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Comparing regions of the European Union according to their innovation performance

Krisztina Szujó

Széchenyi István Egyetem

Regionális és Gazdaságtudományi Doktori Iskola

Nowadays every day of our lives is affected by innovation. We only have to watch advertisements to be enlightened about the innovative qualities of a new shampoo, facial crème, or a car. Member countries of the EU, and also regions in a country stand on different development level, and this difference is also viable at the innovation, it is measurable. There are statistics demonstrating the differences. During the preparation of this study I would like to analyse the extent of the division between regions, and the explanation of the existing difference.

Since 2001, each year the Committee demonstrates the European Innovation Scoreboard (EIS) comparing innovation results of each member countries. The countries are marked on a scale 0 to 1 in the following categories, and these ratings generate the merged innovation index:

A) Enablers for the company's external environment	
a) Human resources	b) Financing and support
ICT, Social Sciences and Humanities graduates in the age group 20-29	Publicly-funded R & D expenditures (% of GDP)
The proportion of graduates in ICT, social sciences and humanities in the 25-34 age group	Venture capital (% of GDP)
Proportion of graduates with 25-64 year-olds	The share of bank loans to the private sector from GDP
Rate of lifelong learning in the 25-64 age group	The proportion of companies employing broadband internet with at least 10 employees
The proportion of people with a maturity of 20 to 24 years of age	

B) Corporate activities		
a) Corporate investment	b) Relationships and entrepreneurial willingness	c) Intermediate products of innovation (throughputs)
R & D expenditure (% of GDP)	The proportion of SMEs performing in-house innovation activities across all SMEs	The number of EPO patents [Patents filed by the European Patent Office] per 1 million inhabitants
Information technology expenditure (% of GDP)	Ratio of SMEs participating in innovation co-operation (from all SMEs)	Number of Community trademarks per 1 million inhabitants
Non-R & D Innovation Expenditures in Turnover Revenues	Share of newly emerging and abolished SMEs from all SMEs	Number of community sample holdings per 1 million inhabitants
	Proportion of articles made in co-ownership by business and public sector researchers per 1 million inhabitants	The ratio of technology exports and imports from GDP

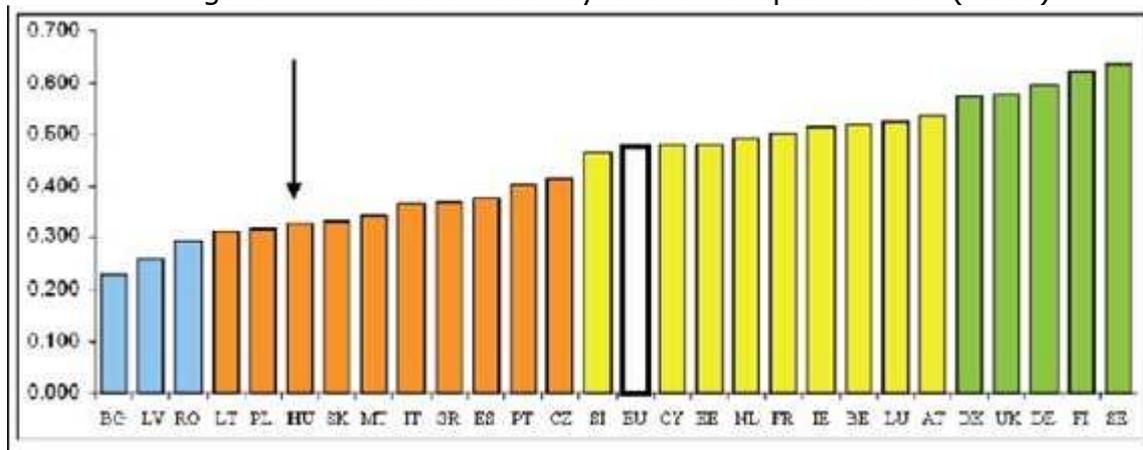
C) The result of innovation

a) Innovators	b) Economic impacts
- Proportion of SMEs introducing product or process innovation from all SMEs	- Employed in middle and high-tech manufacturing in proportion to employees
- The proportion of SMEs introducing marketing or organizational innovation from all SMEs	- Employing knowledge-intensive service sectors in proportion to employees
- Innovators improving the efficiency of their resources in the following 2 categories	- Exports of medium and high technology products to total exports
- Ratio of innovative companies that reduce their labor costs in terms of emissions	- Export of knowledge-intensive services in proportion to total service exports
- The proportion of innovative companies that reduce their inputs in terms of material and energy consumption in terms of output	- Revenues from sales of new products on the market in proportion to sales
	- Revenues from sales of new products to the company in proportion to sales

According to the innovation index, member countries can be ranked by their innovativeness.

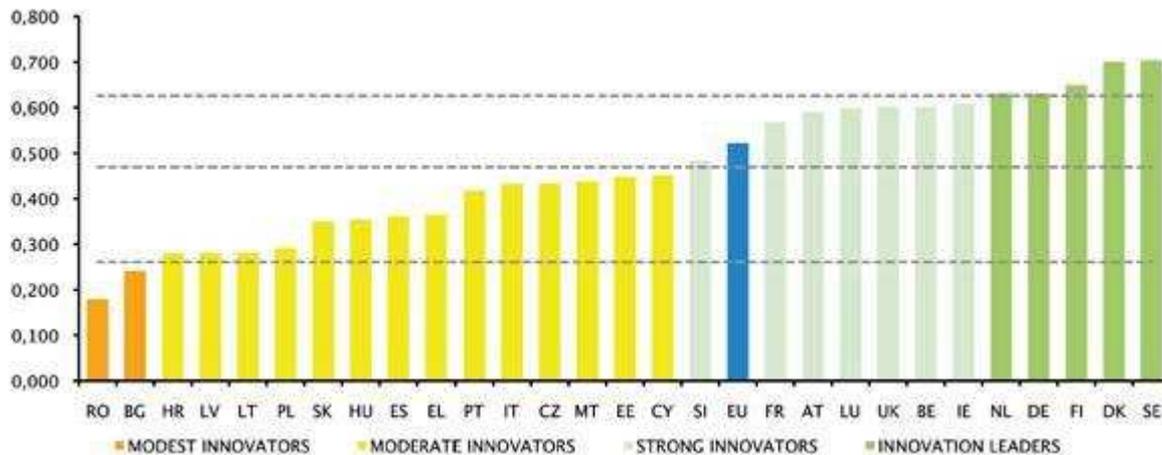
Comparing the diagrams below, it is observable that in the 7-year-long period from 2009 to 2016 the ranking order within the power groups altered, and also movements between groups are also noticeable. There is also an overlap between innovation efficiency and the above-mentioned competitiveness classification.

Figure 1. Innovation activity of the European Union (2009)



Source: European innovation index

Figure 2. Innovation activity of the European Union (2016)



Source: Scoreboard for the innovative Union in 2016

After the innovation efficiency, member countries can be classified into the following power groups:

- Innovation leaders: Denmark, Finland, Germany, the Netherlands and Sweden – their performance is far above the union average.
- Strong innovators: Austria, Belgium, France, Ireland, Luxembourg, Slovenia and the United Kingdom. The innovation performance of these countries is above or near the Union average.
- Moderate innovators: Croatia, Cyprus, the Czech Republic, Estonia, Greece, Hungary, Italy, Lithuania, Malta, Poland, Portugal, Slovakia, Latvia and Spain – their efficiency is below the Union average.
- Modest innovators: Bulgaria and Romania. The performance of these countries is far below the Union average.

Among the moderate innovators several Central-Eastern-European countries are discoverable, and the modest innovators come also out of the Central-Eastern-European states.

It is evident, that our nation has put down an outstanding progress; however the difference from the Union average is still significant. The Czech Republic has lost its leading position inside its power group. Hungary has passed Slovakia and Poland from the Visegrad Four. The newest member, Croatia got into the group of moderate innovators as a file-closer. There has been a change of rank between the modest innovators, Romania dropped from its leading position to the last place, and Lithuania stepped forward to the next level.

Studying the state of development of Central and Eastern-European countries from a different aspect it is noticeable that in gross domestic expenditure on R&D (GERD) the modest innovators overpower by force, however it is still not enough to close up. Developed countries are able to spend more on innovation – they realize economy development on a

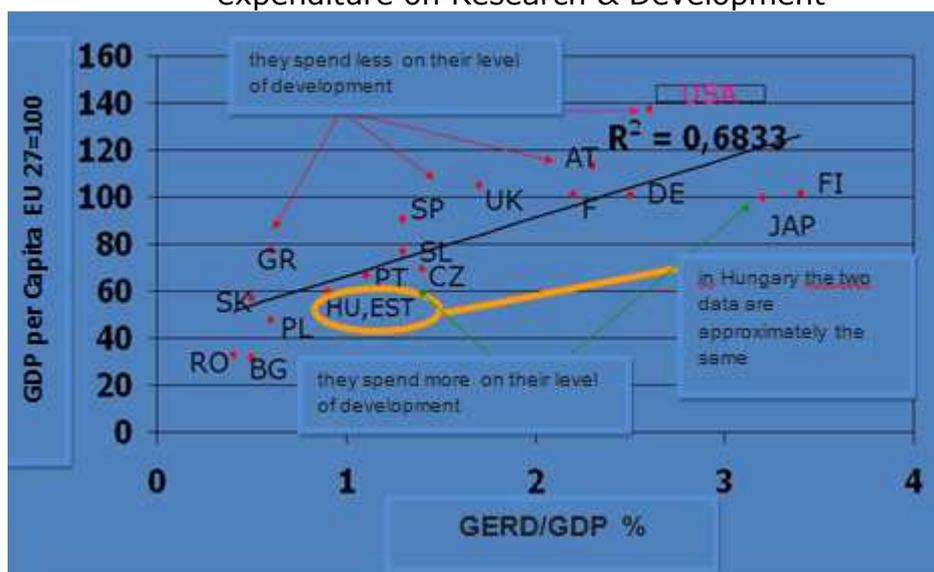
shorter term. Nevertheless, spending outstandingly much on research and education may result the key of close up to these countries – for example the case of Finland.

GERD is the internationally accepted indicator of measuring innovation efficiency. Gross Expenditure on Research and Development the gross inputs of the economy on R&D. GERD/GDP is a macro indicator of R&D which allows to rank the countries of the world into four classes:

- the "leaders" (GERD/GDP > 2%) – these countries form the international tendencies of R&D (Finland, Sweden, USA, Israel, etc.)
- the "followers" (GERD/GDP 1 to 2%) – developed countries which take part mainly on the supply side on R&D market (Canada, Italy, Norway, Austria, Ireland, etc.)
- the "midfield" (GERD/GDP 0,5 to 1%) – these countries take part on the demand side in the international R&D cooperation (for example Central-Eastern-European countries)
- the "marginal performers" (GERD/GDP 0,2 to 0,5%) – R&D sector works in these countries, however their international attendance is not considerable.

BERD (Business Expenditure on Research and Development). indicator of business expense on R&D, and also a main substance of GERD. Relative ratio between BERD and GERD shows strong connection with economy development level of a country and also with the changing of GERD/GDP rate. In the circle of "leader" countries BERD takes 2/3 part of GERD, however in the followers group it worth 1/2, in the midfield nearly 1/3.

Figure 3. Coherence between economy development (GDP/person) and Gross expenditure on Research & Development

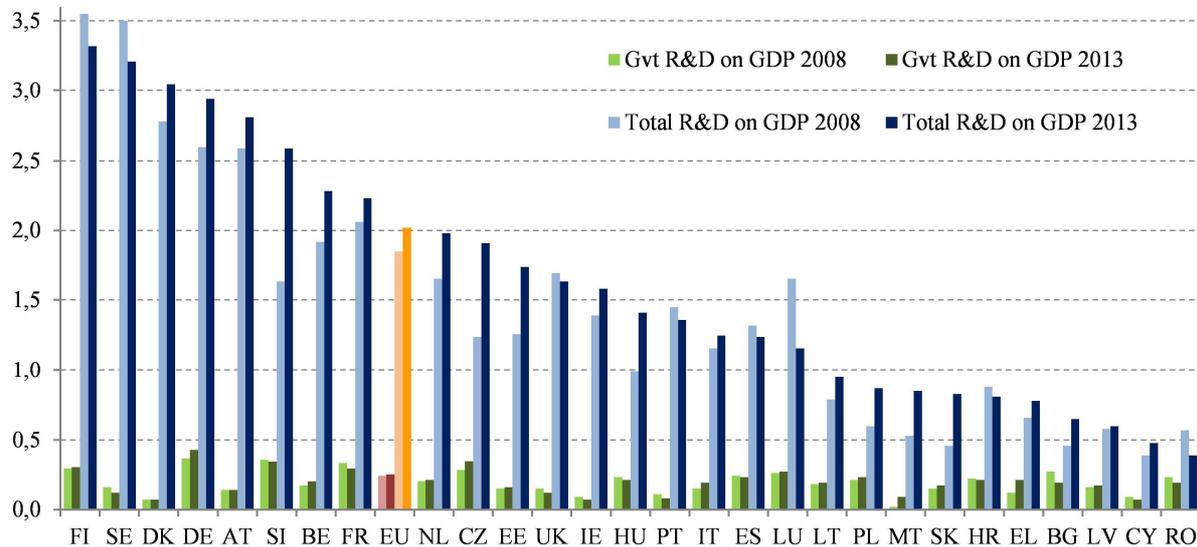


Source: *Ádám Török: R&D and its competitiveness*

According to this diagram it can be stated that among Central-Eastern-European countries out nation takes an upscale position in gross domestic

expenditure on R&D. From this region the Czech Republic and Estonia own the highest ranks, overtaking the United Kingdom and Ireland too. With its level of 1,4% Hungary falls behind from the 2% Union average, but the modest innovators, Bulgaria, Latvia and Romania only reach 0,5%.

Figure 4. The R&D amount in proportion to GDP (2013)



Source: eur-lex.europa.eu, Eurostat

Between the first (Finland) and the last (Romania) the difference is more than octuple. May it be possible for the latest joiners – economically undeveloped and not so innovative countries – to catch up with the stable innovation leaders? The European Union recognise the problem that the economic dominance of Europe is decreasing, and inside EU there are huge differences between economic development levels of member countries.

The European Commission in its publication on regional policy lays down the following ones. "Europe needs to invest more in research and innovation as it is a key driver of economic growth and jobs. ERDF funds invest in both basic and applied research, encouraging all actors in the innovation chain (research institutes, universities, technological centres, entrepreneurs, large and small companies, financial institutions, etc.) to work together to generate the innovative products and services which EU countries needs to remain competitive internationally."

Manfred Moldaschl and Nico Stehr (2010) conceive that before the crisis known as "the crisis of the century" large economical development was in centre, and to get rid of economical problems such as increasing unemployment and labour shortage in whole industry, countries getting indebted, financial difficulties of social services. According to the authors "the real innovation is the difference between the new increasing theory and the previous increasing theories is to reject accepting not to have suggestibility, and inner reasons become sought after in technological developments (Moldaschl & Stehr, 2010:148).

Innovative society may help entrepreneurs to build out competitive advantage, to realise higher added value, and keep the jobs through incentive of the economical activities, or even create new jobs.

I suppose that the least developed regions are in countries that have high indicators on economic judgement and have an imposing industrial part. In these rankings the higher education standards also take part, and so do cooperation abilities between professional training and universities, research institutes and corporations.

Developed economy assumes a well-built infrastructure. Available higher wage levels magnetize the best grey matter of other countries and regions to these regions, smart and creative experts, whose expertise is needed to reach the highest level of innovation. To my mind political situation of the last century also explains the differences. For 40 years progression in Central-Eastern-European countries had to brake; however western countries were able to soar. I believe regions near universities and research institutes are able to reach the highest ranking. Development mainly concentrates in capitols and big cities. I would like to support my assumption below.

Zoltán Bugovics in his work titled *Society, identity and regional development* (2007) is seeking an answer among others, why regionalisation is so important for us. He identified the four most important factors as the following ones:

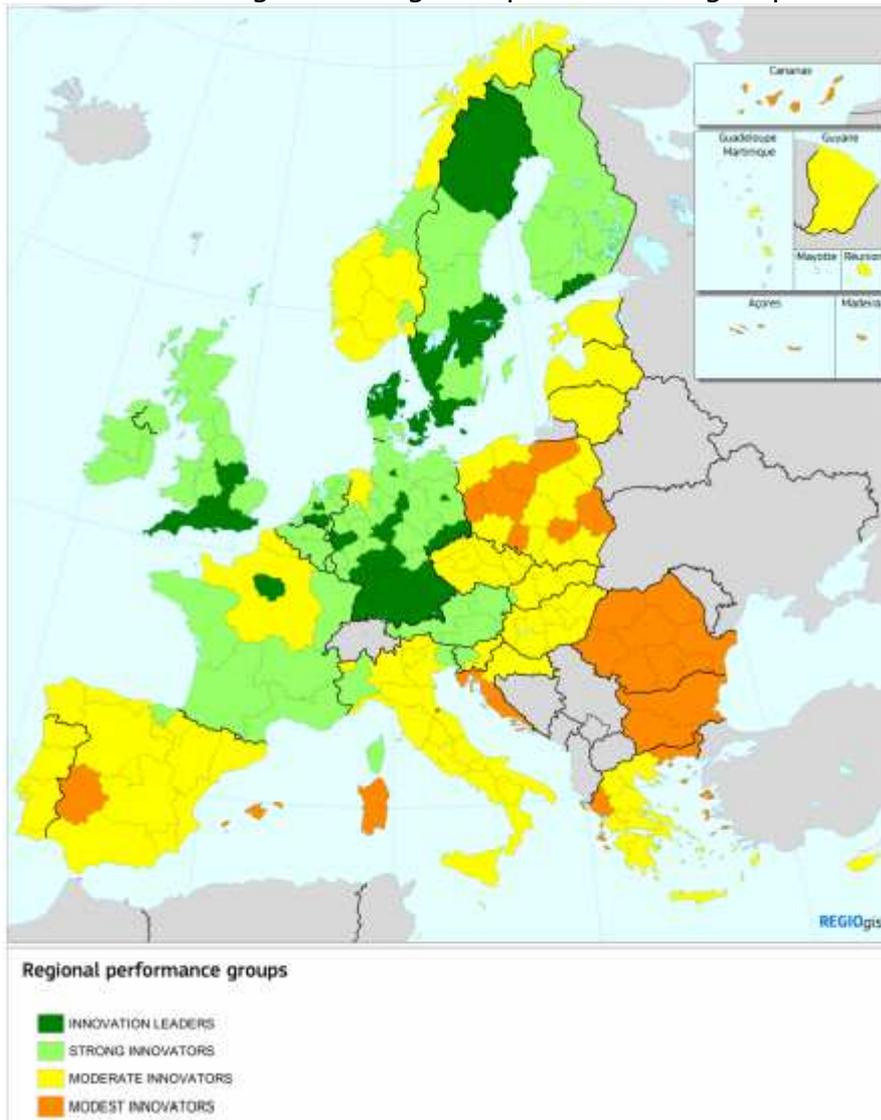
- development of spreading terms of innovation
- factors related to structural analogy of foreign economic relations
- modernisation of polity structure
- access to regional programming and to structural funds.

According to regionalisation a shaded picture can be obtained of innovation activities of some countries. It is easier to identify developing factors that are able to improve the innovation factor, and through that the level of economic development.

Every year beside the previously featured innovation scoreboard a regional innovation ranking would be compiled, and it tags European regions into four categories:

- Innovation leader regions (in 2016 36 regions belonged into this category)
- Strong innovator regions (65 regions)
- Modest innovator regions (83 regions)
- Modest innovator regions (30 regions)

Figure 5. Regional performance groups



Source: Regional innovation scoreboard

Regional innovation scoreboard is constructed as follows.

- regions of 22 EU member countries
- regions of Norway
- Cyprus, Estonia, Latvia, Lithuania, Luxembourg and Malta as countries as there are no administrative levels in these countries.

Leading innovators of the regions come out in the first instance from Western-European and Scandinavian countries with a luckier way of development: Denmark, Finland, France, Germany, the Netherlands, Sweden and the United Kingdom.

In most of the countries regions of the same country are classified in the same class – this observation means that regional and national innovation results are related. In seven countries the innovation performance of the regions is completely homogenous, in Austria, Belgium, the Czech Republic, Hungary, Ireland and Romania. In 12

countries 2 power groups, in 4 states 3 classes are traceable at innovation efficiency. The size of these countries explains that, and also regional innovation centres have evolved: France, Germany, Italy and Spain. Regional rating is mostly equivalent to the rates for each country at the European innovation scoreboard.

Figure 6. European innovation scoreboard (2016)



Source: European innovation scoreboard 2016

After Zoltán Bugovics (2007) in most of the countries one or more innovation centres are identified, where intellectual capital, production capacity and infrastructure relations are present. These also help forward socio-economic development, structure changing and innovation. The thoughts of Imre Lengyel and János Rechnichter (2004:254) are in line with the statement above: "Evolving a new product requires considerable human capital and R&D investments, innovation potential, qualified manpower and venture capital; all of these concentrate specifically in developed countries, and in the economical agglomeration of their biggest cities."

The next statement gives further explanation for ranking the different regions. "Choosing premises at state-of-art technology is placed to the economical centre, they do not stand out to the peripheries, because continuous development requires the presence of numerous development and research apparatus, so the best option for them is to concentrate in the agglomeration regions of the centres." (Lengyel & Rechnitzer, 2004:255) This is why it is surprising that "until the recent years innovation was not given enough emphasis in forming regional politics"

(Gál, 2013:88). However, "*Beneath work and capital, technical knowledge must be considered as important and determining factor of regional economic development*" (Rechnitzer, 1994:118).

Another explanation on evolution of regional differences: "Formation of new products is not connected to the agglomeration, however novelties are preferably present in core areas, because there invention is more powerful, economical environment is more inspirational, settlement conditions are favourable, information is more versatile, what is to say innovation milieu is richer, its effects are occurring in more levels and spheres." (Imre Lengyel and János Rechnitzer 2004:256) quotes Camagnit (1992).

The explanation for *raison d'être* of regions by Zoltán Gál (2013:11). "*Justification for raison d'être of the Regional Innovation Systems (RIS) and the connecting policies are, that regionality is organic part of innovation processes.*"

If we take a look behind regional performance we might find the reason, what makes a region highlight, when others take a back seat: Small businesses are often considered to be main sources of innovation. Their innovation capacity is limited, because they usually do not possess enough resources to react to fast technical changes. Problems appear more serious at corporations of a less developed region, where main difficulty at these small businesses is not their size but their isolation. In a less developed region evolving a modernization strategy based on innovation and applying new technology might be opposed with a strategy built on comparative advantages, which want to use the benefits coming from low wages (Kengyel, 2002:40).

Certain factors are recognizable which are common in developed regions. According to the thoughts of Ákos Kengyel (2002) I have identified the following ones:

- How much is a region able to attract foreign capital investments. Judgement on a region depends strongly in the country.
- Region located in a country with a big domestic market, for example Germany, France.
- Their infrastructural supplement is excellent.
- Skilled workforce is present.
- Producing costs, especially wage costs are low.
- They are located near a port, and there is also a good quality road network leading to the port.
- There is an international airport located in the region.
- There is a well-built fast-track train network.
- The state or even the region provides special discounts for investors.

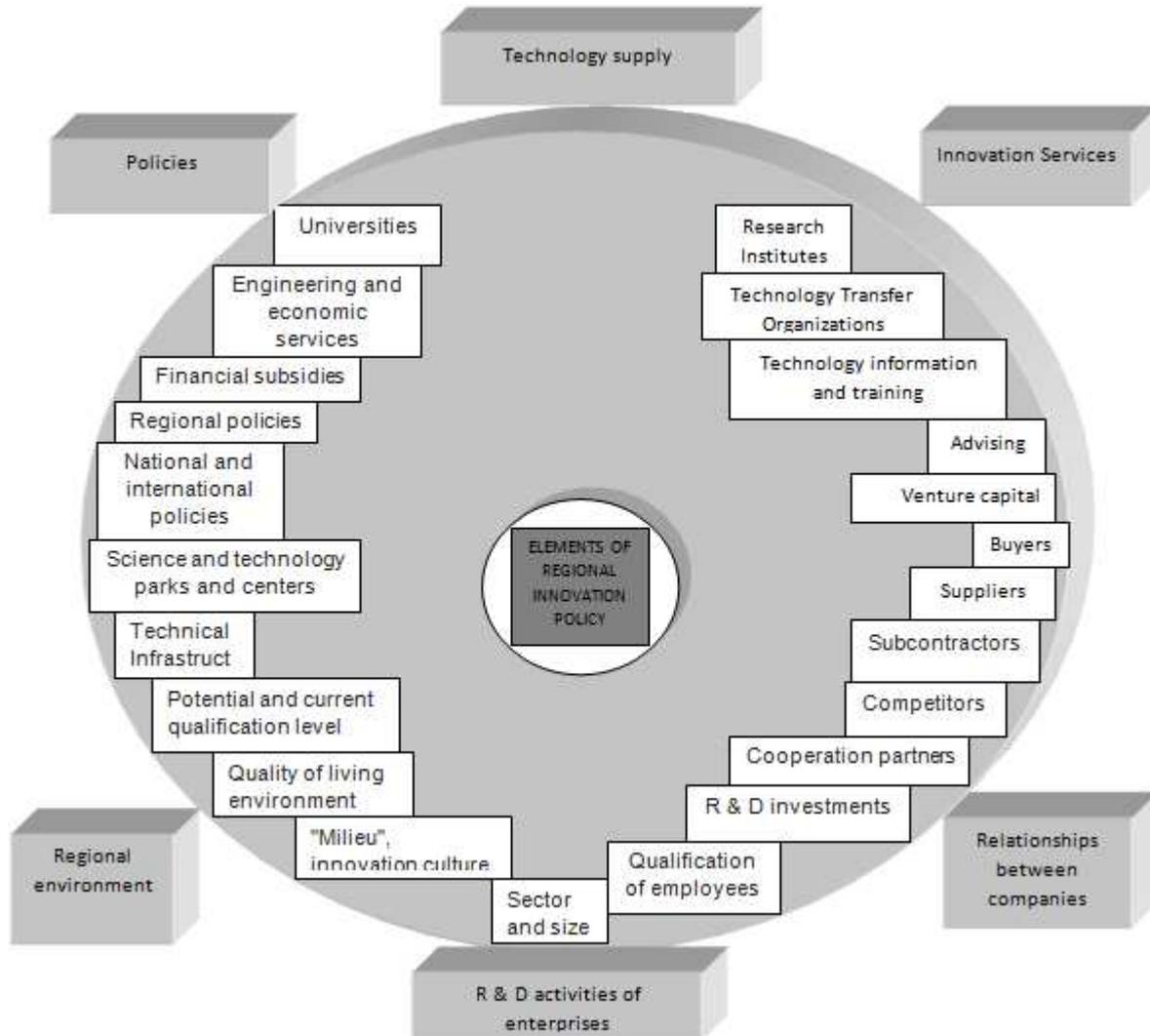
It may be disadvantageous:

- high wages
- language difficulties
- cultural differences
- peripheral location

- uncertain political and law system
- unqualified workforce
- weak industrial background.

Tibor Dóry and János Rechnitzer (2000) have identified factors determining regional innovation as seen in the figure below.

Figure 7. Factors determining regional innovation



Source: Dóry-Rechnitzer: *Regional innovation strategies (2000)*(own editing)

As a summary it can be stated that research and development, and also high-levelled innovation can be identified as a factor determining the economical development. The European Union – although it shows an advanced level of innovation on the average – does not have a homogenate innovation indicator. As to my hypothesis, more factors influence the ranking of regions, like their location, infrastructure, and existence of higher education and research facilities, political structure for or against development in the past. However to my mind, anyone who follows at least a bit daily politics and knows the history, it would not mean any difficulties to explain why regions of Germany with car factories

are far on a higher level than the Western-Dunántúl region of our country, where there are also car factories. Innovation of big factories happen in the home country, parent company supports less the innovation costs here. Overcoming the lag is nearly impossible, handicap cannot be introduced even with targeted support. Although I still believe in the ingenuity of Hungarians and national and EU supports patronizing innovation. So our regions and especially our own region would improve itself and get into the class of strong innovators – like Bratislava region did it before.

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