

## **Financing Innovational and Research Development Activities Before and After the Crisis in Hungary**

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**ABSTRACT:** *The study tries to respond to the question how did the financial crisis of 2007-2008 influence the amount and composition of the expenses of the Hungarian innovational research institutes (company, public financial, non-profit organizational and higher education together). As per my first hypothesis outbreak of the crisis could have induced two different reactions from the financiers of the innovations. One of the possible reactions could be retaining and reducing of the innovation expenses due to the crisis-related dropping demand and lower incomes. The other response could be contrary to the above; namely that choosing a kind of preliminary escape they try to reset and increase their incomes to those before the crisis by increasing their innovation expenses despite the reducing demand. My other hypothesis is that the increased budgetary deficiencies and debts of the member countries of the European Union caused these countries reduce their state innovational expenses. As it is clear from the study this was the case in the state budget of Hungary, but due to the crisis, the Hungarian companies increased their innovational costs. However the innovational expenses stagnate in the member countries of the European Union, as compared to the GDP.*

**KEYWORDS:** *innovation and research&development, structure of the sources, financial crisis, Hungary, European Union*

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### **I. INTRODUCTION**

The statement - that the key basis of immediate adaptability to the quickly changing conditions of the global economy is innovation - has become a fully accepted paradigm of the mainstream economics of our days. Lack or restrained measure of the continuous product- and production development, organizational and marketing innovation involves the risk for the national economies and their companies in the global competitions of gradual losing of their space, narrowing of their markets and reducing of their sales. This tendency can lead to loss-making operation and finally to the liquidation of the company. The economic significance of permanent renewal of the company production/service by innovation is in the fact that successful innovation and financial performance are in close relationship both at micro- and macro-economic levels. It is an essential recognition of innovation research that coherence and consensus-generating capacity of the institutional system of a country is of key importance in respect of innovation efficiency (Capron - Cincera, 2012).

Theoretical research defined several aspects of the role of innovation and that of the individuals and the entrepreneurs; I am going to describe the most relevant ones of them. First I have to mention (Schumpeter, 1980) who states that the innovator-entrepreneur disturbs the market balance by doing new things, or things differently. So the entrepreneur breaks the routine activities and produces temporary inconsistency between the output and input prices. In another approach the innovative activity of the individuals and entrepreneurs stimulate also others for doing similarly and thus it contributes to the development of the whole economy. This competitive activity of the entrepreneurs moves the market processes and the technological innovation itself is the manifestation of the entrepreneurial ability (Wront et al., 2005). Similarly (Pretorius et al., 2005) consider that this innovation willingness makes the difference between the entrepreneur and the company owner. Changes in the concept of entrepreneurship in the recent times turned the idea of the entrepreneur into a new direction, clearly connecting it to the increase of the economy. Accordingly the entrepreneurs - who put new ideas on the market - induce the changes. Previous statements of the researchers (Wennekers – Thurik, 1999) outline diversity of the activity of the entrepreneurs as innovators, they state that not only acceptance of the novelty is the task of fundamental innovation, but also its induction together with searching the possibilities of moving towards new markets.

That is the theoretical researches do not dispute that innovation is the key of economic growth both in respect of the national economy and the global economy. Continuous increase in innovation and in the level of education together make up the determinant basis of global success of the knowledge-based economy. By

raising company profits - innovation improves competitiveness of the concerned company, it produces new workplaces and increases growth and market share in the given industrial sector both locally and globally (Novák, 2013). Due to strengthening of the international competitiveness of the national economies and their companies it is relevant that the possible most should be spent on innovation. The study examines it in respect of Hungary and it also gives a brief insight into innovation financing of the European Union.

## II. METHODOLOGY

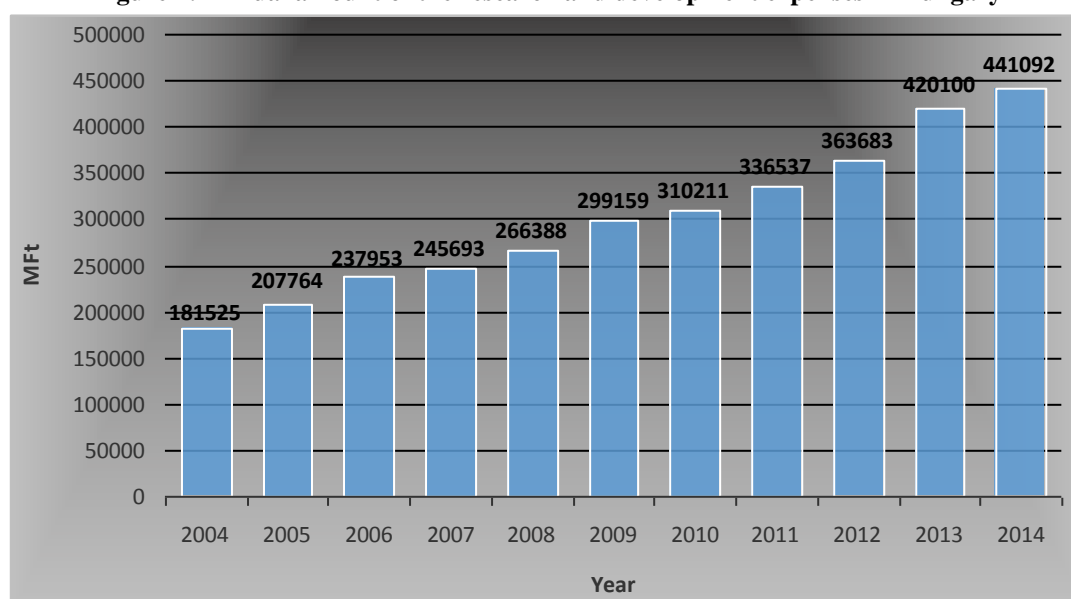
There were available several primary and secondary statistical data sources enabling me for making domestic and international comparisons in respect of innovation and research&development (K+F) including its financing structure, as well as of organizational innovation; they were mainly data from Eurostat and KSH (Central Statistical Office, Hungary) The research is based on the examination of these data, performed by means of classic univariate time series.

Because the study aims at the analysis of the influence of the financial crisis of 2007-2008 on the innovation activity, it is relevant to determine which period is considered by the analysis as before crisis and after crises period. I consider years between 2004 and 2008 to be before crises period and 2009 is considered to be the nadir. This was the year when recession reached its deepest level, when GDP reduced in Hungary by more than 6 per cent and by more than 4 per cent in the Union. Following the nadir in 2009 world economy began ascending and based on the estimates of the international organizations the growth rate was between 4.6-5.0 %. I chose the period between 2010 and 2014 for the after crisis period, in view of the fact that economy has begun growing again in 23 member countries of the union and this tendency continued also in 2011.

## III. THE TENDENCIES OF RESEARCH AND DEVELOPMENT IN THE EXAMINED PERIOD IN HUNGARY AND IN THE EUROPEAN UNION

In the next part of the section I examine the domestic research and development expenses, their ratio to the GDP, the development of the composition of the financial sources of the expenses and finally I show the comparative analysis made with the average values of 28 countries of the European Union.

Figure 1: Annual amount of the research and development expenses in Hungary



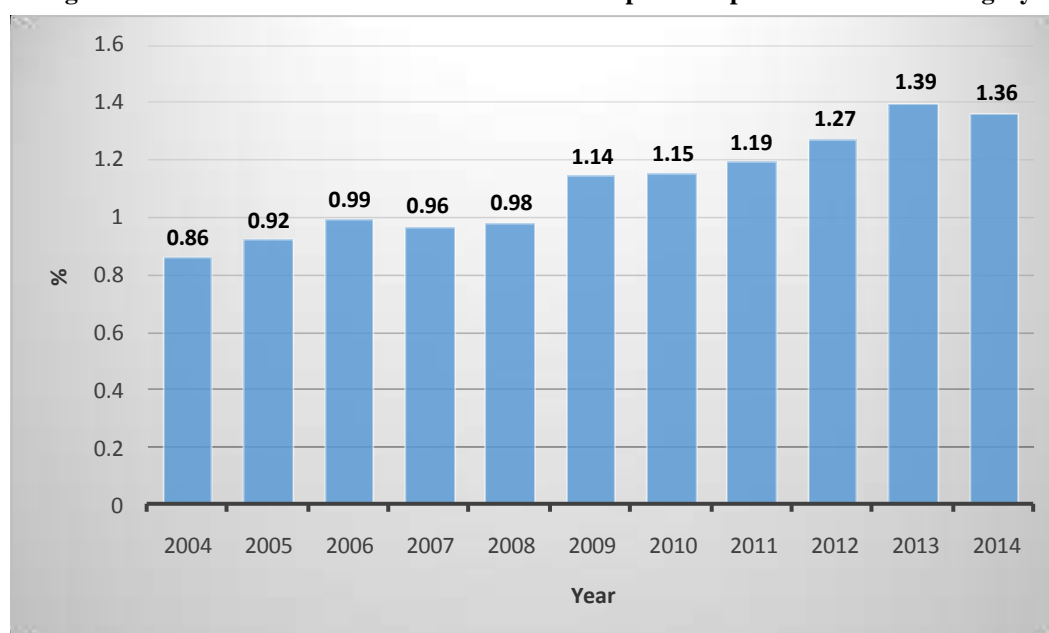
Source: Based on KSH (2017a), own editing

It is clear from the figure that the amount of research and development expenses increased from the 182 thousand million HUF in 2004 to 299 thousand million HUF by 2009; the average annual increase is almost 13 per cent in this period. However the deepest point of the crisis (2009) brought a turning point in the rate of growth; although the absolute amount of the expenses increased to 441 thousand million HUF in 2014 (+ 47 %), the average dynamics of annual growth in the period between 2009 and 2014 does not reach 9.5 per cent. Namely turn of the trend did not occur because the increase remained but its dynamics slowed down after the nadir of the crisis.

Next I will describe some relevant information about the research and development activity in Hungary, based on (NIH, 2013). Company-financed research and development expenses in Hungary have started to grow

from the end of the nineties; their expansion was even more intensive in the recent years. GDP-proportional research and development expenses have increased by 30 per cent and they reached the highest level in 2012 during the past twenty years. However regional concentration of the K+F expenses reduced in the recent years in Hungary, but still 59 HUF of each 100 HUF is spent in Budapest (in the capital). The weight of the region is even higher in the state sector: more than three quarter of the total state K+F expenses is related to the central region. The annual K+F expenses in Hungary make up 120.6 € (33.673 HUF) per capita, being one quarter of the EU average, but it still exceeds the average of the newly joined countries. The large companies spend more by 30 per cent on K+F than the micro-, small- and medium-sized companies together. The smaller the company, the larger is the ratio of state share and the smaller is the share of foreign sources in K+F expenses. The highest K+F expense per one researcher is in the pharmaceutical industry. At the same time the expense demand per one researcher in the sectors representing higher volume of GDP (e.g. vehicle industry, info-communicational services) is below the national economic average.

**Figure 2: Ratio of the domestic research and development expenses to GDP in Hungary**



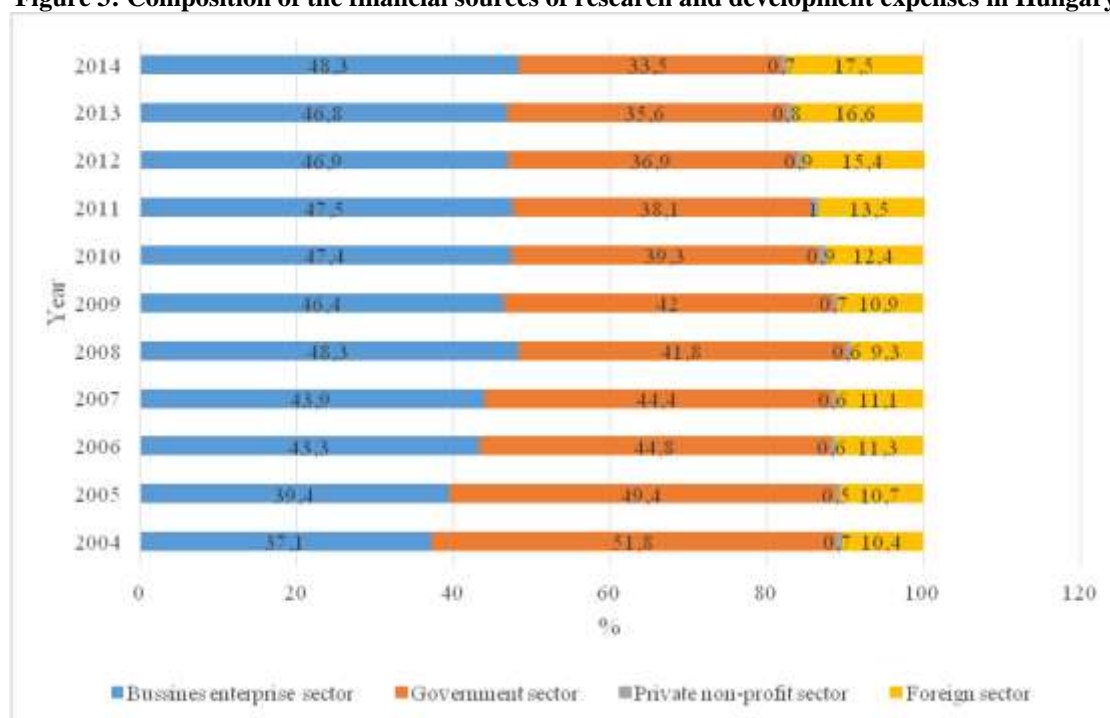
*Source: Based on Eurostat (2017a), own editing*

Figure 2. expressively illustrates that the ratio of research and development expenses increased from 0.86 % in 2004 to 1.14 % by 2009 in the GDP; the time series average of the annual growth of innovation expenses is 0.056 %/year in this period. However this growth dynamics is broken after 2009, because although the rate increases from 1.14 % to 1.36 % between 2009 and 2014, the average of the annual increase time series is only 0.044 %/year. Based on the development of the data of the above time series and of Figure 4. it can be stated that we can rather speak of near-stagnation state than lagging behind.

The ratio of K+F expenses to the GDP has significantly increased to 1.36 % (from the low basis data at the beginning of the period.) (This index was below 1 % in 2004.) Namely each index used in international comparison, too shows improvement of K+F activity. This improvement was however mainly in relation with those companies, whose research and development activity has developed over the average for several years. As an example an increase could be measured in 2013 at the research sites belonging to the national budget, following the continuous reduction characteristic for the past years, and long-lasting relapse was experienced in the higher education.

The companies of the business sector (see the next figure No. 3) play important role in using of the financial sources of the research and development expenses. The size of the company is of great importance in using of the sources. The larger the company is, the greater is the chance of being innovative: One quarter of the small companies, and almost half of the medium-sized companies are innovative in Hungary. At the same time seven of the ten domestic large companies perform innovation activity (NIH, 2013). Almost half of the research and development expenses as to the national economic GDP is used by the business companies in Hungary.

**Figure 3: Composition of the financial sources of research and development expenses in Hungary**



Source: Based on KSH (2017b), own editing

The following tendencies are visible from figure 3. share of the companies in the composition of the financial sources has dynamically increased from 37.1 % to 46.4 % - almost 10 % by 2009, the annual average growth dynamics (average of the time series) was 1.86 %/year in this period. This ratio increased from the 46.4 % of the deepest level of the crisis in 2009 only by 1.9 % to 48.3 %, the average of the annual average growth was only 0.38 %/year. This value is slightly more than one-fifth of the growth rate before the crisis. Significant relapse of the share of national budget in financing of the research and development is especially striking. Although the value increased in absolute amount from 94 thousand million HUF of 2004 to 148 thousand million HUF (see: Figure 1.) but its share of 51.8 % in the initial year drastically reduced to 33.5 % by 2014.

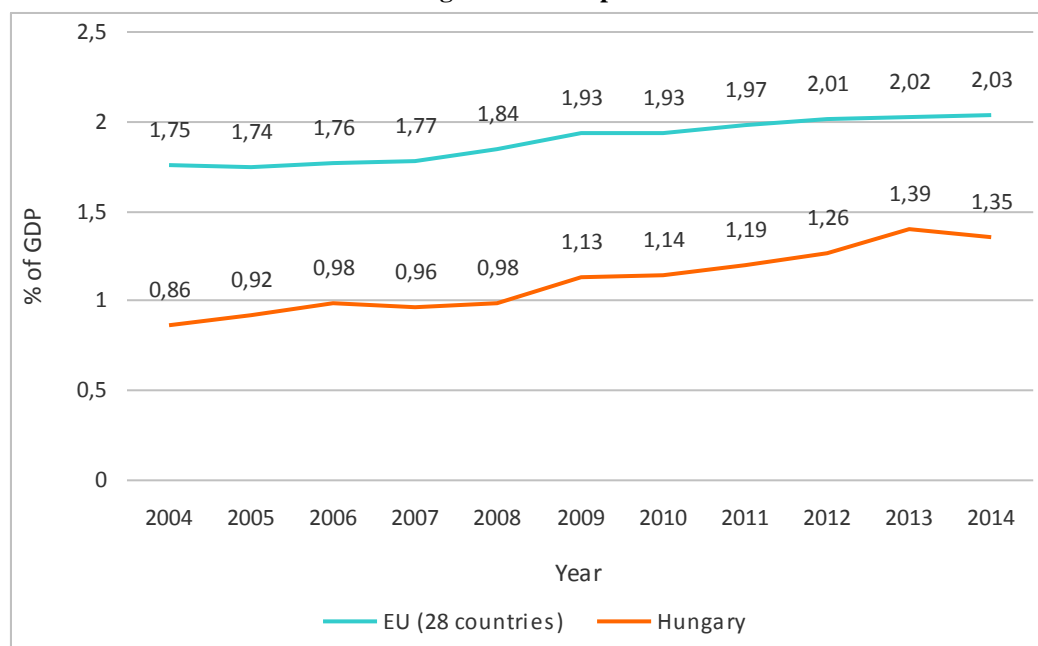
Participation of the other domestic (first of all non-profit) organizations in financing of the research and development can be considered insignificant in Hungary, their share did not even reach one per cent in the examined period. On the contrary innovation-maintaining role of the foreign financial sources became more and more significant in the examined period between 2004 and 2014. Their absolute amount increased from 19 thousand million HUF to 77 thousand million HUF at current prices that is it more than quadrupled. The ratio of foreign financial sources was almost constant in financing of the innovation until crisis year 2009, it was in the range of 9.3-11.3 %. Later, however, it has dynamically increased both in absolute amount (from 33 thousand million HUF to 77 thousand million HUF) and its share (from 10.9 % to 17.5 %).

Increasing importance of the foreign financial sources is shown on the figure by the data that while financing from the state budget in the examined period increased only to 1.6-fold on the basis of the absolute amounts (3.2-fold in case of the undertakings) then the foreign sources raised more than 4.1-fold. Appearance of the European Union sources from 2009 in financing of the domestic research and development gives an explanation to the dynamic increase.

#### IV. COMPARISON OF THE K+F EXPENSES OF HUNGARY WITH THE DATA OF THE EUROPEAN UNION

Intensity and efficiency of the K+F activity of a country can be quantified in several ways, but the most acceptable and most frequently used index is the measure of GDP-proportional expenses. Although cooperation of the union supplied numerous important innovations in the recent years unfortunately Hungary is far from the average 3 % of average target if we see only the figures. The ratio of expenses could be averagely increased to 2.03 % by 2016, but there are only three countries above the magic 3 %: Finland, Sweden and Denmark.

**Figure 4: Development of the domestic research and development expenses as to the GDP, as compared to the average of the European Union**



Source: Based on Eurostat (2017b), own editing

It is clear from figure 4. that GDP proportional research and development expenses were below 1 % until 2008 in Hungary, hardly more than half of the Union average. Changes have occurred from 2008, the value is over 1 % from then, and although increase is continuous but it is slow. Deviation scissors of the Hungarian K+F intensity from the union average has not narrowed in the past years, the important difference in the level still exists. In 2014 we spent less by 0.68 % for research purposes from the GDP, than the average of the Union, so the domestic ratio does not achieve even two-third of the average of the Union. Unfortunately, not only dynamics of the domestic increase was broken by the crisis (where it is hardly three quarter of the pre-crisis years), it is also experienced in the average of the Union, but in a more drastic measure, than in Hungary. Dynamics of the increase in the Union, in the years following the crisis, is hardly more than half (0.55) of the growth rate of the period between 2004 and 2009.

I show the main characteristics of the research and development activity of the European Union on the basis of Eurostat (2017b). Among the member countries the ratio of this type of expenses was the highest in Finland - 3.17 per cent, it was 3.16 % in Sweden and 3.08 in Denmark. The lowest amounts were spent on K+F last year in Romania - 0.38 percent, in Cyprus - 0.47 per cent and in Latvia 0.68 per cent. Almost two-third of the research and development expenses are spent in the business sphere, this is followed by higher education with 23 % and the governmental sector with its 12 %. Non-profit sector spends only one per cent of the total K+F expenses.

The highest spending on K+F in the competition sphere occurred in Slovenia, Ireland and Hungary - to the ratio of 77, 73 and 72 per cent, accordingly. Last year, the highest part of K+F expenses - 43 % - was spent in the governmental sector, while in Cyprus and Latvia 53-53 per cent was given to the higher education.

In an international comparison South Korea is the leader with its 4.15 per cent of GDP-proportional K+F expenses, followed by Japan - 3.47 % and the United States of America - 2.81 %. China spent on this purpose a similar 2.08 % in 2014, while this value is 1.15 % for Russia.

## V. KEY CONSEQUENCES

1. From among the hypotheses defined at the beginning of the study the optimist version seems to be confirmed in case of Hungary, because the domestic undertakings followed a kind of “pre-escape” strategy in respect of their K+F expenses after the deepest point of the crisis. This consequence is supported by several facts: on the one hand it is seen from figure 3 that after 2009 the research and development expenses of the companies have continuously grown both in their absolute amount (+53%) and their share (+1.9 %). On the other hand the growth of 53 percent in absolute amount is significant because in the same period (2009-2014) the domestic GDP increased only by 23 % (KSH, 2017c), meaning that growth dynamics of the company expenses spent on innovation is more than double of the growth rate of the gross domestic production.



2. The global financial crisis that culminated by 2009 broke the growth dynamics of the total research and development expenses of the previous period in Hungary. This is mainly explained by the important reduction of the state budgetary expenses for this purpose, contrary to the company expenses - which, although in a slighter volume - but increased in their share and absolute amount. State participation is gradually restraining and the company sector plays more and more important role in financing of the innovation.

3. Following the subprime mortgage market crisis the growth rate of the research and development expenses dropped in the whole European Union and since 2009 practically stagnation has been experienced, because the 1.93 % of that time value of research and development expenses increased only to 2.03 % in the five years. Should the growth dynamics remain at this level, then the target of the Union -according to which the member countries should spend an average 3 % of their GDP on research and development by 2020, would not be fulfilled, expectedly.

4. Studying the structure of the financial sources of research and development it can be stated that the Hungarian financing structure lags well behind the recommendations of the European Union. According to the recommendation the contribution of the business (company) sphere - contrary to the two-third included in the target - was less than its half - 48.3 % at the end of the examined period in Hungary. K+F financing has even narrowed due to the lower financing capacities of the states and the debt problems.

5. The previous aim of the European Union - to increase the share of research and development expenses to 3 % of the GDP by 2010, had not been fulfilled in Hungary. The specific index of research and development expenses in Hungary was 1.14 in the said year and only 1.35 % at the end of the examined period (2014). The average target of the Union by 2020 remained 3 percent; it is 1.8 % in case of Hungary (EB, 2013) being moderate but feasible.

6. We can find a fundamental relation between the relative low innovation expenses of Hungary and the country's position in the last fifth of the global competitiveness range. This relation is significant despite the fact that our country improved its position by two places by 2014 in the hierarchy examining sixty countries and moved from the 50th to the 48th place (IMD, 2014) The relation is supported by the fact that the union countries behind our us in the competitiveness hierarchy (with the exception of Slovenia) are also in the back third - following our country - in the union hierarchy, too, in respect of their research and development expenses to the GDP.

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