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SPECIFIC MECHANISMS FOR STIMULATING R&D INVESTMENTS WITHIN THE EU

VICTOR LAVRIC

Abstract:

This paper consists of a meta-analysis of several studies regarding the innovation and R&D potential of the European Union, as well as the internal discrepancies among different member states. This part is followed by a comparative structural analysis of the main characteristics of innovative and non-innovative enterprises from the European Union, thus facilitating the identification of the most relevant aspects that are innovation-sensitive, as well as and the major obstacles that influence the innovative activity of companies. As a result, we were able to identify the most adequate mechanisms used for stimulating innovation and R&D activities and, therefore, we draw our concluding remarks and advanced several general recommendations concerning the governmental approaches innovation and R&D activities in the business enterprise sector.

Keywords:

R&D, Innovation, Tax incentives, European Union, Entrepreneurship

JEL Classification: L29, O32, O52

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1 Introduction

The beginning of the twenty-first century implied a series of changes at social, economic and even cultural levels that signaled the crystallization of a new economic paradigm. The new economic reality, marked by the transition to the knowledge-based economy, assigns a central role for knowledge, thus implying a radical reconsideration of the business processes and the competitiveness concept. It is generally accepted that in times of major changes, even the most stable hierarchies may shift, therefore generating the premises for consistent leaps in development of the most adaptable economies. From this perspective, the transition to the knowledge-based economy could be considered both a threat and an opportunity. One of the most generous definitions of the new paradigm underlines that the *"knowledge-based economy is characterized by the transformation of knowledge in raw material, capital, products, essential production factor for the economy, and by economic processes in which the generation, selling, acquisition, learning, stocking, developing, splitting and protection of the knowledge become predominant and decisive for long term profit gaining and sustainability assurance"* (Nicolescu, 2011). As knowledge acquires a new status, research and development activities become a vital component for competitive enterprises. In the context of the European Union, we could define R&D potential as a function of several elements (Lavric, 2014): entrepreneurial intensity, capacity to design and manage large projects, access to high quality human resources and the comparative advantages of the national R&D systems. As we identified the presence of a positive correlation between the research and development expenditures as a percentage of GDP and the GDP per capita (Lavric, 2012), it is important that we find the most cost-efficient and effective mechanisms for stimulating innovation and R&D in the business enterprise sector, as these activities have a direct and significant influence on the medium and long-term perspective of socio-economic development. In this context, our paper aims to analyze the specific characteristics of innovative enterprises from the European Union, as well as the most adequate mechanisms used for stimulating innovation and R&D activities, in order to be able to draw some concluding remarks and to advance several recommendations.

2 Theoretical framework

The issue of innovation, research and experimental development is approached from different angles by the theoretical literature, thus emphasizing both the complexity of the subject and the conferred importance by the scientific community. There are studies that underline the existence of a positive correlation between the scale of R&D and innovative projects and the success rate (Schwartz, 2012), as well as the importance of inter-organizational collaboration in such projects (Kesavayuth, 2012). Another way of approaching this subject is to make a comparative analysis of the enterprises that benefited from public subsidies for R&D activities, as opposed to the ones that didn't. There is documented evidence that public subsidies are complementary to the private

initiative in the sense that *"funded firms are significantly more R&D active than non-funded firms"* (Aerts, 2008).

Others have argued that corporate governance plays a critical role for R&D activities (Dong, 2010), thus pointing out that the use of certain incentive schemes (linked to the volume of the business) addressed for the leadership of the organizations may increase the efforts towards innovation, as well as the nominal performance of such projects (Lin, 2011). The managerial view over the R&D and innovation activities encouraged some authors to stress the fact that *"the perspective on managing R&D processes has changed over the years, moving from a technology-centered model to a more interaction-focused view"* (Nobelius, 2004).

Also, by creating an indicator for measuring the societal know-how – the economic complexity index (Hausmann, 2011) – the academic and professional community were given a tool not only for assessing the knowledge and the ability to produce complex products in a competitive way, but also for substantiating some predictions regarding the future development of the economies. Such an approach was used in our prior research in order to identify the convergent and divergent forces that influence the EU economies (Lavric, 2014), both in terms of employee mobility on the unrestricted labor market (Lavric, 2013), geographical influence (Lavric, 2012) and the migration phenomenon of consistent industrial facilities towards the Eastern border of the European Union. All these perspectives are also accompanied by some pragmatic studies that aim to extract valuable insights from the best practices concerning the design and implementation of innovation and R&D incentives, in order to advance specific recommendations and proposals for governmental authorities (Popa, 2012).

3 Methodology

First of all we must emphasize the fact that in our work we use the commonly accepted definition of R&D that was given by the OECD – i.e. *"creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications"* (OECD, 2002). Secondly, our paper encompasses a meta-analysis of a series of studies regarding innovation and R&D activities, thus attempting to assess properly the innovation and R&D potential of the European Union. We also performed a dynamic comparative analysis of the total R&D expenditure as percentage of GDP and its growth between 2001 and 2012 (based on Eurostat data) among the EU (28 states), United States of America, Japan, South Korea, China (except Hong Kong), Russia and Turkey. After defining the general framework, we performed a structural analysis of the main characteristics of innovative enterprises by using the data collected through the most recent Community Innovation Survey – Eurostat (published in 2015). In order to do so, we first tested the correlation between the share of innovative enterprises and the per capita GDP (Purchasing Power Standard per inhabitant) as regard to the all member

states from the EU (except Luxemburg, which is a unique and exotic example): Belgium (BE), Bulgaria (BG), Czech Republic (CZ), Denmark (DK), Germany (DE), Estonia (EE), Ireland (IE), Greece (EL), Spain (ES), France (FR), Croatia (HR), Italy (IT), Cyprus (CY), Latvia (LV), Lithuania (LT), Hungary (HU), Malta (MT), Netherlands (NL), Austria (AT), Poland (PL), Portugal (PT), Romania (RO), Slovenia (SI), Slovakia (SK), Finland (FI), Sweden (SE) and the United Kingdom (UK). The second approach regarding the main characteristics of innovative enterprises implied the comparative analysis of the innovative and non-innovative entities, as well as a structural analysis by size classes of a series of elements such as: the number of enterprises, the number of employees, the average turnover and the major obstacles that influence the activity of companies. At the end of our study we are emphasizing the most relevant mechanisms used for stimulating innovation and R&D activities, therefore allowing us to make several recommendations and to draw our concluding remarks.

4 Results

4.1 R&D and innovation in the European Union

As this work is a continuation of our efforts to analyze the R&D and innovation potential of EU countries, it would be proper to resume some of the main findings. In the context of identifying the positive correlation between the research and development expenditures as a percentage of GDP (GERD) and the GDP per capita (Lavric, 2012) we were able to outline three different clusters of states by characterizing them on a series of specific features (Figure 1). Our analysis underlines that geography plays a major role in a region's "appetite" for R&D investment (both public and private); therefore, the Eastern frontier of the European Union consists quasi-exclusively of states with low R&D intensity (Lithuania, Latvia, Poland, Slovakia, Romania, Hungary, Bulgaria, Cyprus and Malta), the group of states with average R&D intensity are mainly exponents with Latin and Anglo-Saxon origin (France, Slovenia, Belgium, Netherlands, Ireland, Great Britain, Estonia, Portugal, Czech Republic, Spain and Italy), while the high performers have a pronounced Germanic influence (Germany, Austria, Denmark, Finland and Sweden). In this framework, it is essential that we define "geography" dynamically, thus emphasizing its historical development and its implications for the future. In this sense, Robert D. Kaplan embraces the approach of geography as the "*backdrop to human history itself. In spite of cartographic distortions, it can be as revealing about a government's long-range intentions as its secret councils"* (Kaplan, 2012). Another finding that occurred in our prior research refers to the fact that the propensity towards experimental development and applied research increases alongside with the intensity of the overall R&D activities. As a result, we could argue that the measures used for stimulating R&D activities should focus on the private sector, as private investment opportunities have a much higher potential, are aimed at the real needs of the economy and are not subject to the restrictions implied by the direct public funding practices.

In addition to the above mentioned elements, we have to stress out that the analysis of the main trends regarding the human resources that perform R&D activities in the European Union (Lavric, 2013) underlines the challenges imposed by the development differential between EU member states and the existence of an unrestricted labor market. The "brain drain" phenomenon is affecting in a decisive way the medium and long term potential of the least developed entities, thus aggravating the divergence between the East and the West, and the North and the South. Such a paradigm would not be complete if we did not point out the structural changes in the EU economies that have occurred over the past decades. Therefore, the accumulation of societal know-how – i.e. the knowledge and the ability to produce complex products in a competitive way – can give us some clues regarding the future development of some economies. By using the economic complexity index (Hausmann, 2011) for measuring the societal know-how, we found out that during 1995-2012, almost all the states with low R&D intensity – excepting Slovakia – had a robust growth in the complexity of the economy, varying from 8,3% to 113% (Lavric, 2014). Such an evolution makes the long term perspective of less developed countries more favorable, as it implies the fact that, with a set of appropriate mechanisms for stimulating R&D investments, the "brain drain" phenomenon could be stopped an even reversed (in the long run).

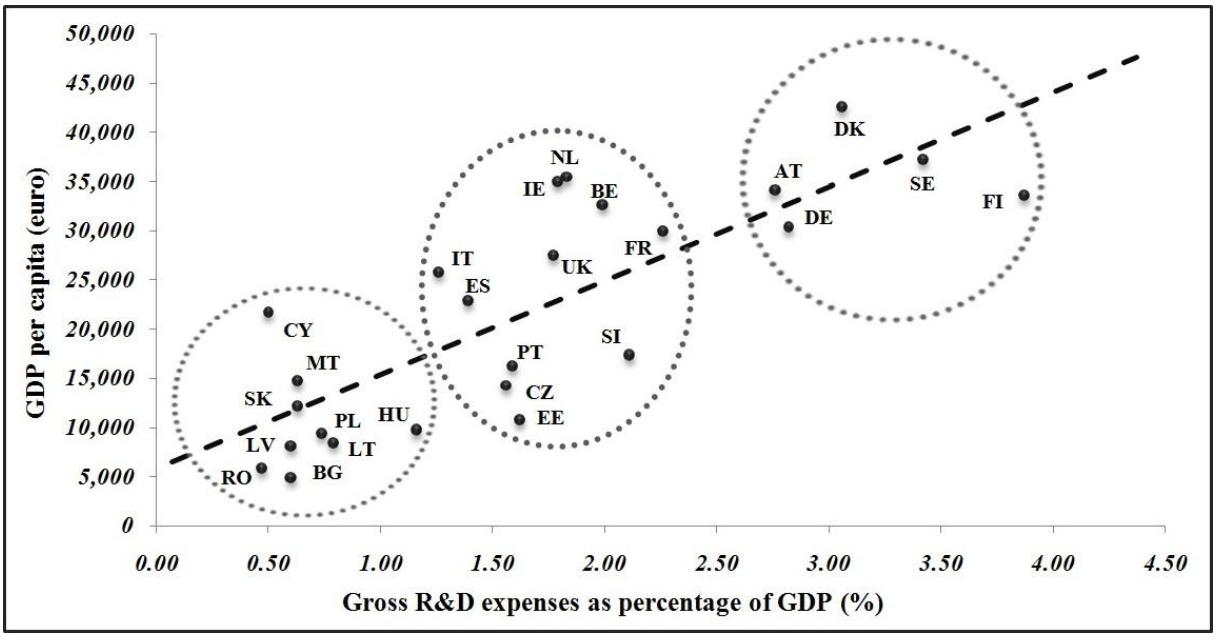

Figure 1. GDP per capita and GERD correlation in the European Union
Source: Lavric V. (2012)

Another way of interpreting the R&D and innovation potential of the EU is to make a parallel with other relevant actors. Therefore, in our research we also focused on the comparative analysis between the European Union (28 states), United States of America, Japan, South Korea, China (except Hong Kong), Russia and Turkey. Figure 2 is a graphical representation of the total intramural R&D expenditure as percentage of GDP in

2012 (horizontal axis), the cumulative growth of the per capita total R&D expenditure between 2001 and 2012 (vertical axis) and the total R&D expenditure in euro per inhabitant for 2012 (proportional to the area of the corresponding disk). As we see, the highest R&D investments per inhabitant are in USA (1,123.7 euro per capita) and Japan (1,123.6 euro per capita), being followed by South Korea (650.3 euro per capita), EU28 (533.1 euro per capita), Russian Federation (122.5 euro per capita), China (93.8 euro per capita) and Turkey (75.6 euro per capita). A first observation that strikes out is that the analyzed entities could be grouped in three categories as regard to the per capita expenditure on R&D: high intensity (USA and Japan), above average intensity (South Korea and the European Union) and low intensity (Russia, China and Turkey). Although it might be tempting to take this hierarchy as a static outcome of the economic interaction of the past decades, the evolution since 2001 shows us huge progresses in the case of the low intensity entities. It is true that such a phenomenon is partly due to a base effect, but it is still significant that China's per capita total R&D expenditure was more than 8.5 times larger in 2012 as compared to 2001, thus doubling its share of R&D investments as percentage of GDP. As a result, China was able to catch up the European Union in terms of R&D expenditure as percentage of gross domestic product, but the differential still remains as regard to per capita values. Russia and Turkey grew in terms of per capita R&D investments by almost 4.5 times, although the share in GDP remained just around 1%.

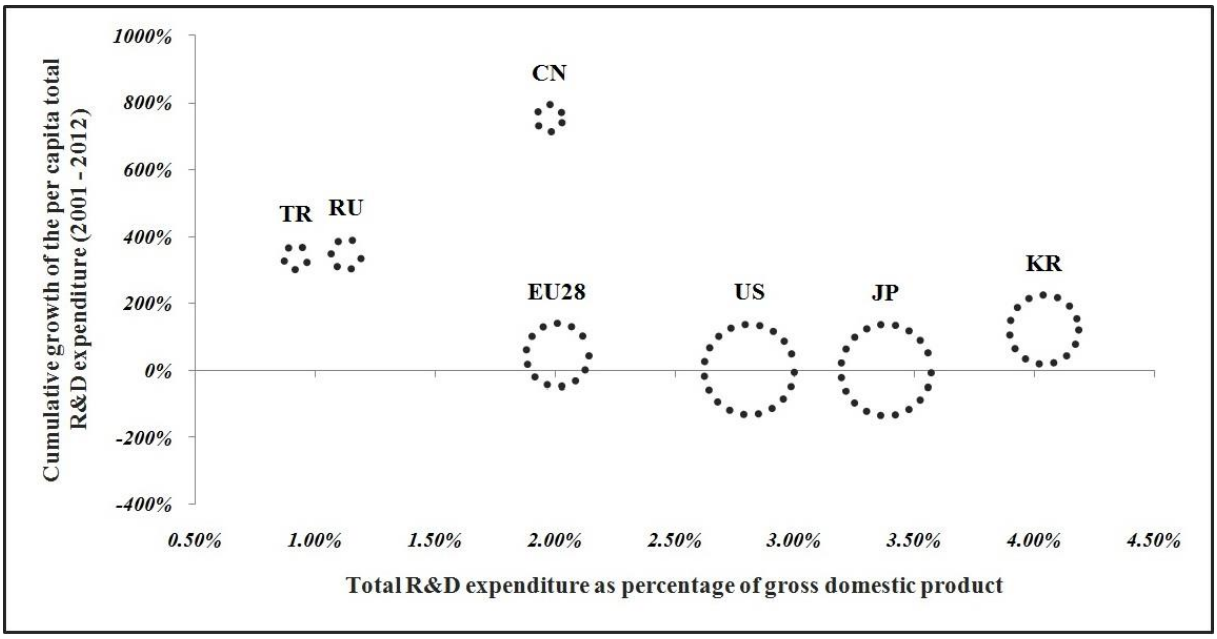

Figure 2. Total R&D expenditure as percentage of GDP and its change between 2001 and 2012

Source: Eurostat, own calculations

It is also interesting to point out the fact that EU's objective of investing at least 3% of GDP in R&D activities, as it is stated in the "Europe 2020: the European Union strategy for growth and employment", represents the same target that was set in the previous 10 year strategic document - Lisbon Strategy (Agenda). Although the target wasn't met, it is essential to note the fact that 3% of GDP invested in R&D is around the value registered in the EU states with the highest R&D intensity (Germany, Austria, Denmark, Finland and Sweden), as well as the scores from the USA and Japan. Although Korea' per capita total R&D expenditure was just 2.2 times larger in 2012 as compared to 2001, it is a sort of outlier because its share of R&D investments as percentage of GDP is more than 4%. The above mentioned elements are converging towards the idea that at a certain point in the development of the economy the total R&D expenditure as percentage of GDP is stabilizing somewhere around 3.0% – 3.5%, but its contribution continues to grow as a result of the following factors:

- The cumulative effect of continuous and consistent investments in R&D generates revenue long after the research projects are finished;
- The accumulation of knowledge regarding the management and execution of R&D projects makes them much more efficient and the success rate higher;
- The globalization process allows for outsourcing the least profitable projects in a way that still benefits the local economy;
- Because of the tradition for R&D sector and its competitiveness, they have the capacity to attract the most talented researchers and professionals from all over the world;
- The access to large markets makes it easier for companies to get involved in continuous and consistent R&D activities.

4.2 Specific characteristics of innovative enterprises

As the private sector investments in R&D have proven to contribute substantially to economic development, generating not only competitive products and services, but also a corporate culture oriented towards innovation and excellence, it would be interesting to analyze the specific characteristics of innovative enterprises from the European Union. It is clear that an exhaustive investigation of the 23 million active enterprises regarding innovation and R&D is beyond the capabilities of any EU organism, not to mention other independent-private bodies. It is also important to mention that, although the exhaustive approach is absent, the consistent preoccupation for business enterprise innovation and R&D, brought to a biannual investigation – Community Innovation Survey – performed in all EU countries on a statistically significant sample (785 243 enterprises). For the beginning, it would be interesting to take a look at the propensity towards innovation among the EU counties. In order to do so, we tested the correlation between the share of innovative enterprises and the per capita GDP (Purchasing Power Standard per

inhabitant), thus aiming to find out whether the innovative behavior could be considered as a growth factor for the EU states that seek to converge in real terms.

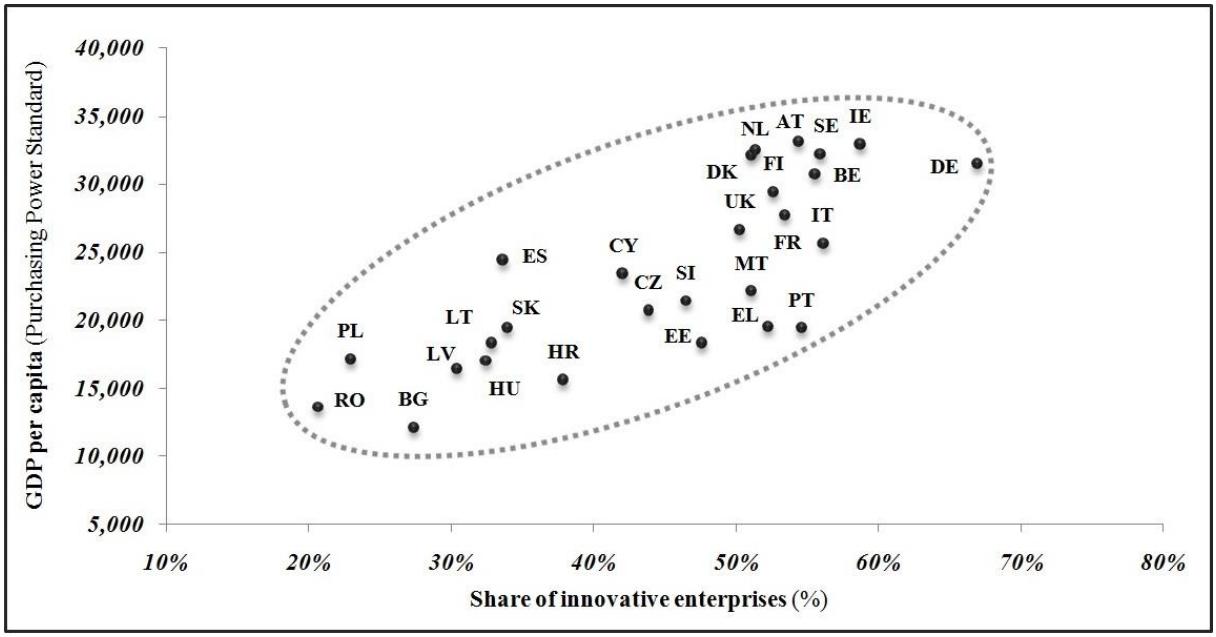

Figure 3. The correlation between the GDP per capita and the share of innovative enterprises

Source: Eurostat, own calculations

As we see in Figure 3, it is clear that there is a certain pattern regarding the relationship we are testing, thus registering a 0.79 coefficient of correlation between the share of innovative enterprises and the GDP per capita. Such a substantial result is both intuitive, as it validates the mainstream perspective towards the role and importance of innovation, and in accordance with our prior findings (Lavric, 2012). We should also mention that Luxemburg was eliminated from our analysis because of its structural characteristics (it is in essence of the size of an average European city), and mainly because its GDP per capita is enormous (80,700 in euro and 67,100 in PPS) – the largest in the world after Qatar and is followed by Singapore. In the case of the European Union, the share of innovative organizations in the total number of enterprises varies from 20.57% to 66.94%, while almost half (13 entities) of the EU countries are within the range of 50% – 60%. As we see, the countries from the Eastern frontier of the EU (excepting Estonia) register the lowest propensity towards business enterprise innovation (Lithuania, Latvia, Bulgaria, Hungary, Poland and Romania), thus emphasizing the great importance of informal institutions and geography. The clustering of the EU countries on predetermined intervals as regard to the share of innovative enterprises has the following distribution:

- 60% – 70%: Germany (66.94%);
- 50% – 60%: Ireland (58.74%), Italy (56.14%), Sweden (55.93%), Belgium (55.56%), Portugal (54.62%), Austria (54.41%), France (53.44%), Finland (52.62%), Greece

(52.30%), Netherlands (51.36%), Malta (51.09%), Denmark (51.06%), United Kingdom (50.27%);

- 40% – 50%: Estonia (47.63%), Slovenia (46.53%), Czech Republic (43.88%), Cyprus (42.06%);
- 30% – 40%: Croatia (37.88%), Slovakia (33.98%), Spain (33.64%), Lithuania (32.85%), Hungary (32.46%), Latvia (30.43%);
- 20% – 30%: Bulgaria (27.42%), Poland (23.00%), Romania (20.67%).

For a more complex analysis, it would be necessary a closer look into the structural aspects of innovative enterprises in the European Union. Therefore, the distribution by size classes is relevant because it can help us to choose and customize the most efficient tools and measures for stimulating innovation and R&D activities in the business enterprise sector. In order to do so, we made a comparative analysis of both the innovative and non-innovative companies. One of the first things that stand out is the fact that, in the case of innovative organizations, the share of enterprises with 10 – 49 employees is almost 12p.p. (11.81p.p.) smaller than in the case of non-innovative ones (73.48%, respectively 85.29%). This difference is compensated by both percentages registered for medium (+7.83p.p.) and large entities (+3.97p.p.). It is important to mention that for the large enterprises (250 employees or more) the change of 3.97 percentage points represents an increase by a factor of almost 3.4, respectively 1.6 in the case of medium companies (50 - 249 employees). Such a finding is coherent with the conclusions of other studies that emphasize the existing positive correlation between the scale of R&D and innovative projects and the success rate (Schwartz, 2012).

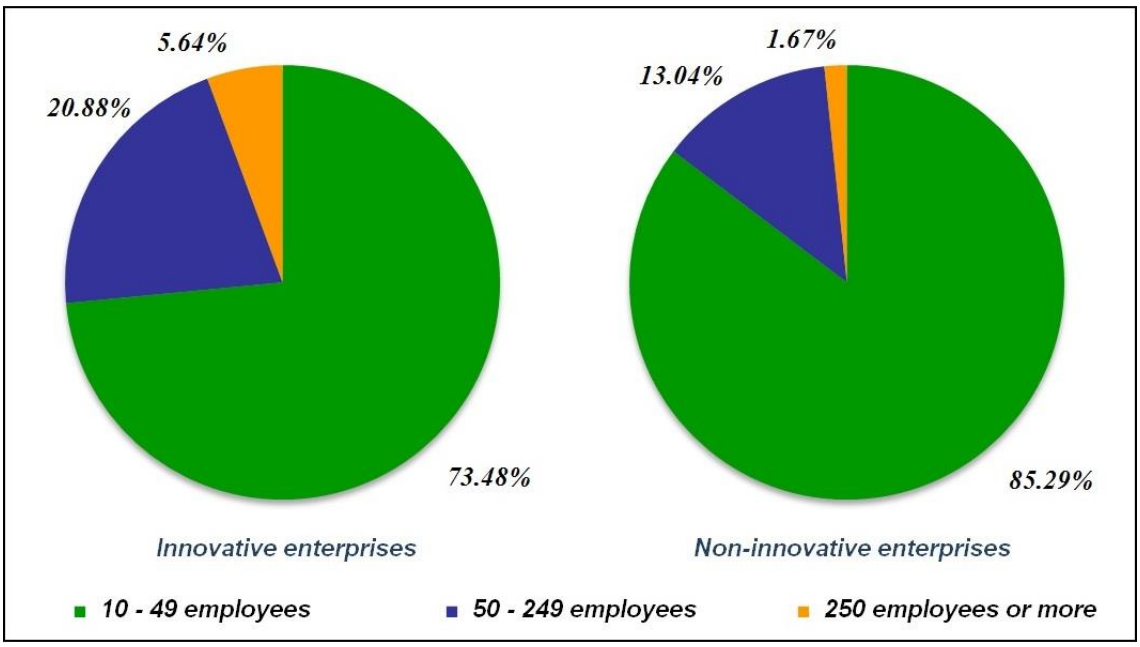

Figure 4. Number of enterprises by size classes in the European Union
Source: Eurostat, own calculations

Another interesting finding emerges in the framework of comparing the structure as regard to the number of employees (Figure 5). The above mentioned changes are actually amplified in terms of the average employed personnel, thus having not just a change in the hierarchy, but an increase of the share of employees from large companies that innovate by a factor of 2.3 (+34.07p.p.) as regard to the non-innovative enterprises. As it was the case in the previous endeavor, the difference is counterbalanced by opposite changes in the other two categories – medium (-8.93p.p.) and small (-25.14p.p.) enterprises. Although surprising, these findings get a much more acute interpretation due to the analysis of the average number of employees per each category. So, the average number of employees per an innovative enterprise is 96.24, which is 58.46 persons more (2.55 times higher) than the average number of a non-innovative organization. In terms of structure, this disparity translates as follows: an innovative large organization employs on average 1,034.44 persons (432 employees more than a non-innovative entity), a medium innovative company has on average 105.82 employees (13.46 persons more than a non-innovative one) and a small firm that is innovative has an average number of employees of 21.49 (3 persons more). Such differences between the innovative and non-innovative enterprises are also present in the distribution of the annual turnover. The innovative organizations have an average turnover (the simple arithmetic average of the average turnover from each 28 EU countries) of 31,836,025euro, therefore exceeding by almost 3 times (+21,152,920 euro) the average turnover of the non-innovative enterprises (10,683.105 euro/company).

It is essential to underline the fact that our findings contradict the common interpretation that innovation contributes not only to competitiveness growth, but also to a decrease of employment – as an effect of productivity increase. As we have shown, there is empirical evidence that invalidates the above mentioned statement, thus emphasizing the fact that innovation and R&D activities are driving job creation in a sustainable fashion, thus contributing to the structural upgrading of the economy. In essence, not only the number of jobs increases, but also the quality of them, both in terms of retribution and labor processes complexity. Such a perspective underlines the mainstream specific of the option for stimulating innovation and R&D in the business enterprise sector, as it influences directly and significantly the medium and long-term perspective of socio-economic development.

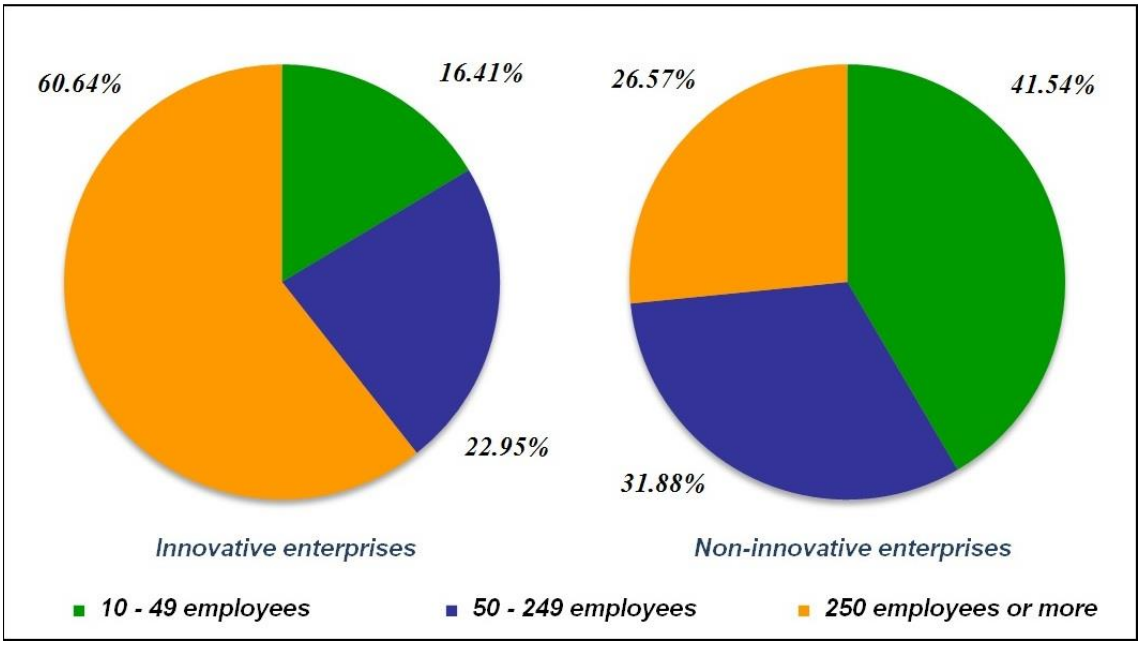

Figure 5. Number of employees by size classes in the European Union
Source: Eurostat, own calculations

In addition to the above mentioned facts, we continued our structural analysis as regard to the main obstacles that influence the activity of innovative and non-innovative enterprise from the European Union. Before we get to comment on the findings we have identified, it is important to underline the fact that these elements must be correlated with the results that were already validated in the above paragraphs. Therefore, it is critical to have in mind the comparative higher competitiveness and strength that innovative organization have, as compared to the non-innovative ones: (a) an average turnover almost 3 times larger and (b) an average number of employees per company that is 2.55 times higher. Regarding the main challenges that are considered highly important by companies, we would like to list the most relevant findings that derive from the analysis of the most recent Community Innovation Survey (Table 1):

- The sharpness of price competition is considered to be highly important by more than half of the innovative enterprises (52.25%), being slightly higher in the case of medium companies (54.11%) and a little bit lower in the case of small entities. It is also important to underline the fact that in comparison with other obstacles, the price competition has an incidence two times larger than the next most frequent element (i.e. lack of demand).
- The lack of demand is the second most intense obstacle, thus being mentioned by more than 26% of the innovative enterprises, at the same time, registering, in terms of structure, a small negative difference in the case of large companies (-1.47p.p.).
- There is a negative correlation of the size of organizations and the frequency of the following obstacles: high costs of meeting regulations (23.18%), lack of adequate

finance (21.98%), high costs of access to new markets (21.42%), dominant market share held by competitors (17.87%) and the lack of qualified personnel (13.51%). Such a variation could be considered a complex effect of market diversification, in the sense that large organizations have more resources to address multiple markets and to diversify, therefore they are experiencing less harm from a series of obstacles, and, at the same time, enterprises that succeed to diversify are more likely to grow bigger.

We have also identified a positive correlation of the size of enterprise and the frequency with which companies consider strong competition on product quality as a highly important challenge (25.30%). Large organizations register a percentage that is 3.21 percentage points higher than the value corresponding to the small enterprises (28.51%, respectively 25.30%), therefore emphasizing the fact that big innovative entities are facing a global competition, as they are more likely to operate on multiple markets. The above mentioned elements are also validated by the statistically significant difference between innovative and non-innovative entities in terms of considering strong competition on product quality highly important (+5.70p.p.).

Table 1. The main obstacles of innovative and non-innovative enterprises

Obstacles of innovative and non-innovative enterprises	**Innovative enterprises**				**Non-innovative enterprises**
	Total	*Small enterprises*	*Medium enterprises*	*Large enterprises*	
Enterprises considering strong price competition highly important	52.25%	51.57%	54.11%	52.27%	46.63%
Enterprises considering a lack of demand highly important	26.08%	26.05%	26.08%	24.61%	25.87%
Enterprises considering strong competition on product quality highly important	25.63%	25.30%	26.11%	28.51%	19.92%
Enterprises considering high costs of meeting regulations highly important	23.18%	25.52%	20.08%	18.24%	22.78%
Enterprises considering a lack of adequate finance highly important	21.98%	23.83%	17.78%	15.28%	21.93%

Enterprises considering high costs of access to new markets highly important	21.42%	22.76%	18.83%	14.06%	18.29%
Enterprises considering dominant market share held by competitors highly important	17.87%	18.25%	17.57%	16.01%	16.86%
Enterprises considering a lack of qualified personnel highly important	13.51%	13.87%	13.12%	12.03%	11.99%
Enterprises considering innovations introduced by competitors highly important	9.98%	9.98%	10.07%	9.97%	9.54%

Source: Eurostat, own calculations

4.3 Main mechanisms used for stimulating the R&D activities

In respect to the above mentioned elements, and especially to the fact that innovation and R&D in the business enterprise sector influences directly and significantly the medium and long-term perspective of socio-economic development, it is essential to define what are the most efficient tools and measures for stimulating these activities. These mechanisms must respond to such challenges as the lack of adequate finance, lack of qualified personnel, high administrative and fiscal burden, lack of critical research infrastructure and global competition. In this context, both the economic science and the empirical evidence that captures the best practices are converging towards the following classification of the main mechanisms/incentives used for stimulating innovation and R&D in the business enterprise sector:

A. Mechanisms of direct stimulus – these mechanisms involve the direct contact between the beneficiary and those entities that offer or apply the incentives. Therefore, such a way of stimulating innovation and R&D, although it is one of the most visible and tangible options, has certain disadvantages: administrative costs, the need for selecting the beneficiaries, governmental spending possibilities are limited, national and EU legislation that forbids or discourages some types of direct intervention etc. These mechanisms of direct stimulus can take the following form:

Fiscal incentives – this is one of the most frequently used tool for stimulating innovation and R&D in the business enterprise sector because: (a) it allows a greater efficiency of

the public resources, since the intervention is marginal; (b) the investment decision is made by the private actor, therefore it is more likely to respond to the real needs of the economy and society; (c) such mechanisms imply low administrative costs and are less bureaucratic in implementation both for the beneficiaries and scheme managers. The analysis of the best practices from the European Union (Popa, 2012) underlines the fact that there are five main criteria by which fiscal incentives can be classified: beneficiary differentiation (by size of the company or the magnitude of investments), dimensioning the base used for applying the incentive (expenses or project results), the type of eligible expenses (current or capital expenses), the type of tax credit (deduction/exemption or reimbursement) and the type of the tax credit rate (progressive, regressive or flat ratio).

Price reductions of certain critical infrastructure and specific supplies – this type of incentive implies such elements as discounted energy prices, cheap access to utilities, privileged access to natural resource, cheap access to land and buildings etc. Such mechanisms are the least frequent used because the EU regulations regarding competition, state aid and access to markets forbid preferential incentives that distort competition in a major way.

Financial aid for the investment projects – this type of stimulus is the most attractive for beneficiaries, but in the same time is the most limited one, as it implies investing public funds into private enterprises. These mechanisms of direct stimulus can take the following form: grants from governmental programs, governmental guarantees, complementing the EU structural funds that finance private innovative projects, interest rate reductions, loans, innovation voucher schemes, financing through public (full or partial) investment funds, European structural funds and special European Commission programs.

B. Mechanisms of indirect stimulus – these mechanisms usually generate results on medium and long term and are shadowed by the active and aggressive direct interventions that claim to transform overnight the weaknesses of the innovation and R&D system. Such an approach is harmful at least because the indirect incentives have the potential to transform in a structural manner the economy and the society. It is important to create institutions that can support the development of innovation and R&D system in a sustainable way, thus ensuring its competitiveness in the global arena. The relevance of these instruments is in a substantial way coherent with the fact that innovative behavior of private enterprises has deep roots in the informal institutes of a society (cultural profile), therefore, entrepreneurial education and the development of creativity has to be a must in any serious strategy aiming to offer a roadmap for competitiveness, innovation and R&D development. The mechanisms of indirect stimulus can take the following form: Financing R&D in government specialized organizations and higher education sector, Investing in education, Reducing the administrative and fiscal burden, Stimulating entrepreneurship,

Facilitating the consolidation of investment - credit infrastructure, Facilitating internationalization and the collaboration between enterprises.

5 Conclusions

As our study shows, in terms of overall economic development and R&D intensity, there are consistent differences among the EU member states. In such a context, the combined effect of the "brain drain" phenomenon, the comparative advantages achieved by continuous investments in R&D and the accumulation of know-how regarding the management and execution of R&D projects is generating a divergent tendency, thus widening the gaps between the least developed entities and the high performers. Although the divergent forces are strong and persistent, the evolution of economic complexity for the last decade indicates a revival of the least developed economies from the EU, thereby underlining the necessity for an appropriate set of incentives for innovation and R&D activities.

Our findings regarding the structural specificity of innovative enterprises converge towards the conclusion that innovation and R&D activities are not only generating economic performances, but are also contributing to job creation in a consistent and sustainable way. Therefore, it would be wise to integrate the components regarding the development of innovation and R&D in the business enterprise sector in every governmental strategy that addresses the medium and long-term perspective of socio-economic development. As we have shown, the globalization processes, the lack of adequate finance, qualified personnel and critical research infrastructure, as well as the overwhelming administrative and fiscal burden, are a few challenges that have to be taken into account when defining a set of measures for stimulating innovation and R&D activities in the business enterprise sector.

Although there is a large number of possible ways to stimulate R&D and innovation, we would argue that the most adequate tactic is to include as many indirect mechanisms as possible, as they are building the needed infrastructure in a sustainable manner, and to complement them with active/direct incentives in the form of fiscal/tax deductions and co-financing the EU structural funds that target private innovation and R&D projects. Such an approach has to become a continuous, non-partisan and mainstream policy option at least for the next decade, so that the transformation is robust enough to foster real economic and social convergence.

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