemented from earlier data, surveys, or – if following year data exists – average is counted. Indicators are cleaned from outliers, re-scaled and unweighted average is calculated. This is the Summary Innovation Index what is used for comparison of innovation performance in the individual countries and the Union.

Inno-Policy Trendchart

This is issue of the DG Enterprise and Industry of the Commission. There is no independent primary collection of data, but the experts prepare their country reports from existing databases – among them the CIS surveys – and from documents about the innovation policy of 39 countries. The main findings of the Hungary Report 2008 are the following: (*Havas-Polgár* [2009])

- Low share of innovative firms
- Low occurrence of cooperation in innovation activities
- Potential gaps in the quantity and quality of human resources for RTDI (p. 8.)

The first and second data are well known from the CIS2006 survey, (however I do not consider co-operativity as bad) the source of the third statement is the low level of the Science and Engineering students, what is labelled as improving due to new measurements.

Innobarometer

This is again the issue of the DG Enterprise and Industry, but it is based on direct survey. The Gallup in frame of the Flash Eurobarometer surveys carries it out. Managers of firms with at least 20 employees, from specific innovation-intensive industry sectors, were randomly selected to be included in the survey. There were interviewed 5,238 enterprises across Europe in 2009. Among the main findings Hungary is presented as by far the country with the most of such firms reporting no innovation (30%). It was calculated from responses of 202 firms.

In the interviews taken in April 2009 about half (45% to 50%) of companies reported that they have been introducing each type of innovation in the Oslo Manual. Mostly were introduced new products, services (50%) and new organisational solutions (49%). Hungarian firms were active mainly in product innovation (23%) it was followed by service innovations (21%), 17% of them introduced marketing, 16% organisational and 12% process innovation.

Mannheim Innovation Panel (ZEW)

There are interesting investigations in the in the research institutions carrying out the harmonised community innovation survey in certain countries. These institutions with

the CIS survey often put their own questions too. The panel survey of the Centre for European Economic Research (ZEW) belongs to these.

The survey started in 1993. The same enterprises are included every year. Every two years the sample is refreshed by a random sample of newly founded firms in order to substitute enterprises, which are closing or left market through mergers. The population is set from the Germany located firms with more 5 person employees from the following industries: mining, manufacturing, energy and water supply, wholesale, computer services, research and development, other economic, communal, cultural and sport services. The whole population consist 200-250 thousands firms, there are 20-30 thousands (generally 8,5%) surveyed. The survey is representative of Germany (West and East) and enables expansion for the German economy in total as well as for single industries. This is the so-called gross sample. The returning 25-30% responses forms the net sample, cleaned it consist only 2000 firms. In this the large companies, the East-German companies and the research-intensive branches are over represented.

ETH-KOF

ETH-KOF is the economic research institute of the Zurich technical college. It conducts panel surveys, similarly the ZEW. Due to smaller size of the country the questioned sample consist only 1500-2000 firms and it is disproportionately stratified. That way they can get at least 3 responses from each 27 industries in the economy from all the three investigated company size. The questionnaire begins with mapping of the company and its market conditions. After the usual questions as age, size, investments, exports they go in for number of competitors and strength competition. They regarded in 2006 as innovation only product and process innovations.

Survey of Economic Intelligence Unit

A time for new ideas The report is based on three main components: a worldwide survey of 370 executives carried out in Spring 2008; 25 in-depth interviews with C-level executives, consultants and other experts in the field; and the Economist

Intelligence Unit's own innovation model. This last one is a composite model, it is based on scaling and contraction partly of statistical data (as R&D as a % of GDP, broadband penetration etc.) partly of opinion indicators (as quality of the local research infrastructure, political stability, regulatory environment, etc.)

Innovation survey of Boston Consulting Group

The innovation survey of the illustrious management science institution was based in 2009 on responses of 170 managers. Participation was voluntary and anonymous. 55 of them were C level (Chief …) executive, 115 worked in other levels.

Breakdown of respondents according region and industries

Region	Number	Industry	Number
North-America	71	Technology and telecommunications	44
Europe	60	Industrial goods and manufacturing	27
Asia-Pacific	36	Financial services	15
Latin-America	3	Pharmaceuticals, biotechnology and healthcare	15
		Consumer products	10
		Entertainment and media	10
		Energy	4
		Travel, tourism, hospitality	4
		Other	41
Total	170	Total	170

46% of managers stated that in their company innovation is measured, but only 32% was pleased with the applied method. At the same time 73% offered an opinion that

innovation activity should have been measured as consequently as other business actions.

Innovation survey of the Hungarian Central Statistical Office (CSO)

The statistical office started and has been conducting company innovation survey joining the community innovation surveys.

The R&D statistics have a past longer than half century; the collection of data started in 1953. The CSO is responsible for this topic since 1969. In innovation statistics the office has fewer experiences. The first nationwide survey carried out in 2000, mainly in aim of grounding regular data collection. In 2002 it came to fully EU harmonised but voluntary survey. 2004 brought an essential change as the innovation survey became compulsory for the firms. Two third of the appointed respondents answered, so the results suitably represented innovation activity of Hungarian companies with more than 10 employees. Since 2004 there is an EU law about the innovation statistics similarly to the R&D statistic, its follows the methodology of Oslo Manual. (*Szunyogh* [2009])

The last published results are Hungarian data of the CIS 2006 survey. Contrary to the former practice there was no summarising publication produced about the result of the survey, they are partly acquainted in the statistical Yearbook 2008 in tables 4.3.13. and 4.3.14. (More desperate enquirers can search Hungarian data in the homepage of Eurostat.) About company investment there were data collected from firms with more than 10 employees. Summary was prepared from responses of 15620 companies.

Survey in County Baranya (Inzelt-Szerb [2003])

“The advantage of choosing from one region is that the environment of the companies is more homogenous than in case of survey in broader region or national economy. Accordingly to objects of the authors in this sample small- and medium size companies appear in larger proportion than it is usual in innovation surveys.” (Citation, p. 1003.) The population consisted 3316 firms on 31 December 2000, there were taken into the

survey 10% of them. The population was firm register of County Baranya complemented with the register of the local industry chamber and the list of applicants for the tender of Technical Development Fund for innovation, quality management system building in 1999.

Number of firms and respondents in County Baranya

	Respondents		Innovative companies	
	Number	Proportion	Number	Proportion
Microfirms with 0-9 employees	30	31,9	16	53
Small enterprises with 10-49 employees	31	33,0	18	58
Medium size enterprises with 50-249 employees	24	25,5	16	67
Large enterprises with over 250 employees	9	9,6	7	78
Sum	94	100	57	61

Source: *Inzelt and Szerb* [2003] p. 1004.

GEM Research in Hungary

The Boston Babson College and the London Business School of Economics have been leading since the early 2000-s an international research, the Global Entrepreneurship Monitoring (GEM). It aims measurement and international comparison of several aspects of entrepreneur activity. Hungary took part in collection of data through the research group in the Economic Faculty of Pécs University of Science in 2001, 2002, 2004 and 2005. The main sponsor of the research was the ministry for Economy and Transport. 35 countries entered into the 2005 investigation; they represent 67% of the worlds population and 93% of its GDP. The database consist more parts. One of it is a survey on a sample representing the population of age between 18-65. In each country there are generally 2000 people surveyed. The Hungarian sample consisted 2878 responses, it was questioned by the Sociograph Pollster Institute in June and July 2005. The national research groups of the GEM conducted interviews and filled

questionnaires with over 100 questions with domestic experts of entrepreneurship, professionals in government politicians, researchers, trainers and entrepreneurs. As secondary data there were general national statistics (economic growth, education, R&D, etc.) and international data sources as UNO, OECD, World Bank etc. used.

"Connection between macro and micro level competitiveness" research program

The Corvinus University of Budapest there has been running a research series for complex examination of competitiveness of Hungarian companies. The Competitiveness Research Centre in the university could have sustained the research longer than ten years, during this time they surveyed more times Hungarian companies. This opened the possibility for longitudinal investigations. The results of examinations about company innovations is presented in *Kiss* [2006].

The researchers visited during the research series three times companies in Hungary with quite long questionnaires and prepared professional interviews with them. There were only 40 companies who participated in all the three surveys; more 54 were participants of two surveys. The circle is tighter if one leaves out the companies in trade, services and agriculture as the research orientated technological innovations. In the 1996 survey participated 157, in 1999 256 and in the 2004 194 industrial companies. The samples are not representative as small enterprises hardly occur, the foreign and a domestic private owned companies are under, the state owned over represented. But the longitudinal analysis of the time and again surveyed companies is important value of the research; the databases of the years are appropriate for cross-sectional analysis. They used for measurement of company innovations in first row R&D activity, but fortunately they out other questions as well.

GKI surveys

Company behaviour surveys

The GKI has investigated with its surveys for long time a few behavioural characteristics of Hungarian companies. Using the time series we prepared comprehensive analysis; in the following I introduce these investigations according Nemethne-Petz [2008].

The GKI sent per post questionnaire for individual filling to 8000 companies until 2004 twice a year, later only once. The questions asked their opinion about their state, outlooks and intentions. The target population was group of running companies with more than 20 employees and legal entity. From this population were randomly selected the questioned companies representatively by industries and number of employees. We did no investigate the following sectors: financial services, civil service, compulsory social security, social and healthcare services.

The respond rate was strongly wavering during the surveys between 1997 and 2007, generally it was between 7 and 14%, what is similar to the other domestic survey experiments. The respondents covered according number of employees 8-16% of Hungarian business sector. The analysed responses more or less well represent the domestic companies and the internal structure of the sample proved to be very stable. This series of surveys can considered as longitudinal cohort research. There were two extreme group of companies missing: firms in very difficult situation (in bankruptcy, before liquidation, etc.) and the big multinational companies. Both did not like spend time filling our questionnaire, but tended to be very close. The got responses so characterized the main cohort of the Hungarian economy. The number of responses changed from 518 to 880. Representatives of industry, trade and business services performed in great proportion. In the Hungarian economy these are the main sectors according number of companies.

Survey for the Competition Culture Centre of the Hungarian Competition Authority

In autumn of 2007 we surveyed the companies what is their opinion about of strength of competition according the main factors. The method was again questionnaire sent by post. We got together 1271 responses, successfully in that distribution that all industries

could have been analysed. The survey population was – similarly to the earlier behaviour surveys – the firm register of Hungarian Central Statistical Office. There were wiped out companies with less than 10 employees because of their impartial competition state. Financial services, civil service, compulsory social security, social and healthcare services were again missing. From the cleaned population we chose stratified random sample. The number of companies was 7000, the response rate was 18%. The respondents represent 7,4% of the population. Companies with less than 20 employee are under, medium companies (with between 51 an d 250 employees) are over represented.

Business tendency surveys

GKI Economic Research Co. has organised monthly surveys in industry and trade and quarterly ones in construction since 1996. Quarterly research in services started in 1998 and since January 2002, monthly surveys have been made in construction and services. Surveys organised in the European Economic Space are co-ordinated by the Directorate General Economy and Finance of the European Commission. GKI Co. is the Hungarian participant of this project. The sequencing of the surveys, the questions asked the evaluation and publication procedures are in line with the practice of the EU and they are monitored and controlled frequently by the experts of the EU. Further information are available in the home page of the DG: (http://ec.europa.eu/economy_finance/indicators/business_consumer_surveys/userguide_en.pdf).

The survey panel is constructed from the firm register of companies with over 10 employees bought from the Hungarian Central Statistical Office. We take samples of 1300-1400 firms from each industries, stratified by number of employees. One third of the sample is changed every year. There are again missing the following sectors: financial services, civil service, compulsory social security, social and healthcare services. The method of survey is postal, individual filling.

The response rates are here again quite low, below 20%. Generally the small firms (below 50 employees) and the foreign owned firms are under represented.

Manufacturing and transport are over represented. The homogeneity of response samples is satisfactory in terms of both company size and sectoral structure. This means that in the subsequent surveys, the internal structure of the samples show a rather high degree of stability.

Annex 2: CHANGES IN THE EUROPEAN INNOVATION SCOREBOARD 2000-2007

	EIS 2000	EIS 2001	EIS 2002	EIS 2003	EIS 2004	EIS 2005	EIS 2006	EIS 2007
Number of indicators	16	18	18	22	22	26	25	25
Number of groups/dimensions	4	4	4	4	4	5	5	5
Indicators based on CIS	4	4	4	5	6	7	7	7
Countries	17: EU15, US, JP	17	33: +10 new Members, +IS, NO, CH, BG, RO, TR	33	33	33	34: +HR	37: + AU, CA, IL
						Input – Innovation drivers		
S&E (Science and Engineering) graduates	Share of postsecondary graduates	Share of population aged 20-29	←	←	←	←	←	←
Share of working-age population with tertiary education	←	←	←	←	←	←	←	←
Broadband penetration rate						←	←	←
Participation in life-long learning		←	←	←	←	←	←	←
Youth education attainment level								
						Input – Knowledge creation		
Public R&D expenditures (% of GDP)	GOVERD only	GOVERD + HERD	GERD-BERD	←	←	←	←	←
Business R&D expenditures (% of GDP)	←	←	←	←	←	←	←	←
Share of medium-high/high-tech R&D in manufacturing (NACE 24, 29, 30, 31, 32, 33, 34 és 35)						←	←	←
Share of enterprises that receive public funding for innovation (CIS)						←	←	←
						Input – Innovation & entrepreneurship		
Share of SMEs innovating in-house (CIS)	Manufacturing sector	←	←	← + Services sector	Total business sector	←	←	←
Share of SMEs co-operating in innovation (CIS)	Manufacturing sector	←	←	← + Services sector	Total business	←	←	←

					sector			
Innovation expenditures (% of turnover) (CIS)	Manufacturing sector	←	←	← + szolgáltató szektor	Total business sector	←	←	←
Venture capital (% of GDP)	Early stage and expansion stage			Early stage only	←	←	←	←
ICT expenditures (% of GDP)	←	←	←	←	←	←	←	←
Share of SMEs using organisational innovations (CIS)					Using nontechnological change	←	Using organisational innovation	←
High-tech venture capital		Share of GDP	←	←	Share of venture capital			
Internet use	Users per 100 population	Share of households	←	Composite indicator for households and firms				
Capitalisation of new markets (% of GDP)	←	←	←					
Volatility rates of SMEs				←				
						Output - Applications		
Share of high-tech services employment	←	←	←	←	←	←	←	←
Share of high-tech exports						←	←	←
New-to-market products (% of turnover) (CIS)	Manufacturing sector	←	←	← + Services sector	Total business sector	←	←	←
New-to-firm products (% of turnover) (CIS)				Manufacturing + Services sector	Total business sector	←	←	←
Share of medium-high/high-tech manufacturing employment	←	←	←	←	←	←	←	←
Share of high-tech manufacturing value added	Percent change	←	←	←				
						Output – Intellectual property		
EPO patents per million population				←	←	←	←	←
USPTO patents per million population				←	←	←	←	←
Triad patents per million population						←	←	←
Community trademarks per million population						←	←	←

Community designs per million population						←	←	←
High-tech EPO patents per million population	←	←	←	←	←			
High-tech USPTO patents per million population		←	←	←	←			
	EIS 2000	EIS 2001	EIS 2002	EIS 2003	EIS 2004	EIS 2005	EIS 2006	EIS 2007

Source: : Hollanders-Van Cruysen [2008] p. 34.

Countries:

Annex 3: DIMENSIONS AND INDICATORS OF SUMMARY INNOVATION INDICATOR

	2007			2008	
No	Dimension/Indicator	**Data source**	Sor-szám	Dimension/Indicator	Change for EIS 2007
			1.	**Enablers**	
1.	**Innovation drivers**		*1.1.*	*Human resources*	
1.1.	S&E graduates per 1000 population aged 20-29	Eurostat	1.1.1	S&E and SSH graduates per 1000 population aged 20-29 (first stage of tertiary education)	Revised
1.2	Population with tertiary education per 100 population aged 25-64	Eurostat, OECD	1.1.2.	S&E and SSH doctorate graduates per 1000 population aged 25-34 (second stage of tertiary education)	Revised
1.3.	Broadband penetration rate (number of broadband lines per 100 population)	Eurostat, OECD	1.1.3	Population with tertiary education per 100 population aged 25-64	Same
1.4.	Participation in life-long learning per 100 population aged 25-	Eurostat	1.1.4	Participation in life-long learning per 100 population aged 25-64	Same

	64				
1.5.	Youth education attainment level (% of population aged 20-24 having completed at least upper secondary education)	Eurostat	1.1.5.	Youth education attainment level	Same
2.	**Knowledge creation**		*1.2.*	*Finance and support*	Same
2.1.	Public R&D expenditures (% of GDP)	Eurostat, OECD	1.2.1.	Public R&D expenditures (% of GDP)	Same
2.2.	Business R&D expenditures (% of GDP)	Eurostat, OECD	1.2.2.	Venture capital (% of GDP)	Revised
2.3.	Share of medium-high-tech and high-tech R&D (% of manufacturing R&D Expenditures) (NACE 24, 29, 30, 31, 32, 33, 34 és 35)	Eurostat, OECD	1.2.3.	Private credit (relative to GDP)	New
2.4.	Share of enterprises receiving public funding for innovation	CIS*	1.2.4.	Broadband access by firms (% of firms)	Revised
			2.	**Firm activities**	
3.	**Innovation & entrepreneurship**		*2.1.*	*Firm investments*	
3.1.	SMEs innovating in-house (% of all SMEs)	CIS	2.1.1.	Business R&D expenditures (% of GDP)	Same
3.2.	Innovative SMEs co-operating with others (% of all SMEs)	CIS	2.1.2.	IT expenditures (% of GDP)	Revised
3.3.	Innovation expenditures (% of total turnover)	CIS	2.1.3.	Non-R&D innovation expenditures (% of turnover)	Revised
3.4.	Early-stage venture capital (% of GDP)	Eurostat	*2.2.*	*Linkages & entrepreneurship*	
3.5.	ICT expenditures (% of GDP)	Eurostat, World Bank	2.2.1.	SMEs innovating in-house (% of SMEs)	Same
3.6.	SMEs using organisational innovation (% of all SMEs)	CIS	2.2.2.	Innovative SMEs collaborating with others (% of SMEs)	Same
4.	**Applications**		2.2.3.	Firm renewal (SMEs entries + exits) (% of SMEs)	New
4.1.	Employment in high-tech services (% of total workforce)	Eurostat	2.2.4.	Public-private co-publications per million population	New
4.2.	Exports of high technology products as a share of total exports	Eurostat	*2.3.*	*Throughputs*	
4.3.	Sales of new-to-market products (% of total turnover)	CIS	2.3.1.	EPO patents per million population	Same
4.4.	Sales of new-to-firm products (% of total turnover)	CIS	2.3.2.	Community trademarks per million population	Same
4.5.	Employment in medium-high and high-tech manufacturing (% of total	Eurostat, OECD	2.3.3.	Community designs per million population	Same

	workforce)				
5.	**Intellectual property**		2.3.4.	Technology Balance of Payments flows (% of GDP)	New
5.1.	EPO patents per million population	Eurostat, OECD	**3.**	**Outputs**	
5.2.	USPTO patents per million population	Eurostat, OECD	*3.1.*	*Innovators*	
5.3.	Triad patents per million population	Eurostat, OECD	3.1.1.	Technological (product/service/process) innovators (% of SMEs)	New
5.4.	New community trademarks per million population	OHIM**, Eurostat, OECD	3.1.2.	Non-technological (marketing/organisational) innovators (% of SMEs)	Revised
5.5.	New community designs per million population	OHIM, Eurostat, OECD	3.1.3.	Resource efficiency innovators 3.1.3.a: Reduced labour costs (% of firms) 3.1.3. b.: Reduced use of materials and energy (% of firms)	 New New
			3.2.	*Economic effects*	
			3.2.1.	Employment in medium-high & high-tech manufacturing (% of workforce)	Same
			3.2.2.	Employment in knowledge-intensive services (% of workforce)	Revised
			3.2.3.	Medium and high-tech exports (% of total exports)	Revised
			3.2.4.	Knowledge-intensive services exports (% of total services exports)	New
			3.2.5.	New-to-market sales (% of turnover)	Same
			3.2.6.	New-to-firm sales (% of turnover)	Same

Source: EIS 2007, 2008, Hollanders-Van Cruysen [2008], own collection
Marks: thick letters: Dimensions, italics: group of indicators, yellow cell: existing indicator in 2007, but non existing in 2008

Annex 4: COMPOSIT INDICATORS MEASURING TECHNOLOGICAL CAPABILITIES

Institution	**European Commission (EUComm)**	**World Economic Forum (WEF**	**World Economic Forum (WEF**	**World Economic Forum (WEF**	**World Bank**	UNIDO	UNCTAD	Archibugi Coco
Synthetic Indicator	*Global Summary Innovation Index*	*Technology Index*	*Technological Readiness Index*	*Technological Innovation Index*	*Knowledge Index*	*Technological Advance Index*	*Technological Activity Index*	
Short name	GSII	Tech	TechRead	Techinnov	KI	TechAdv	TAI	ArCo
Creation of new scientific and technological knowledge	Public R&D expenditures (% GDP) Business R&D expenditures (% GDP) Patents per million population Scientific articles per million population	Patents per million population R&D expenditure (% GDP)	Foreign Direct Investments	Business R&D expenditures (% GDP) Patents	Patents per million pop. Scientific articles per million pop.		Patents per million pop. Scientific and technical articles per million pop.	Patents per million pop. Scientific and technical articles per million pop
Infrastructures and diffusion of the new ICT	ICT expenditures (% GDP)	Cooperation activities between university and firms in research Land lines per 100 pop. Mobile phones per 100 pop. PC users per 100 population Internet users per 10000 pop. Internet *Host* per 10000 pop.	Firms' capabilities in adopting new technologies ICT laws Mobile phones per 100 pop. PC users per 100 pop. Internet users per 10000 pop.	Quality of research institutions Co-operation between universities and firms in research related activies Public demand for high-tech products Intellectual Property Right	Land lines per 1000 pop. PC per 1000 pop. Internet users per 1000 pop.			Land lines per 1000 pop. Mobile phones per 1000 pop. Internet users per 1000 pop.

		Capacity of the institutions of creating a propitious environment the diffusion and efficient use of ICT						
Human capital	Scientific & engineering graduates (% labour force) Researcher per million population	Tertiary enrolment rate		Scientists and egineers availability	Literacy rate Secondary school enrolment University enrolment Researchers per million pop.		Personnel involved in R&D activities per million pop. Literacy rate Secondary school enrolment	Literacy rate Tertiary science & engineering enrolment ratio Mean years of schooling over 14
Competitiveness	Share of exports in high-tech industries (% total exports) Share of added value in high-tech industries (% total value added)	Country's competitive capability		Taken into account in other GloCI subindicators: macroeconomic and institutional conditions in the "*Institutions Index"* ; firms strategies in the "*Business Sophistication Index"*		Export share in high-tech industries Added value share in high-tech industries		
Considered years	2006	2004-2006	2004-2006	2004-2006	2006	1990 and 2002	1995 and 2001	1990 ands 2000
Number of countries	48	125	125	125	132	161	117	162
Short name	GSII	Tech	TechRead	Techinnov	KI	TechAdv	TAI	ArCo

Source: *Archibugi and al.* [2009] pp. 16-17.

Survey questionnaire

Questions about company innovation

General information

1. Recent NACE-code of Your firm:

2. Number of employees: **..... person**

3. Approximate revenues in 2008: …….. HUF

4. **Seat of the company is in** ……. County.

5. **Did fulfil Your company any innovation in the following fields in the last three years**? (*Please, write number of actions into the cells*.)

Innovation activity	Character of novelty		
	New in the world	New in the market	New in the company
Implementation of a new or significantly improved product (good or service)			
Implementation of a new or significantly improved process			
Implementation of a new or significantly improved marketing method			
Implementation of a new or significantly improved organisational method			

6. Did Your company implemented new supply sources, new commodities, other new input?

1. yes 2. non

7. Did take part Your employees in related training?

1. yes 2. non

8. The main intent of the innovation was … (*You can mark more answers*.)

1. enlargement of products/services 2. cost cutting, improvement of effectiveness 3. improvement of quality, competitiveness 4. own usage of innovation tax 5. others, namely:

……
……...

Supporting and obstructive factors

9. The necessity of innovation occurred in … (*You can mark more answers*.)

1. marketing department 2. production department 3. technical designer department 4. administration department 5. management 6. owner's, parent company's order 7. other, namely:

……
……...

10. Resource of the applied knowledge were … … (*You can mark more answers*.)

1. employees in the company 2. costumers 3. competitors 4. professional forum, literature 5. co-operation with companies (parent company included) 6. innovation bridging institutions 7. co-operation with universities, research institutions

11. What type of financial support could you get to Your innovation in the last three years? (*You can mark more answers*.)

1. EU funding 2. other funding from the state 3. development loans (from banks, financial institutions) 4. venture capital 5. family, friends, other private funds 6. other

12. If You got union or state funding, what was its impact? (*You can mark more answers*.)
1. You fulfilled the designed innovation with better financial result.
2. Without the fund You could have not fulfil the innovation.
3. You entered into the innovation for gaining the funding.

Success and failure

13. Successful innovations in the last three years (*Please, write number of actions into the cells*.)

Innovation activity	Character of novelty		
	New in the world	New in the market	New in the company
Implementation of a new or significantly improved product (good or service)			
Implementation of a new or significantly improved process			
Implementation of a new or significantly improved marketing method			
Implementation of a new or significantly improved organisational method			

14. The matter of success was … (*You can mark more answers*.)
1. solution of the occurred problem 2. rise of revenues 3. improvement of competitiveness

15. The most important concern was during execution …(*You can mark more answers*.)
1. acquisition of technical information 2. acquisition of specialized knowledge 3. resistance of management 4. resistance of employees 5. to cope with financial problems 6. others, namely:

……
……...

Competition

16. The impact of global crisis is …
1. constraining, Your running plans are stopped
Promoting, because You can stay competitive by
2. new products, profile change
3. implementing new technology
4. selling in new markets/ to new costumers/ implementing new marketing methods
5. renewal of way of company's operation

17. The actors in Your most important markets:

1. You are the only player 2. few companies cover the market 3. few large and more small firms 4. varied companies compete

18. Your main costumer is …(*You can mark more answers*.)
1. state, public sector 2. other companies, business sector 3. private persons, civil sector

19. Characteristics of the competition is:
1 weak 2. vivid 3. very hard 4. unfair methods are used

20. If competition is unfair, what does it mean?
1. cartels, competitions constraining agreements 2. tax avoidance, blackleg workers, trafficking 3. corruption 4. others, namely

……
……...

Tables of survey processing

1. Connections of Oslo innovations

		Product innovator		Process innovator		Marketing innovator		Organisational innovator	
		non	yes	non	yes	non	yes	non	yes
		Count	Count	Count	Count	Count	Count	Count	Count
Product innovator	non	170	0	147	23	155	15	142	28
	yes	0	115	43	72	77	38	74	41
Process innovator	non	147	43	190	0	172	18	158	32
	yes	23	72	0	95	60	35	58	37
Marketing innovator	non	155	77	172	60	232	0	193	39
	yes	15	38	18	35	0	53	23	30
Organisational innovator	non	142	74	158	58	193	23	216	0
	yes	28	41	32	37	39	30	0	69

Pearson Chi-Square Tests

		Product innovator	Process innovator	Marketing innovator	Organisational innovator
Product innovator	Chi-square	.	74,355	26,581	13,755
	df	.	1	1	1
	Sig.	.(a)	,000(*)	,000(*)	,000(*)
Process innovator	Chi-square	74,355	.	31,337	16,866
	df	1	.	1	1
	Sig.	,000(*)	.(a)	,000(*)	,000(*)
Marketing innovator	Chi-square	26,581	31,337	.	37,233
	df	1	1	.	1

	Sig.	,000(*)	,000(*)	.(a)	,000(*)
Organisational innovator	Chi-square	13,755	16,866	37,233	.
	df	1	1	1	.
	Sig.	,000(*)	,000(*)	,000(*)	.(a)

Results are based on nonempty rows and columns in each innermost subtable.

* The Chi-square statistic is significant at the 0.05 level.

a The Chi-square test is not performed for this subtable because row and column variables are identical.

Comparisons of Column Proportions(b)

		Product innovator		Process innovator		Marketing innovator		Organisational innovator	
		non	yes	non	yes	non	yes	non	yes
		(A)	(B)	(A)	(B)	(A)	(B)	(A)	(B)
Product innovator	non	.(a)	.(a)	B		B		B	
	yes	.(a)	.(a)		A		A		A
Process innovator	non	B		.(a)	.(a)	B		B	
	yes		A	.(a)	.(a)		A		A
Marketing innovator	non	B		B		.(a)	.(a)	B	
	yes		A		A	.(a)	.(a)		A
Organisational innovator	non	B		B		B		.(a)	.(a)
	yes		A		A		A	.(a)	.(a)

Results are based on two-sided tests with significance level 0.05. For each significant pair, the key of the category with the smaller column proportion appears under the category with the larger column proportion.

a This category is not used in comparisons because its column proportion is equal to zero or one.

b Tests are adjusted for all pair wise comparisons within a row of each innermost subtable using the Bonferroni correction.

		Imitator	
		,00	1,00
		Count	Count
Size		1	10
	Small enterprise	15	69
	Medium enterprise	4	34
	Micro enterprise	0	13
	Great enterprise	2	16

Pearson Chi-Square Tests

		Imitator
Size	Chi-square	6,977
	df	4
	Sig.	,137

Results are based on nonempty rows and columns in each innermost subtable.

		Imitator	
		,00	1,00
		Count	Count
Sector		0	3
	Construction	3	29
	Manufacturing	9	73
	Trade	1	5
	Services	9	32

Pearson Chi-Square Tests

		Imitator
Sector	Chi-square	11,164
	df	4
	Sig.	,025(*)

Results are based on nonempty rows and columns in each innermost subtable.
* The Chi-square statistic is significant at the 0.05 level.

2. Innovativity and sector classification

Industry * Innovator Crosstabulation

Count

		Innovator		Total
		nem	igen	nem
Sector		12	3	15
	Construction	42	38	80
	Manufacturing	42	82	124
	Services	25	41	66
Total		121	164	285

Directional Measures

			Value	Asymp. Std. Error(a)	Approx. T(b)	Approx. Sig.
Nominal by Nominal	Lambda	Symmetric	,046	,057	,803	,422
		Industry Dependent	,000	,057	,000	1,000
		Innovator Dependent	,107	,076	1,338	,181
	Goodman and Kruskal tau	Industry Dependent	,016	,010		,003(c)
		Innovator Dependent	,057	,025		,001(c)
	Uncertainty Coefficient	Symmetric	,031	,014	2,098	,001(d)
		Industry Dependent	,024	,011	2,098	,001(d)
		Innovator Dependent	,043	,020	2,098	,001(d)

a Not assuming the null hypothesis.
b Using the asymptotic standard error assuming the null hypothesis.
c Based on chi-square approximation
d Likelihood ratio chi-square probability.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	,239	,001
	Cramer's V	,239	,001
	Contingency Coefficient	,232	,001
N of Valid Cases		285	

a Not assuming the null hypothesis.
b Using the asymptotic standard error assuming the null hypothesis.

3. Innovativity and additional innovation activities

New input * Innovator Crosstabulation

			Innovator		Total
			non	yes	
New input	yes	Count	39	122	161
		% within Innovator	37,9%	79,2%	62,6%
	non	Count	64	32	96
		% within Innovator	62,1%	20,8%	37,4%
Total		Count	103	154	257
		% within Innovátor	100,0%	100,0%	100,0%

a

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	45,111(b)	1	,000		
Continuity Correction(a)	43,361	1	,000		
Likelihood Ratio	45,606	1	,000		
Fisher's Exact Test				,000	,000
Linear-by-Linear Association	44,936	1	,000		
N of Valid Cases	257				

a Computed only for a 2x2 table
b 0 cells (,0%) have expected count less than 5. The minimum expected count is 38,47.

Directional Measures

			Value	Asymp. Std. Error(a)	Approx. T(b)	Approx. Sig.
Nominal by Nominal	Lambda	Symmetric	,286	,079	3,215	,001
		New input Dependent	,260	,091	2,493	,013
		Innovator Dependent	,311	,079	3,336	,001
	Goodman and Kruskal tau	New input Dependent	,176	,049		,000(c)
		Innovator Dependent	,176	,048		,000(c)
	Uncertainty Coefficient	Symmetric	,133	,038	3,512	,000(d)
		New input Dependent	,134	,038	3,512	,000(d)
		Innovator Dependent	,132	,037	3,512	,000(d)

a Not assuming the null hypothesis.
b Using the asymptotic standard error assuming the null hypothesis.
c Based on chi-square approximation
d Likelihood ratio chi-square probability.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	-,419	,000
	Cramer's V	,419	,000
	Contingency Coefficient	,386	,000
N of Valid Cases		257	

a Not assuming the null hypothesis.
b Using the asymptotic standard error assuming the null hypothesis.

Training * Innovator Crosstabulation

			Innovator		Total
			non	yes	
Training	yes	Count	21	87	108
		% within Innovator	20,4%	56,5%	42,0%
	non	Count	82	67	149
		% within Innovator	79,6%	43,5%	58,0%
Total		Count	103	154	257
		% within Innovator	100,0%	100,0%	100,0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	33,023(b)	1	,000		
Continuity Correction(a)	31,558	1	,000		
Likelihood Ratio	34,642	1	,000		
Fisher's Exact Test				,000	,000
Linear-by-Linear Association	32,895	1	,000		
N of Valid Cases	257				

a Computed only for a 2x2 table
b 0 cells (,0%) have expected count less than 5. The minimum expected count is 43,28.

Directional Measures

			Value	Asymp. Std. Error(a)	Approx. T(b)	Approx. Sig.
Nominal by Nominal	Lambda	Symmetric	,166	,093	1,683	,092
		Training Dependent	,185	,104	1,620	,105
		Innovator Dependent	,146	,110	1,232	,218
	Goodman and Kruskal tau	Training Dependent	,128	,040		,000(c)
		Innovator Dependent	,128	,040		,000(c)
	Uncertainty Coefficient	Symmetric	,100	,032	3,101	,000(d)
		Training Dependent	,099	,032	3,101	,000(d)
		Innovator Dependent	,100	,032	3,101	,000(d)

a Not assuming the null hypothesis.
b Using the asymptotic standard error assuming the null hypothesis.
c Based on chi-square approximation
d Likelihood ratio chi-square probability.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	-,358	,000
	Cramer's V	,358	,000
	Contingency Coefficient	,337	,000
N of Valid Cases		257	

a Not assuming the null hypothesis.
b Using the asymptotic standard error assuming the null hypothesis.

4. Types of innovation and additional activities

		Product innovator		Process innovator		Marketing innovator		Organisational innovator	
		yes	non	yes	non	yes	non	yes	non
		Count	Count	Count	Count	Count	Count	Count	Count
New input	yes	70	91	87	74	120	41	107	54
	non	81	15	79	17	86	10	83	13
Training	yes	42	66	51	57	77	31	66	42
	non	109	40	115	34	129	20	124	25

Pearson Chi-Square Tests

		Product innovator	Process innovator	Marketing innovator	Organisational innovator
New input	Chi-square	41,507	20,992	8,563	12,480
	df	1	1	1	1
	Sig.	,000(*)	,000(*)	,003(*)	,000(*)
Training	Chi-square	30,337	24,572	9,192	15,882
	df	1	1	1	1
	Sig.	,000(*)	,000(*)	,002(*)	,000(*)

Results are based on nonempty rows and columns in each innermost subtable.
* The Chi-square statistic is significant at the 0.05 level.

Comparisons of Column Proportions(a)

		Product innovator		Process innovator		Marketing innovator		Organisational innovator	
		yes	non	yes	non	yes	non	yes	non
		(A)	(B)	(A)	(B)	(A)	(B)	(A)	(B)
New input	yes		A		A		A		A
	non	B		B		B		B	
Training	yes		A		A		A		A
	non	B		B		B		B	

Results are based on two-sided tests with significance level 0.05. For each significant pair, the key of the category with the smaller column proportion appears under the category with the larger column proportion.
a Tests are adjusted for all pairwise comparisons within a row of each innermost subtable using the Bonferroni correction.

5. Types of innovation and sectors

		Sector			
		Na	Construction	Manufacturing	Services
		Count	Count	Count	Count
Product innovator	yes	2	23	66	24
Process innovator	non	13	62	69	46
	yes	2	18	55	20
Marketing innovator	yes	1	11	29	12
Organisational innovator	yes	3	15	31	20
New input	yes	2	45	81	33
	non	0	29	38	29
Training	yes	1	32	51	24
	non	1	42	68	38

Pearson Chi-Square Tests

		Sector
Product innovator	Chi-square	.
	df	.
	Sig.	.
Process innovator	Chi-square	13,976
	df	3
	Sig.	,003(*)
Marketing innovator	Chi-square	.
	df	.
	Sig.	.
Organisational innovator	Chi-square	.
	df	.
	Sig.	.
New input	Chi-square	5,145
	df	3
	Sig.	,161(a,b)
Training	Chi-square	,411
	df	3
	Sig.	,938(a,b)

Results are based on nonempty rows and columns in each innermost subtable.
* The Chi-square statistic is significant at the 0.05 level.
a More than 20% of cells in this subtable have expected cell counts less than 5. Chi-square results may be invalid.
b The minimum expected cell count in this subtable is less than one. Chi-square results may be invalid.

Comparisons of Column Proportions

		Sector			
			Construction	Manufacturing	Services
		(A)	(B)	(C)	(D)
Product innovator	yes	.(a)	.(a)	.(a)	.(a)
Process innovator	non	C	C		
	yes			A B	
Marketing innovator	yes	.(b,a)	.(a)	.(a)	.(a)
Organisational innovator	yes	.(a)	.(a)	.(a)	.(a)
New input	yes	.(a)		D	
	non	.(a)			C
Training	yes				
	non				

Results are based on two-sided tests with significance level 0.05. For each significant pair, the key of the category with the smaller column proportion appears under the category with the larger column proportion.
a This category is not used in comparisons because its column proportion is equal to zero or one.
b This category is not used in comparisons because the sum of case weights is less than two.

6. Types of innovation and size

		Size				
			Small enterprise	Medium enterprise	Micro enterprise	Large enterprise
		Count	Count	Count	Count	Count
Product innovator	yes	10	60	24	8	13
Process innovator	non	21	95	35	27	12
	yes	3	51	23	6	12
Marketing innovator	yes	2	30	11	7	3
Organisational innovator	yes	5	30	19	7	8
New input	yes	3	92	43	13	10
	non	2	49	13	19	13
Training	yes	4	57	29	7	11
	non	1	84	27	25	12

Pearson Chi-Square Tests

		Size
Product innovator	Chi-square	.
	df	.
	Sig.	.
Process innovator	Chi-square	12,308
	df	4
	Sig.	,015(*)
Marketing innovator	Chi-square	.
	df	.
	Sig.	.
Organisational innovator	Chi-square	.
	df	.
	Sig.	.
New input	Chi-square	15,450
	df	4
	Sig.	,004(*,a)
Training	Chi-square	10,948
	df	4
	Sig.	,027(*,a)

Results are based on nonempty rows and columns in each innermost subtable.
* The Chi-square statistic is significant at the 0.05 level.
a More than 20% of cells in this subtable have expected cell counts less than 5. Chi-square results may be invalid.

Comparisons of Column Proportions

		Size				
			Small enterprise	Medium enterprise	Micro enterprise	Large enterprise
		(A)	(B)	(C)	(D)	(E)
Product innovator	yes	.(a)	.(a)	.(a)	.(a)	.(a)
Process innovator	non	B C E			C E	
	yes		A	A D		A D
Marketing innovator	yes	.(a)	.(a)	.(a)	.(a)	.(a)
Organisational innovator	yes	.(a)	.(a)	.(a)	.(a)	.(a)
New input	yes		D E	D E		
	non				B C	B C
Training	yes	D	D	D		D
	non				A B C E	

Results are based on two-sided tests with significance level 0.05. For each significant pair, the key of the category with the smaller column proportion appears under the category with the larger column proportion.

a This category is not used in comparisons because its column proportion is equal to zero or one.

7. Intent of innovation by innovation types

		Product innovator		Process innovator		Marketing innovator		Organisational innovator	
		non	yes	non	yes	non	yes	non	yes
Intent of innovation:		Count	Count	Count	Count	Count	Count	Count	Count
Expanding production/services	,00	28	43	37	34	53	18	34	37
	yes	21	72	32	61	58	35	61	32
Cost cutting	,00	28	59	38	49	61	26	59	28
	yes	21	56	31	46	50	27	36	41
Improvement of quality	,00	23	44	36	31	50	17	43	24
	yes	26	71	33	64	61	36	52	45
Own usage of innovation tax	,00	47	113	67	93	108	52	95	65
	yes	2	2	2	2	3	1	0	4
Other	,00	49	114	69	94	111	52	95	68
	yes	0	1	0	1	0	1	0	1

Pearson Chi-Square Tests

Intent of innovation:		Product innovator	Process innovator	Marketing innovator	Organisational innovator
Expanding production/services	Chi-square	5,460	5,178	2,777	5,178
	df	1	1	1	1
	Sig.	,019(*)	,023(*)	,096	,023(*)
Cost cutting	Chi-square	,470	,196	,501	7,436
	df	1	1	1	1
	Sig.	,493	,658	,479	,006(*)
Improvement of quality	Chi-square	1,071	6,317	2,497	1,817
	df	1	1	1	1
	Sig.	,301	,012(*)	,114	,178
Own usage of innovation tax	Chi-square	,792	,106	,100	5,645
	df	1	1	1	1
	Sig.	,373(a)	,745(a)	,751(a)	,018(*,a)
Other	Chi-square	,429	,731	2,107	1,385
	df	1	1	1	1
	Sig.	,513(a,b)	,393(a,b)	,147(a,b)	,239(a,b)

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* The Chi-square statistic is significant at the 0.05 level.
a More than 20% of cells in this subtable have expected cell counts less than 5. Chi-square results may be invalid.
b The minimum expected cell count in this subtable is less than one. Chi-square results may be invalid.

8. Take-off of innovation by innovation types

		Product innovator		Process innovator		Marketing innovator		Organisational innovator	
		non	yes	non	yes	non	yes	non	yes
Take-off:		Count	Count	Count	Count	Count	Count	Count	Count
marketing department	,00	32	75	41	66	77	30	64	43
	yes	17	40	28	29	34	23	31	26
production department	,00	30	53	48	35	60	23	45	38
	yes	19	62	21	60	51	30	50	31
technical designer department	,00	42	98	62	78	96	44	84	56
	yes	7	17	7	17	15	9	11	13
administration department	,00	41	105	59	87	98	48	92	54
	yes	8	10	10	8	13	5	3	15
management	,00	43	99	60	82	97	45	86	56
	yes	6	16	9	13	14	8	9	13
owner	,00	47	106	65	88	105	48	91	62
	yes	2	9	4	7	6	5	4	7
other	,00	45	110	66	89	106	49	92	63

yes	4	5	3	6	5	4	3	6

Pearson Chi-Square Tests

Take-off:		Product innovator	Process innovator	Marketing innovator	Organisational innovator
marketing department	Chi-square	,000	1,781	2,578	,449
	df	1	1	1	1
	Sig.	,991	,182	,108	,503
production department	Chi-square	3,150	17,122	1,630	,949
	df	1	1	1	1
	Sig.	,076	,000(*)	,202	,330
technical designer department	Chi-square	,007	1,922	,345	1,687
	df	1	1	1	1
	Sig.	,934	,166	,557	,194
administration department	Chi-square	2,048	1,508	,190	14,123
	df	1	1	1	1
	Sig.	,152	,219	,663	,000(*)
management	Chi-square	,082	,014	,190	3,019
	df	1	1	1	1
	Sig.	,774	,905	,663	,082
owner	Chi-square	,770	,158	,930	2,250
	df	1	1	1	1
	Sig.	,380(a)	,691(a)	,335(a)	,134(a)
other	Chi-square	,964	,298	,640	2,363
	df	1	1	1	1
	Sig.	,326(a)	,585(a)	,424(a)	,124(a)

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* The Chi-square statistic is significant at the 0.05 level.

a More than 20% of cells in this subtable have expected cell counts less than 5. Chi-square results may be invalid.

9. Source of knowledge by innovation types

		Product innovator		Process innovator		Marketing innovator		Organisational innovator	
		non	yes	non	yes	non	yes	non	yes
Source of knowledge:		Count	Count	Count	Count	Count	Count	Count	Count
Employees	,00	19	49	32	36	51	17	47	21
	yes	30	66	37	59	60	36	48	48
Costumers	,00	42	86	55	73	88	40	76	52
	yes	7	29	14	22	23	13	19	17
Competitors	,00	39	97	61	75	94	42	81	55
	yes	10	18	8	20	17	11	14	14
Professional forum, literature	,00	31	80	48	63	75	36	64	47
	yes	18	35	21	32	36	17	31	22
Co-operation with companies	,00	44	95	59	80	99	40	85	54
	yes	5	20	10	15	12	13	10	15
Bridging institutions	,00	48	115	69	94	111	52	95	68
	yes	1	0	0	1	0	1	0	1
Co-operation with universities	,00	37	98	58	77	92	43	74	61
	yes	12	17	11	18	19	10	21	8

Pearson Chi-Square Tests

Source of knowledge:		Product innovator	Process innovator	Marketing innovator	Organisational innovator
Employees	Chi-square	,208	1,185	2,843	5,969
	df	1	1	1	1
	Sig.	,648	,276	,092	,015(*)
Costumers	Chi-square	2,397	,192	,304	,502
	df	1	1	1	1
	Sig.	,122	,661	,582	,479
Competitors	Chi-square	,549	2,526	,750	,871
	df	1	1	1	1
	Sig.	,459	,112	,387	,351
Professional forum, literature	Chi-square	,623	,193	,002	,010
	df	1	1	1	1
	Sig.	,430	,660	,964	,920
Co-operation with companies	Chi-square	1,374	,052	5,224	3,889
	df	1	1	1	1
	Sig.	,241	,820	,022(*)	,049(*)
Bridging institutions	Chi-square	2,361	,731	2,107	1,385
	df	1	1	1	1
	Sig.	,124(a,b)	,393(a,b)	,147(a,b)	,239(a,b)

Co-operation with universities	Chi-square	2,224	,248	,076	3,034
	df	1	1	1	1
	Sig.	,136	,618	,783	,082

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b The minimum expected cell count in this subtable is less than one. Chi-square results may be invalid.

10. Intent of innovation and source of knowledge

Intent of innovation:		Enlargement of production		Cost cutting		Improvement of quality		Own usage of innovation tax		Other	
		,00	yes	,00	yes	,00	yes	,00	yes	,00	yes
Source of knowledge:		Count	Count	Count	Count	Count	Count	Count	Count	Count	Count
Employees	,00	33	35	47	21	36	32	66	2	68	0
	yes	38	58	40	56	31	65	94	2	95	1
Costumers	,00	60	68	73	55	59	69	126	2	128	0
	yes	11	25	14	22	8	28	34	2	35	1
Competitors	,00	61	75	79	57	57	79	133	3	135	1
	yes	10	18	8	20	10	18	27	1	28	0
Professional forum, literature	,00	46	65	65	46	50	61	108	3	110	1
	yes	25	28	22	31	17	36	52	1	53	0
Co-operation with companies	,00	63	76	74	65	55	84	136	3	138	1
	yes	8	17	13	12	12	13	24	1	25	0
Bridging institutions	,00	71	92	86	77	67	96	159	4	162	1
	yes	0	1	1	0	0	1	1	0	1	0
Co-operation with universities	,00	59	76	68	67	58	77	132	3	134	1
	yes	12	17	19	10	9	20	28	1	29	0

Pearson Chi-Square Tests

Intent of innovation: / Source of knowledge:		Enlargement of production	Cost cutting	Improvement of quality	Own usage of innovation tax	Other
Employees	Chi-square	1,298	12,043	7,024	,123	,713
	df	1	1	1	1	1
	Sig.	,255	,001(*)	,008(*)	,726(a)	,399(a,b)
Costumers	Chi-square	3,048	3,713	6,626	1,883	3,577
	df	1	1	1	1	1
	Sig.	,081	,054	,010(*)	,170(a,b)	,059(a,b)
Competitors	Chi-square	,790	8,122	,369	,182	,207
	df	1	1	1	1	1
	Sig.	,374	,004(*)	,544	,670(a,b)	,649(a,b)
Professional forum, literature	Chi-square	,479	4,186	2,497	,100	,480
	df	1	1	1	1	1
	Sig.	,489	,041(*)	,114	,751(a)	,488(a,b)
Co-operation with companies	Chi-square	1,532	,013	,623	,302	,181
	df	1	1	1	1	1
	Sig.	,216	,909	,430	,583(a,b)	,671(a,b)
Bridging institutions	Chi-square	,768	,890	,695	,025	,006
	df	1	1	1	1	1
	Sig.	,381(a,b)	,345(a,b)	,404(a,b)	,874(a,b)	,937(a,b)
Co-operation with universities	Chi-square	,053	2,199	1,406	,151	,216
	df	1	1	1	1	1
	Sig.	,819	,138	,236	,698(a,b)	,642(a,b)

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b The minimum expected cell count in this subtable is less than one. Chi-square results may be invalid.

11. Source of innovation by take-off

Source of knowledge		Employees		Costumers		Competitors		Professional forum, literature		Co-operation with companies		Bridging institutions		Co-operation with universities	
		,00	igen	,00	igen	,00	igen	,00	igen	,00	igen	,00	igen	,00	igen
Take-off		Count	Count	Count	Count	Count	Count	Count	Count	Count	Count	Count	Count	Count	Count
marketing department	,00	51	56	87	20	93	14	76	31	89	18	106	1	85	22
	yes	17	40	41	16	43	14	35	22	50	7	57	0	50	7
production department	,00	50	33	67	16	74	9	55	28	73	10	83	0	66	17
	yes	18	63	61	20	62	19	56	25	66	15	80	1	69	12
technical designer department	,00	57	83	110	30	118	22	97	43	120	20	139	1	119	21
	yes	11	13	18	6	18	6	14	10	19	5	24	0	16	8
administration department	,00	65	81	114	32	120	26	99	47	124	22	146	0	122	24
	yes	3	15	14	4	16	2	12	6	15	3	17	1	13	5
management	,00	61	81	117	25	120	22	97	45	120	22	141	1	115	27
	yes	7	15	11	11	16	6	14	8	19	3	22	0	20	2
owner	,00	64	89	122	31	125	28	102	51	135	18	152	1	126	27
	yes	4	7	6	5	11	0	9	2	4	7	11	0	9	2
other	,00	64	91	120	35	127	28	105	50	131	24	154	1	129	26
	yes	4	5	8	1	9	0	6	3	8	1	9	0	6	3

Pearson Chi-Square Tests

Source of knowledge / Take-off		Employees	Costumers	Competitors	Professional forum, literature	Co-operation with companies	Bridging institutions	Co-operation with universities
marketing department	Chi-square	4,876	1,909	3,460	1,575	,594	,536	1,752
	df	1	1	1	1	1	1	1
	Sig.	,027(*)	,167	,063	,209	,441	,464(a,b)	,186
production department	Chi-square	24,413	,701	4,607	,154	1,328	1,031	,904
	df	1	1	1	1	1	1	1
	Sig.	,000(*)	,402	,032(*)	,694	,249	,310(a,b)	,342
technical designer department	Chi-square	,221	,153	1,248	1,124	,680	,172	4,731
	df	1	1	1	1	1	1	1
	Sig.	,638	,696	,264(a)	,289	,410(a)	,678(a,b)	,030(*,a)
administration department	Chi-square	5,122	,001	,508	,010	,032	8,161	1,416
	df	1	1	1	1	1	1	1
	Sig.	,024(*)	,977(a)	,476(a)	,922	,859(a)	,004(*,a,b)	,234(a)
management	Chi-square	,974	11,668	1,867	,190	,051	,156	1,289
	df	1	1	1	1	1	1	1
	Sig.	,324	,001(*,a)	,172(a)	,663	,822(a)	,693(a,b)	,256(a)

owner	Chi-square	,126	3,802	2,428	1,077	21,371	,072	,002
	df	1	1	1	1	1	1	1
	Sig.	,722(a)	,051(a)	,119(a)	,299(a)	,000(*,a)	,788(a,b)	,964(a)
other	Chi-square	,035	,653	1,961	,004	,126	,058	1,602
	df	1	1	1	1	1	1	1
	Sig.	,852(a)	,419(a)	,161(a)	,947(a)	,723(a)	,809(a,b)	,206(a)

Results are based on nonempty rows and columns in each innermost subtable.

* The Chi-square statistic is significant at the 0.05 level.

a More than 20% of cells in this subtable have expected cell counts less than 5. Chi-square results may be invalid.

b The minimum expected cell count in this subtable is less than one. Chi-square results may be invalid.

12. Financial support by innovation types

		Product innovator		Process innovator		Marketing innovator		Organisational innovator	
		non	yes	non	yes	non	yes	non	yes
Funding:		Count	Count	Count	Count	Count	Count	Count	Count
EU funding	,00	40	90	57	73	92	38	78	52
	yes	9	25	12	22	19	15	17	17
Funding from the state	,00	42	105	63	84	101	46	83	64
	yes	7	10	6	11	10	7	12	5
Development loans	,00	37	90	60	67	91	36	74	53
	yes	12	25	9	28	20	17	21	16
Venture capital	,00	48	110	67	91	106	52	91	67
	yes	1	5	2	4	5	1	4	2
Private funds	,00	44	100	62	82	97	47	85	59
	yes	5	15	7	13	14	6	10	10
Other	,00	45	98	60	83	96	47	79	64
	yes	4	17	9	12	15	6	16	5

Pearson Chi-Square Tests

Funding:		Product innovator	Process innovator	Marketing innovator	Organisational innovator
EU funding	Chi-square	,238	,809	2,731	1,106
	df	1	1	1	1
	Sig.	,626	,368	,098	,293
Funding from the state	Chi-square	1,156	,358	,681	1,248
	df	1	1	1	1
	Sig.	,282	,550	,409	,264
Development loans	Chi-square	,149	6,176	4,057	,027
	df	1	1	1	1
	Sig.	,700	,013(*)	,044(*)	,870
Venture capital	Chi-square	,519	,195	,697	,195
	df	1	1	1	1
	Sig.	,471(a)	,659(a)	,404(a)	,659(a)
Private funds	Chi-square	,259	,468	,056	,587
	df	1	1	1	1
	Sig.	,611	,494	,813	,443
Other	Chi-square	1,348	,006	,154	3,296
	df	1	1	1	1
	Sig.	,246	,938	,694	,069

Results are based on nonempty rows and columns in each innermost subtable.

* The Chi-square statistic is significant at the 0.05 level.

a More than 20% of cells in this subtable have expected cell counts less than 5. Chi-square results may be invalid.

13. Matter of success by innovation types

Matter of success		Successful product innovator		Successful process innovator		Successful marketing innovator		Successful organisational innovator	
		non	yes	non	yes	non	yes	non	yes
		Count	Count	Count	Count	Count	Count	Count	Count
Solution of the occurred problem	,00	22	56	51	27	60	18	59	19
	yes	21	35	29	27	41	15	28	28
Rise of revenues	,00	37	57	56	38	74	20	62	32
	yes	6	34	24	16	27	13	25	15
Improvement of competitiveness	,00	19	20	27	12	33	6	25	14
	yes	24	71	53	42	68	27	62	33

Pearson Chi-Square Tests

Matter of success		Successful product innovator	Successful process innovator	Successful marketing innovator	Successful organisational innovator
Solution of the occurred problem	Chi-square	1,292	2,506	,242	9,411
	df	1	1	1	1
	Sig.	,256	,113	,623	,002(*)
Rise of revenues	Chi-square	7,642	,002	1,904	,147
	df	1	1	1	1
	Sig.	,006(*)	,963	,168	,701
Improvement of competitiveness	Chi-square	6,980	2,076	2,531	,016
	df	1	1	1	1
	Sig.	,008(*)	,150	,112	,898

Results are based on nonempty rows and columns in each innermost subtable.

* The Chi-square statistic is significant at the 0.05 level.

14. Concerns by take-offs

Concern		Acquisition of technical information		Acquisition of specialized knowledge		Resistance of management		Resistance of employees		Coping with financial problems		Others	
		,00	yes	,00	yes	,00	yes	,00	yes	,00	yes	,00	yes
Take-off		Count	Count	Count	Count	Count	Count	Count	Count	Count	Count	Count	Count
marketing department	,00	196	17	187	26	210	3	196	17	165	48	211	2
	yes	60	12	64	8	72	0	63	9	43	29	70	2
production	,00	175	10	172	13	185	0	170	15	155	30	183	2
department	yes	81	19	79	21	97	3	89	11	53	47	98	2
technical designer	,00	230	26	228	28	253	3	234	22	192	64	252	4
department	yes	26	3	23	6	29	0	25	4	16	13	29	0
administration	,00	235	27	235	27	260	2	242	20	192	70	258	4
department	yes	21	2	16	7	22	1	17	6	16	7	23	0
management	,00	229	29	227	31	255	3	238	20	190	68	256	2
	yes	27	0	24	3	27	0	21	6	18	9	25	2
owner	,00	250	24	245	29	272	2	249	25	202	72	270	4
	yes	6	5	6	5	10	1	10	1	6	5	11	0
other	,00	244	29	242	31	270	3	247	26	197	76	270	3
	yes	12	0	9	3	12	0	12	0	11	1	11	1

Pearson Chi-Square Tests

Concern / Take-off		Acquisition of technical information	Acquisition of specialized knowledge	Resistance of management	Resistance of employees	Coping with financial problems	Others
marketing department	Chi-square	4,441	,061	1,025	1,325	8,591	1,315
	df	1	1	1	1	1	1
	Sig.	,035(*)	,804	,311(a,b)	,250	,003(*)	,252(a)
production department	Chi-square	13,125	12,063	5,609	,655	31,197	,396
	df	1	1	1	1	1	1
	Sig.	,000(*)	,001(*)	,018(*,a)	,418	,000(*)	,529(a)
technical designer department	Chi-square	,001	2,358	,343	,849	5,194	,460
	df	1	1	1	1	1	1
	Sig.	,975(a)	,125(a)	,558(a,b)	,357(a)	,023(*)	,498(a,b)
administration department	Chi-square	,060	8,154	2,608	8,685	,148	,356
	df	1	1	1	1	1	1
	Sig.	,807(a)	,004(*,a)	,106(a,b)	,003(*,a)	,700	,551(a,b)
management	Chi-square	3,379	,019	,317	6,173	,603	7,769
	df	1	1	1	1	1	1
	Sig.	,066(a)	,890(a)	,573(a,b)	,013(*,a)	,437	,005(*,a,b)
owner	Chi-square	15,580	12,239	7,098	,000	1,972	,163
	df	1	1	1	1	1	1
	Sig.	,000(*,a)	,000(*,a)	,008(*,a,b)	,997(a)	,160(a)	,687(a,b)
other	Chi-square	1,419	2,037	,133	1,258	2,218	4,347
	df	1	1	1	1	1	1
	Sig.	,234(a)	,154(a)	,715(a,b)	,262(a)	,136(a)	,037(*,a,b)

Results are based on nonempty rows and columns in each innermost subtable.

* The Chi-square statistic is significant at the 0.05 level.

a More than 20% of cells in this subtable have expected cell counts less than 5. Chi-square results may be invalid.

b The minimum expected cell count in this subtable is less than one. Chi-square results may be invalid.

15. Concerns by sources of knowledge

Concern:		Acquisition of technical information		Acquisition of specialized knowledge		Resistance of management		Resistance of employees		Coping with financial problems		Others	
		yes	,00	yes	,00	yes	,00	yes	,00	yes	,00	yes	,00
Source of knowledge		Count	Count	Count	Count	Count	Count	Count	Count	Count	Count	Count	Count
Employees	,00	159	8	150	17	166	1	159	8	135	32	165	2
	yes	97	21	101	17	116	2	100	18	73	45	116	2
Costumers	,00	217	25	213	29	239	3	221	21	188	54	240	2
	yes	39	4	38	5	43	0	38	5	20	23	41	2
Competitors	,00	226	23	220	29	247	2	227	22	193	56	246	3
	yes	30	6	31	5	35	1	32	4	15	21	35	1
Professional forum, literature	,00	193	21	191	23	211	3	201	13	163	51	210	4
	yes	63	8	60	11	71	0	58	13	45	26	71	0
Co-operation with companies	,00	230	22	226	26	250	2	227	25	185	67	249	3
	yes	26	7	25	8	32	1	32	1	23	10	32	1
Bridging institutions	,00	255	29	250	34	281	3	259	25	207	77	280	4
	yes	1	0	1	0	1	0	0	1	1	0	1	0
Co-operation with universities	,00	230	24	226	28	252	2	231	23	185	69	250	4
	yes	26	5	25	6	30	1	28	3	23	8	31	0

Pearson Chi-Square Tests

Concern: Source of knowledge		Acquisition of technical information	Acquisition of specialized knowledge	Resistance of management	Resistance of employees	Coping with financial problems	Others
Employees	Chi-square	12,797	1,176	,798	9,132	12,624	,124
	df	1	1	1	1	1	1
	Sig.	,000(*)	,278	,372(a)	,003(*)	,000(*)	,725(a)
Costumers	Chi-square	,042	,004	,539	,383	17,996	3,860
	df	1	1	1	1	1	1
	Sig.	,837(a)	,947	,463(a,b)	,536(a)	,000(*)	,049(*,a,b)
Competitors	Chi-square	1,900	,151	1,177	,196	20,493	,562
	df	1	1	1	1	1	1
	Sig.	,168(a)	,698(a)	,278(a,b)	,658(a)	,000(*)	,453(a,b)
Professional forum, literature	Chi-square	,123	1,143	1,006	9,626	4,421	1,346
	df	1	1	1	1	1	1
	Sig.	,725	,285	,316(a,b)	,002(*)	,035(*)	,246(a,b)
Co-operation with companies	Chi-square	4,974	5,385	1,401	1,671	,204	,714
	df	1	1	1	1	1	1
	Sig.	,026(*,a)	,020(*,a)	,236(a,b)	,196(a)	,651	,398(a,b)
Bridging institutions	Chi-square	,114	,136	,011	9,997	,371	,014
	df	1	1	1	1	1	1
	Sig.	,736(a,b)	,712(a,b)	,918(a,b)	,002(*,a,b)	,542(a,b)	,905(a,b)
Co-operation with universities	Chi-square	1,349	1,825	1,577	,013	,026	,495
	df	1	1	1	1	1	1
	Sig.	,245(a)	,177(a)	,209(a,b)	,910(a)	,872	,482(a,b)

Results are based on nonempty rows and columns in each innermost subtable.

* The Chi-square statistic is significant at the 0.05 level.

a More than 20% of cells in this subtable have expected cell counts less than 5. Chi-square results may be invalid.

b The minimum expected cell count in this subtable is less than one. Chi-square results may be invalid.

16. Concerns by funding

Concern:		Acquisition of technical information		Acquisition of specialized knowledge		Resistance of management		Resistance of employees		Coping with financial problems		Others	
		yes	,00	yes	,00	yes	,00	yes	,00	yes	,00	yes	,00
Funding		Count	Count	Count	Count	Count	Count	Count	Count	Count	Count	Count	Count
EU funding	,00	222	25	220	27	245	2	227	20	183	64	245	2
	yes	34	4	31	7	37	1	32	6	25	13	36	2
Funding from the state	,00	237	27	234	30	261	3	242	22	198	66	261	3
	yes	19	2	17	4	21	0	17	4	10	11	20	1
Development loans	,00	215	22	207	30	236	1	215	22	188	49	235	2
	yes	41	7	44	4	46	2	44	4	20	28	46	2
Venture capital	,00	250	28	248	30	277	1	253	25	206	72	274	4
	yes	6	1	3	4	5	2	6	1	2	5	7	0
Private funds	,00	234	26	229	31	257	3	236	24	195	65	257	3
	yes	22	3	22	3	25	0	23	2	13	12	24	1
Other	,00	237	22	229	30	256	3	237	22	190	69	256	3
	yes	19	7	22	4	26	0	22	4	18	8	25	1

Pearson Chi-Square Tests

Concern: / Funding:		Acquisition of technical information	Acquisition of specialized knowledge	Resistance of management	Resistance of employees	Coping with financial problems	Others
EU funding	Chi-square	,006	1,758	1,050	2,351	1,150	4,720
	df	1	1	1	1	1	1
	Sig.	,939(a)	,185(a)	,306(a,b)	,125(a)	,283	,030(*,a,b)
Funding from the state	Chi-square	,011	1,093	,241	2,694	7,396	1,848
	df	1	1	1	1	1	1
	Sig.	,918(a)	,296(a)	,623(a,b)	,101(a)	,007(*)	,174(a,b)
Development loans	Chi-square	1,227	,711	5,374	,043	28,708	3,185
	df	1	1	1	1	1	1
	Sig.	,268(a)	,399	,020(*,a,b)	,835(a)	,000(*)	,074(a,b)
Venture capital	Chi-square	,133	13,962	52,177	,231	7,178	,102
	df	1	1	1	1	1	1
	Sig.	,716(a,b)	,000(*,a,b)	,000(*,a,b)	,631(a,b)	,007(*,a)	,749(a,b)
Private funds	Chi-square	,100	,000	,292	,042	6,119	1,335
	df	1	1	1	1	1	1
	Sig.	,752(a)	,991(a)	,589(a,b)	,838(a)	,013(*)	,248(a,b)
Other	Chi-square	8,780	,325	,304	1,353	,204	1,234
	df	1	1	1	1	1	1
	Sig.	,003(*,a)	,569(a)	,581(a,b)	,245(a)	,651	,267(a,b)

17. Main customers by innovation types

		Product innovator		Process innovator		Marketing innovator		Organisational innovator	
		non	yes	non	yes	non	yes	non	yes
Main customer		Count	Count	Count	Count	Count	Count	Count	Count
public	,00	36	88	49	75	83	41	75	49
sector	yes	13	27	20	20	28	12	20	20
business	,00	14	27	21	20	33	8	28	13
sector	yes	35	88	48	75	78	45	67	56
civil sector	,00	33	83	41	75	81	35	70	46
	yes	16	32	28	20	30	18	25	23
More	non	30	79	39	70	76	33	70	39
	yes	19	36	30	25	35	20	25	30

Pearson Chi-Square Tests

Main customer:		Product innovator	Process innovator	Marketing innovator	Organisational innovator
public sector	Chi-square	,174	1,364	,130	1,364
	df	1	1	1	1
	Sig.	,677	,243	,719	,243
business sector	Chi-square	,475	1,876	4,098	2,410
	df	1	1	1	1
	Sig.	,491	,171	,043(*)	,121
civil sector	Chi-square	,387	7,362	,833	,951
	df	1	1	1	1
	Sig.	,534	,007(*)	,361	,330
More	Chi-square	,860	5,282	,620	5,282
	df	1	1	1	1
	Sig.	,354	,022(*)	,431	,022(*)

Results are based on nonempty rows and columns in each innermost subtable.
* The Chi-square statistic is significant at the 0.05 level.

18. Intent of innovation by main customers

Main customer:		public sector		business sector		civil sector		More	
		,00	yes	,00	yes	,00	yes	non	yes
Intent of innovation:		Count	Count	Count	Count	Count	Count	Count	Count
Enlargement of production	,00	52	19	23	48	53	18	50	21
	yes	72	21	18	75	63	30	59	34
Cost cutting	,00	62	25	28	59	57	30	55	32
	yes	62	15	13	64	59	18	54	23
Improvement of quality	,00	51	16	20	47	42	25	44	23
	yes	73	24	21	76	74	23	65	32
Own usage of innovation tax	,00	123	37	41	119	113	47	109	51
	yes	1	3	0	4	3	1	0	4
Other	,00	124	39	40	123	115	48	108	55
	yes	0	1	1	0	1	0	1	0

Pearson Chi-Square Tests

Main customer: / Intent of innovation:		public sector	business sector	civil sector	More
Enlargement of production	Chi-square	,381	3,651	,928	,880
	df	1	1	1	1
	Sig.	,537	,056	,336	,348
Cost cutting	Chi-square	1,897	5,100	2,434	,875
	df	1	1	1	1
	Sig.	,168	,024(*)	,119	,349
Improvement of quality	Chi-square	,016	1,422	3,542	,032
	df	1	1	1	1
	Sig.	,899	,233	,060	,858
Own usage of innovation tax	Chi-square	5,695	1,367	,036	8,125
	df	1	1	1	1
	Sig.	,017(*,a,b)	,242(a,b)	,849(a)	,004(*,a)
Other	Chi-square	3,119	3,018	,416	,508
	df	1	1	1	1
	Sig.	,077(a,b)	,082(a,b)	,519(a,b)	,476(a,b)

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19. Take-off of innovation by main customers

Main customer:		public sector		business sector		civil sector		More	
		,00	yes	,00	yes	,00	yes	,00	yes
Take-off		Count	Count	Count	Count	Count	Count	Count	Count
marketing	,00	83	24	23	84	79	28	73	34
department	yes	41	16	18	39	37	20	36	21
production	,00	57	26	25	58	53	30	48	35
department	yes	67	14	16	65	63	18	61	20
technical designer	,00	106	34	39	101	97	43	94	46
department	yes	18	6	2	22	19	5	15	9
administration	,00	111	35	36	110	104	42	99	47
department	yes	13	5	5	13	12	6	10	8
management	,00	108	34	38	104	102	40	97	45
	yes	16	6	3	19	14	8	12	10
owner	,00	115	38	39	114	109	44	102	51
	yes	9	2	2	9	7	4	7	4
other	,00	119	36	38	117	109	46	104	51

	yes	5	4	3	6	7	2	5	4

Pearson Chi-Square Tests

Main customer: / Take-off		public sector	business sector	civil sector	More
marketing department	Chi-square	,642	2,017	1,429	,428
	df	1	1	1	1
	Sig.	,423	,156	,232	,513
production department	Chi-square	4,383	2,350	3,838	5,618
	df	1	1	1	1
	Sig.	,036(*)	,125	,050	,018(*)
technical designer department	Chi-square	,006	4,165	,966	,198
	df	1	1	1	1
	Sig.	,940	,041(*)	,326	,656
administration department	Chi-square	,126	,083	,161	1,079
	df	1	1	1	1
	Sig.	,723(a)	,773(a)	,688	,299
management	Chi-square	,114	1,750	,618	1,619
	df	1	1	1	1
	Sig.	,735	,186	,432	,203
owner	Chi-square	,246	,292	,287	,042
	df	1	1	1	1
	Sig.	,620(a)	,589(a)	,592(a)	,837(a)
other	Chi-square	2,077	,353	,228	,508
	df	1	1	1	1
	Sig.	,150(a)	,553(a)	,633(a)	,476(a)

Results are based on nonempty rows and columns in each innermost subtable.
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20. Funding by main customers

Main customer:		public sector		business sector		civil sector		More	
		,00	yes	,00	yes	,00	yes	,00	yes
Funding:		Count	Count	Count	Count	Count	Count	Count	Count
EU funding	,00	98	32	32	98	90	40	84	46
	yes	26	8	9	25	26	8	25	9
Funding from the state	,00	116	31	38	109	104	43	101	46
	yes	8	9	3	14	12	5	8	9
Development loans	,00	96	31	33	94	89	38	83	44
	yes	28	9	8	29	27	10	26	11
Venture capital	,00	118	40	38	120	114	44	105	53
	yes	6	0	3	3	2	4	4	2
Private funds	,00	107	37	36	108	103	41	94	50
	yes	17	3	5	15	13	7	15	5

Other	,00	108	35	38	105	100	43	94	49
	yes	16	5	3	18	16	5	15	6

Pearson Chi-Square Tests

Main customer: / Funding:		public sector	business sector	civil sector	More
EU funding	Chi-square	,017	,049	,682	,961
	df	1	1	1	1
	Sig.	,896	,824	,409	,327
Funding from the state	Chi-square	8,383	,547	,000	3,204
	df	1	1	1	1
	Sig.	,004(*,a)	,460(a)	,989(a)	,073
Development loans	Chi-square	,000	,291	,116	,311
	df	1	1	1	1
	Sig.	,992	,590	,733	,577
Venture capital	Chi-square	2,009	2,076	4,208	,000
	df	1	1	1	1
	Sig.	,156(a)	,150(a)	,040(*,a)	,991(a)
Private funds	Chi-square	1,089	,000	,361	,745
	df	1	1	1	1
	Sig.	,297(a)	1,000(a)	,548	,388
Other	Chi-square	,004	1,475	,347	,266
	df	1	1	1	1
	Sig.	,947	,225	,556	,606

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21. Actors in competition and innovativitiy

1. You are the only player 2. few companies cover the market 3. few large and more small firms 4. varied companies compete

	Innovator		Successful innovator	
	non	yes	non	yes
Actors in competition	Count	Count	Count	Count
Only player	2	2	2	2
Few companies	8	29	12	25
Few large, more small	20	53	25	48
Varied companies	56	63	60	59

Pearson Chi-Square Tests

		Innovator	Successful innovator
Actors in competition	Chi-square	12,108	6,717
	df	3	3
	Sig.	,007(*,a)	,082(a)

Results are based on nonempty rows and columns in each innermost subtable.
* The Chi-square statistic is significant at the 0.05 level.
a More than 20% of cells in this subtable have expected cell counts less than 5. Chi-square results may be invalid.

22. Characteristics of competition and innovativity

1 2. 3. 4.

	Innovator		Successful innovator	
	non	yes	non	yes
Characteristics of competition	Count	Count	Count	Count
weak	2	2	2	2
vivid	13	20	13	20
very hard	33	49	39	43
unfair methods are used	41	77	49	69

Pearson Chi-Square Tests

		Innovator	Successful innovator
Characteristics of competition	Chi-square	,962	1,033
	df	3	3
	Sig.	,811(a)	,793(a)

Results are based on nonempty rows and columns in each innermost subtable.
a More than 20% of cells in this subtable have expected cell counts less than 5. Chi-square results may be invalid.

23. Characteristics of competition by innovation types

Characteristics of competition	Product innovator		Process innovator		Marketing innovator		Organisational innovator	
	non	yes	non	yes	non	yes	non	yes
	Count	Count	Count	Count	Count	Count	Count	Count
weak	0	2	0	2	1	1	0	2
vivid	8	12	6	14	17	3	14	6
very hard	14	35	15	34	33	16	29	20
unfair methods are used	21	56	42	35	45	32	39	38

Pearson Chi-Square Tests

		Product innovator	Process innovator	Marketing innovator	Organisational innovator
Characteristics of competition	Chi-square	2,106	10,158	5,278	5,197
	df	3	3	3	3
	Sig.	,551(a,b)	,017(*,a,b)	,153(a,b)	,158(a,b)

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a More than 20% of cells in this subtable have expected cell counts less than 5. Chi-square results may be invalid.
b The minimum expected cell count in this subtable is less than one. Chi-square results may be invalid.

24. Unfair competition and innovativity

		Innovator		Successful innovator	
		non	yes	non	yes
Unfair competition:		Count	Count	Count	Count
cartels	non	107	136	136	107
	yes	14	28	15	27
tax avoidance,	non	103	132	127	108
blackleg workers	yes	18	32	24	26
corruption	non	97	133	122	108
	yes	24	31	29	26
other	non	120	159	150	129
	yes	1	5	1	5

Pearson Chi-Square Tests

Unfair competition:		Innovator	Successful innovator
cartels	Chi-square	1,678	5,896
	df	1	1
	Sig.	,195	,015(*)
tax avoidance, blackleg workers	Chi-square	1,035	,604
	df	1	1
	Sig.	,309	,437
corruption	Chi-square	,039	,002
	df	1	1
	Sig.	,844	,966
other	Chi-square	1,669	3,245
	df	1	1
	Sig.	,196(a)	,072(a)

Results are based on nonempty rows and columns in each innermost subtable.
* The Chi-square statistic is significant at the 0.05 level.
a More than 20% of cells in this subtable have expected cell counts less than 5. Chi-square results may be invalid.

25. Unfair competition by main costumers

Main customer:		Public sector		Business sector		Private sector		more	
		,00	yes	,00	yes	,00	yes	,00	yes
Unfair competition:		Count	Count	Count	Count	Count	Count	Count	Count
cartels	non	197	46	81	162	178	65	173	70
	yes	32	10	10	32	29	13	31	11
tax avoidance,	non	192	43	83	152	180	55	178	57
blackleg workers	yes	37	13	8	42	27	23	26	24
corruption	non	187	43	80	150	173	57	169	61
	yes	42	13	11	44	34	21	35	20
other	non	226	53	88	191	204	75	201	78
	yes	3	3	3	3	3	3	3	3

Pearson Chi-Square Tests

Main customer: / Unfair competition:		Public sector	Business sector	Private sector	more
cartels	Chi-square	,540	1,494	,318	,120
	df	1	1	1	1
	Sig.	,462	,222	,573	,729
tax avoidance, blackleg workers	Chi-square	1,549	7,080	10,589	11,426
	df	1	1	1	1
	Sig.	,213	,008(*)	,001(*)	,001(*)
corruption	Chi-square	,686	4,463	4,009	2,113
	df	1	1	1	1
	Sig.	,407	,035(*)	,045(*)	,146
other	Chi-square	3,576	,921	1,579	1,403
	df	1	1	1	1
	Sig.	,059(a)	,337(a)	,209(a)	,236(a)

Results are based on nonempty rows and columns in each innermost subtable.
* The Chi-square statistic is significant at the 0.05 level.
a More than 20% of cells in this subtable have expected cell counts less than 5. Chi-square results may be

26. Innovation and corruption

		Unfair competition: corruption	
		,00	yes
		Count	Count
Innovator	non	97	24
	yes	133	31

Pearson Chi-Square Tests

		Unfair competition: corruption
Innovator	Chi-square	,039
	df	1
	Sig.	,844

Results are based on nonempty rows and columns in each innermost subtable.

		Unfair competition: corruption	
		,00	yes
		Count	Count
Size		19	5
	Small ent.	115	31
	Medium ent.	51	7
	Micro ent.	23	10
	Large ent.	22	2
Sector		14	1
	Construction	60	20
	Manufacturing	107	17
	Services	49	17

Pearson Chi-Square Tests

		Unfair competition: corruption
Size	Chi-square	6,752
	df	4
	Sig.	,150(a)
Sector	Chi-square	7,462
	df	3
	Sig.	,059

Results are based on nonempty rows and columns in each innermost subtable.
a More than 20% of cells in this subtable have expected cell counts less than 5. Chi-square results may be invalid.

		Unfair competition: corruption	
		,00	igen
		Count	Count
Successful innovator	non	122	29
	yes	108	26

Pearson Chi-Square Tests

		Unfair competition: corruption
Successful innovator	Chi-square	,002
	df	1
	Sig.	,966

Results are based on nonempty rows and columns in each innermost subtable.

Funding:		Unfair competition: corruption ,00 Count	Unfair competition: corruption yes Count
EU funding	yes	25	9
Funding from the state	yes	13	4
Development loans	yes	34	3
Venture capital	yes	6	0
Private funds	yes	15	5
Other	yes	18	3

Pearson Chi-Square Tests

Funding:		Unfair competition: corruption
EU funding	Chi-square	.
	df	.
	Sig.	.
Funding from the state	Chi-square	.
	df	.
	Sig.	.
Development loans	Chi-square	.
	df	.
	Sig.	.
Venture capital	Chi-square	.
	df	.
	Sig.	.
Private funds	Chi-square	.
	df	.
	Sig.	.
Other	Chi-square	.
	df	.
	Sig.	.

Results are based on nonempty rows and columns in each innermost subtable.

Concern:		Unfair competition: corruption ,00 Count	Unfair competition: corruption yes Count
Acquisition of technical information	yes	20	7
Acquisition of specialized knowledge	yes	26	6
Resistance of management	yes	3	0
Resistance of employees	yes	17	7
Coping with financial problems	yes	55	10
Others	yes	3	0

earson Chi-Square Tests

Concern:		Unfair competition: corruption
Acquisition of technical information	Chi-square	.
	df	.
	Sig.	.
Acquisition of specialized knowledge	Chi-square	.
	df	.
	Sig.	.
Resistance of employees	Chi-square	.
	df	.
	Sig.	.
Resistance of employees	Chi-square	.
	df	.
	Sig.	.
Coping with financial problems	Chi-square	.
	df	.
	Sig.	.
Others	Chi-square	.
	df	.
	Sig.	.

Results are based on nonempty rows and columns in each innermost subtable.

Source of knowledge		Unfair competition: corruption	
		,00	yes
		Count	Count
Employees	yes	77	19
Costumers	yes	30	6
Competitors	yes	22	6
Professional forum, literature	yes	44	9
Co-operation with companies	yes	20	5
Bridging institutions	yes	1	0
Co-operation with universities	yes	23	6

Pearson Chi-Square Tests

Tudás forrása:		Unfair competition: corruption
Employees	Chi-square	.
	df	.
	Sig.	.
Costumers	Chi-square	.
	df	.
	Sig.	.
Competitors	Chi-square	.
	df	.
	Sig.	.
Professional forum, literature	Chi-square	.
	df	.
	Sig.	.
Co-operation with companies	Chi-square	.
	df	.
	Sig.	.
Bridging institutions	Chi-square	.
	df	.
	Sig.	.
Co-operation with universities	Chi-square	.
	df	.
	Sig.	.

Results are based on nonempty rows and columns in each innermost subtable.

Matter of success		Unfair competition: corruption	
		non	yes
		Count	Count
Solution of the occurred problem	,00	66	12
	yes	42	14
Rise of revenues	,00	73	21
	yes	35	5
Improvement of competitiveness	,00	28	11
	yes	80	15

Pearson Chi-Square Tests

Siker lényege:		Unfair competition: corruption
Solution of the occurred problem	Chi-square	1,927
	df	1
	Sig.	,165
Rise of revenues	Chi-square	1,737
	Df	1
	Sig.	,187
Improvement of competitiveness	Chi-square	2,725

	df	1
	Sig.	,099

Results are based on nonempty rows and columns in each innermost subtable.

		Unfair competition: corruption	
		non	yes
Impact of crisis		Count	Count
constraining	yes	89	37
	non	0	0
new products	yes	30	4
	non	0	0
new technology	yes	20	3
	non	0	0
new markets	yes	32	9
	non	0	0
operational renewal	yes	29	8
	non	0	0

Pearson Chi-Square Tests

Impact of crisis		Unfair competition: corruption
constraining	Chi-square	.
	df	.
	Sig.	.
new products	Chi-square	.
	df	.
	Sig.	.
new technology	Chi-square	.
	df	.
	Sig.	.
new markets	Chi-square	.
	df	.
	Sig.	.
operational renewal	Chi-square	.
	df	.
	Sig.	.

Results are based on nonempty rows and columns in each innermost subtable.

Intent of innovation		Unfair competition: corruption	
		non	yes
		Count	Count
Enlargement of production	,00	55	16
	yes	78	15
Cost cutting	,00	69	18
	yes	64	13
Improvement of quality	,00	53	14
	yes	80	17
Own usage of innovation tax	,00	130	30
	yes	3	1
Other	,00	132	31
	yes	1	0

Pearson Chi-Square Tests

Intent of innovation		Unfair competition: corruption
Enlargement of production	Chi-square	1,078
	df	1
	Sig.	,299
Cost cutting	Chi-square	,386
	df	1
	Sig.	,534
Improvement of quality	Chi-square	,294
	df	1
	Sig.	,588
Own usage of innovation tax	Chi-square	,099
	df	1
	Sig.	,753(a,b)
Other	Chi-square	,235
	df	1
	Sig.	,628(a,b)

Results are based on nonempty rows and columns in each innermost subtable.
a More than 20% of cells in this subtable have expected cell counts less than 5. Chi-square results may be invalid.
b The minimum expected cell count in this subtable is less than one. Chi-square results may be invalid.

27. Logistic model

Explanatory variables entered into the model

Name of dependent	Type of dependent	Short name
Number of employees	scale	K2
Revenues, million HUF	scale	K3
New supply sources, commodities	binary	K6
Training of employees	binary	K7
Intent of innovation: expanding production, services	binary	Céltermbőv
Intent of innovation: Cost cutting, improvement of effectiveness	binary	Célktgcs
Intent of innovation: Improvement of quality, competitiveness	binary	Célminjav
Intent of innovation: own usage of innovation tax	binary	Célinnovj
Intent of innovation: other	binary	Célegyéb
Take-off: marketing department	binary	Kiindértékesítő
Take-off: production department	binary	Kiindgyárt
Take-off: technical designer department	binary	kindműszterv
Take-off: administration department	binary	kiindadmin
Take-off: management	binary	kiindcégvez
Take-off: owner, parent company	binary	kiindtulaj
Take-off: other	binary	kiindegyéb
Source of knowledge: employees	binary	Tudforrcégmunkatárs
Source of knowledge: customers	binary	Tudforrvevők
Source of knowledge: competitors	binary	Tudforrverseny
Source of knowledge: professional forum, literature	binary	Tudforrszakmai
Source of knowledge: co-operation with companies	binary	Tudforrvállalati
Source of knowledge: bridging institutions	binary	Tudforrinnovációs
Source of knowledge: co-operation with universities, research institutions	binary	tudforregyüttműködés
Funding: EU-funding	binary	Püiuniós
Funding:: funding from state	binary	Püiegyébállami
Funding:: development loans	binary	Püifejlesztésihitel

Funding:: venture capital	binary	Püikockázati
Funding:: magánforrás	binary	Püimagán
Funding:: egyéb	binary	Püiegyéb
Actors of competition	ordinal	K17
Main customer: public sector	binary	Állvevő
Main customer: business sector	binary	üzlvevő
Main customer: private sector	binary	magánvevő
Characteristics of competition	ordinal	K19
Unfair competition: cartels	binary	Versenykorlátozó
Unfair competition: tax avoiding, blackleg work, trafficking	binary	Adóelkerülés
Unfair competition: corruption	binary	Korrupció
Unfair competition: other	binary	Egyébtisztességtelen
Sector: manufacturing:	binary	Ipar
Sector. construction	binary	Építőipar
Sector: services	binary	Szolgáltatás

Case Processing Summary

Unweighted Cases(a)		N	Percent
Selected Cases	Included in Analysis	189	66,3
	Missing Cases	96	33,7
	Total	285	100,0
Unselected Cases		0	,0
Total		285	100,0

a If weight is in effect, see classification table for the total number of cases.

Dependent Variable Encoding

Original Value	Internal Value
non	0
yes	1

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95,0% C.I.for EXP(B)	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Step 1(a)	K2	,003	,002	2,451	1	,117	1,003	,999	1,007
	K3	,000	,000	2,672	1	,102	1,000	1,000	1,000
	K6	-,241	,717	,113	1	,737	,786	,193	3,203
	K7	-,181	,598	,092	1	,762	,834	,258	2,692
	Céltermbőv	1,647	,609	7,320	1	,007	5,190	1,574	17,110
	Célktgcs	-,050	,605	,007	1	,934	,951	,290	3,115
	Célminjav	,143	,625	,052	1	,819	1,154	,339	3,931
	Célinnovj	21,608	20749,557	,000	1	,999	2422002101,964	,000	.
	Célegyéb	-7,512	41510,112	,000	1	1,000	,001	,000	.
	Kiindértékesítő	1,009	,661	2,333	1	,127	2,743	,751	10,013
	Kiindgyárt	,929	,707	1,727	1	,189	2,531	,634	10,109
	kindműszterv	,186	,929	,040	1	,841	1,205	,195	7,445
	kiindadmin	-,579	,985	,345	1	,557	,561	,081	3,863
	kiindcégvez	,166	,817	,041	1	,839	1,181	,238	5,858
	kiindtulaj	24,080	10373,743	,000	1	,998	28682603662,072	,000	.
	kiindegyéb	,669	1,283	,272	1	,602	1,952	,158	24,152
	Tudforrcégmunkatárs	,656	,585	1,260	1	,262	1,927	,613	6,061
	Tudforrvevők	-,019	,741	,001	1	,980	,981	,229	4,197
	Tudforrverseny	,612	,756	,656	1	,418	1,844	,419	8,108
	Tudforrszakmai	,804	,643	1,562	1	,211	2,234	,633	7,880
	Tudforrvállalati	-1,121	,902	1,546	1	,214	,326	,056	1,908
	Tudforrinnovációs	18,507	40192,970	,000	1	1,000	108986715,689	,000	.
	tudforregyüttműködés	2,698	1,114	5,867	1	,015	14,844	1,673	131,696
	Püiuniós	2,255	,940	5,752	1	,016	9,532	1,510	60,171

Püiegyébállami	,854	1,090	,613	1	,434	2,349	,277	19,905
Püifejlesztésihitel	-,423	,742	,325	1	,568	,655	,153	2,803
Püikockázati	20,626	14751,145	,000	1	,999	907015504,702	,000	.
Püimagán	,544	,937	,337	1	,561	1,723	,275	10,817
Püiegyéb	1,630	1,179	1,910	1	,167	5,102	,506	51,483
K17	-,983	,378	6,773	1	,009	,374	,178	,784
Állvevő	,701	,642	1,194	1	,275	2,016	,573	7,091
üzlvevő	,553	,734	,567	1	,451	1,738	,413	7,320
magánvevő	,003	,582	,000	1	,995	1,003	,321	3,141
K19	,802	,436	3,376	1	,066	2,229	,948	5,243
Versenykorlátozó	,692	,722	,917	1	,338	1,997	,485	8,224
Adóelkerülés	-,321	,700	,211	1	,646	,725	,184	2,857
Korrupció	-,600	,731	,672	1	,412	,549	,131	2,302
Egyébtiszteségtelen	1,956	1,825	1,148	1	,284	7,068	,198	252,793
Ipar	-1,309	1,858	,496	1	,481	,270	,007	10,313
Építőipar	-1,826	1,919	,905	1	,342	,161	,004	6,933
Szolgáltatás	-1,496	1,879	,634	1	,426	,224	,006	8,898

a Variable(s) entered on step 1: K2, K3, K6, K7, Céltermbőv, Célktgcs, Célminjav, Célinnovj, Célegyéb, Kiindértékesítő, Kiindgyárt, kindműszterv, kiindadmin, kiindcégvez, kiindtulaj, kiindegyéb, Tudforrcégmunkatárs, Tudforrvevők, Tudforrverseny, Tudforrszakmai, Tudforrvállalati, Tudforrinnovációs, tudforregyüttműködés, Püiuniós, Püiegyébállami, Püifejlesztésihitel, Püikockázati, Püimagán, Püiegyéb, K17, Állvevő, üzlvevő, magánvevő, K19, Versenykorlátozó, Adóelkerülés, Korrupció, Egyébtiszteségtelen, Ipar, Építőipar, Szolgáltatás.

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	134,469	41	,000
	Block	134,469	41	,000
	Model	134,469	41	,000

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	127,541(a)	,509	,679

a Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	13,177	8	,106

Contingency Table for Hosmer and Lemeshow Test

		Innovátor = nem		Innovátor = igen		Total
		Observed	Expected	Observed	Expected	Observed
Step 1	1	18	18,049	1	,951	19
	2	16	16,097	3	2,903	19
	3	17	13,515	2	5,485	19
	4	7	9,145	12	9,855	19
	5	4	5,372	15	13,628	19
	6	2	3,031	17	15,969	19
	7	1	1,545	18	17,455	19
	8	1	,569	18	18,431	19
	9	1	,105	18	18,895	19
	10	0	,001	18	17,999	18