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# Comparative Analysis of Innovative Activities in the Czech Republic According to Selected Innovative Indices

### Abstract

Policy of the European Union is focused on the fast growing innovative companies which quickly respond to market demands and consequently increase its competitiveness. To meet those objectives companies need the right conditions and support of their state. However, companies are not able to increase the innovative efficiency without the help and support of broader National innovative scheme. Also, there are important requirements for National innovative system to function well. Those are well balanced improvements of an individuals and subsystems during all phases of the innovative process. This is because innovation is not the domain of a single entity but it is the result of the continuous interaction between the various elements of the national innovative system. Therefore, the universities, research organizations as well as companies and their suppliers and customers (customers) all play an important part in the innovative process. However, some of the important factors are also the quality of an institution and the environment where the innovative process is carried out. These all are the main reasons for the establishment of the national innovative strategy in developing countries. National Innovative Strategy builds on the recommendations of the European Union's innovative strategy document, to support Member States in innovative activities.

Feedback to evaluate the strategic objectives that were set out in the national innovative strategy can give composite indicators. The aim of this document is to evaluate the current position of the Czech Republic in the area of the science, research and innovation through selected indices.

### Key Words

*innovation, strategy, innovative policy, indices*

**JEL Classification: O31, O38, O57, R11**

## Introduction

Businesses that want to maintain and improve their market position, must constantly seek opportunities for their innovation. Sufficient innovation (or innovative performance) enables enterprises localized in developed countries to succeed in goods and services in an increasingly interconnected world markets where they face strong competition from other developing economies. Innovative companies which want to carry out their innovative activities and enhance their performance need the right conditions and support from the state. Innovative performance is not only the ability of businesses, but is also tied to the broader environment around the national innovation

system. The system includes both public and private institutions whose activities and interactions provide various aspects of the innovation process, which are the creation, transmission and application of new knowledge. The important prerequisite for a well-functioning national innovation system is the balanced development of individual actors and subsystems at all stages because innovation is not the domain of a single entity but rather are the result of the continuous interaction between the elements of the national innovative system. Important role in the innovative process therefore will not be played only by universities and research organizations, but also by companies and their suppliers and customers (customers), and finally the quality of institutions and the environment in which the innovative process is carried out. Those are the main reasons for the establishment of the national innovative strategy in developing countries. National Innovative Strategy builds on the recommendations of the European Union's innovative strategy document, to support their member states in innovative activities based on knowledge, excellent research, and quality education and training for professionals, but also on innovative activities carried out by industry.

## **1. Innovative policy of the Europe Union**

The Innovative Policy of the European Union is focused on the fast growing innovative companies that can respond quickly to market demands and to increase their competitiveness. Investment in research and development (R & D) is a key element in the promotion of innovative ideas and subsequent economic growth. For these reasons, increasing investment in R & D has become one of the objectives of Europe 2020. This strategy was approved by the European Commission and it is followed by the Lisbon strategy. It contains three basic areas: knowledge, empowerment of citizens in society and sustainable growth. One of the main objectives of the Europe 2020 strategy is the innovative program. To achieve this, an agenda called "European Innovation Union" was established. Its aim is to focus on research and development (R & D) and innovative activities with the intention to close the gap between science and the market. In April 2011, members of EU have set the new targets in their National Reform Programme with regard to the Europe 2020 strategy. EU set itself a new goal in science, research and innovation to increase investment in R & D up to 3 % of GDP and the level of tertiary education up to 40 %. A goal set for the Czech Republic is to increase R & D spending up to 1 % in the public sector. For the innovative policy to function properly, it is essential to create appropriate institutional framework which clearly defines roles and allocates the necessary competencies. It is crucial to establish the key responsibilities between the individual elements of the innovative strategy.

## **2. National Innovative Policy**

The state's role in innovative policy is to promote the networking and structures between the different actors of the innovative process, strengthen the interaction between them, drive effective cooperation and transfer information between all stakeholders in the innovative process. Lundvall sees a distinction between wide and narrow definition of national innovative system. According to the narrow definition, NSI

consists of organizations and institutions which is engaged in exploration and research and includes services such as research and development, technological institutes and universities "[4]. According to the wide definition of NSI ... "are defined elements and which relationships involved in the creation, diffusion and use of new and economically useful knowledge" [4]. Freeman defines a national system of (NSI) as a network of institutions in the public and private sectors whose activities are to encourage, import and to modify and extend the new technology. The authors exploring the national innovative process are usually focused on the structure of a research studies, its performance and development, the evaluation of a quality education systems, the cooperation between industry and universities, the availability of financial instruments to support innovation, etc. [1] The prerequisite of a functional innovative policy is to put in place appropriate institutional framework which clearly defines roles and allocates the necessary competencies. Therefore, the Czech Republic has created a new National Innovative Strategy (NIS) for the period of 2010 – 2020. Its purpose is to increase competitiveness and to emphasize the importance of innovative firms and innovative entrepreneurship in the economy. Following that, NIS has created International Competitiveness Strategy of the Czech Republic for the period of 2012 – 2020 and the Innovative Union Document. NIS is a strategic document with the same objectives of the National Policy, Research, Development and Innovation (hereinafter referred to as "NP & I"). Successful implementation of innovative policy is a matter of coordination together with a consistent partial policies and also social consensus within a single strategy. These conditions could meet the current strategy of the International Competitiveness Strategy of the Czech Republic. The foundation of a strategic approach to innovation is a link between all the pillars of the knowledge triangle, the development of a human resources and achievement of the knowledge and innovative activities. The aim of the effective innovative policy is the balanced development of the three pillars of the knowledge economy which contribute to the strengthening of knowledge production, their use in innovation and the development of knowledge and skills in the population. On the other hand, just a one-sided emphasis on one or two areas of the knowledge triangle cannot provide a sufficiently efficient formation, transmission and utilization of knowledge for the development of economic competitiveness and a quality of life in society. Particular emphasis in the development and implementation of innovative policies should be put on the even strengthening in the supply of a new knowledge and a demand for such knowledge. The public sector, as a user (client) of a new knowledge should be more prominent in a role of an innovative solutions and knowledge expansion.

### **3. The Score of innovative position of the Czech Republic by selected international indices**

International comparison of the innovative environment and innovative performance is carried out by the various international indices. This contribution, which aims to evaluate innovative performance of the Czech Republic uses following indices:

- Summary innovative Index (SII)
- Global Competitiveness Index (GCI)
- IMD Competitiveness Index.

### 3.1 Summary innovative index (SII)

The evaluation system called European Innovative Scoreboard was developed with the purpose to compare an innovative position and progress of the European Union and its members with the rest of the world and to evaluate their latest trends. The main tool for international comparisons of innovative environment and innovation performance of EU countries is a summary innovative index (SII) which was compiled annually since 2001. The sub-indicators and methodology for the summary innovative index calculation has changed during the years, this is why, it is only possible to evaluate the position of the Czech Republic with other monitored countries. Since 2010, the new methodology SII which is composed of 25 quantitative indicators, of which only 12 indicators remain the same, compared to the previous period. The indicators are grouped into eight categories: innovative inputs (human, knowledge and external resources), business activities (internal investment companies, innovative collaboration, entrepreneurship and protection of industrial property) and innovative outputs.

According to the Scoreboard, Research and Innovative Union 2011, Member States are divided into four groups:

- The performance of Denmark, Finland, Germany and Sweden is well above that of the EU27 average. These countries are the **“Innovative leaders”**.
- Austria, Belgium, Cyprus, Estonia, France, Ireland, Luxembourg, Netherlands, Slovenia and the UK all show a performance close to that of the EU27 average. These countries are the **“Innovative followers”**.
- The performance of Czech Republic, Greece, Hungary, Italy, Malta, Poland, Portugal, Slovakia and Spain is below that of the EU27 average. These countries are **„Moderate innovators”**.
- The performance of Bulgaria, Latvia, Lithuania and Romania is well below that of the EU27 average. These countries are **„Modest innovators”**. [9]

Czech Republic is one of the moderate innovators with a below average performance. Relative strengths are in Human resources, Innovators and Economic effects. Relative weaknesses are in Open, excellent and attractive research systems, Finance and support and Intellectual assets.<sup>1</sup>

**Tab. 1 Summary Innovative Index (SII) time series**

| Summary innovative index (SII) | 2007 | 2008 | 2009 | 2010 | 2011 |
|--------------------------------|------|------|------|------|------|
| EU                             | 0.52 | 0.53 | 0.53 | 0.53 | 0.54 |
| CR                             | 0.4  | 0.4  | 0.38 | 0.4  | 0.43 |
| CH                             | 0.78 | 0.81 | 0.82 | 0.82 | 0.83 |

Source: own based on [9]

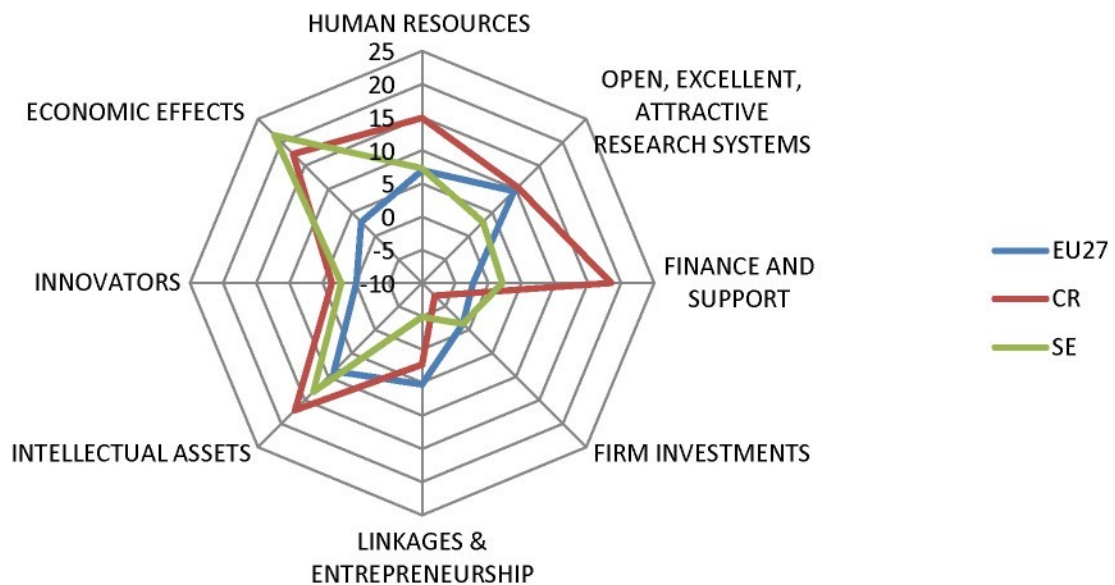
The fig. 1 shows the average annual change in the major indexes, which is calculated indicator SII. The graph shows the average annual change in the CR compared with

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<sup>1</sup> <http://www.proinno-europe.eu/inno-metrics/page/country-profiles-czech-republic>

Switzerland and EU27. Switzerland was chosen because it achieves the best position to evaluate and ranks among the leaders in innovation.

**Fig. 1 Annual average growth per indicator and average country growth (2011)**



Source: own

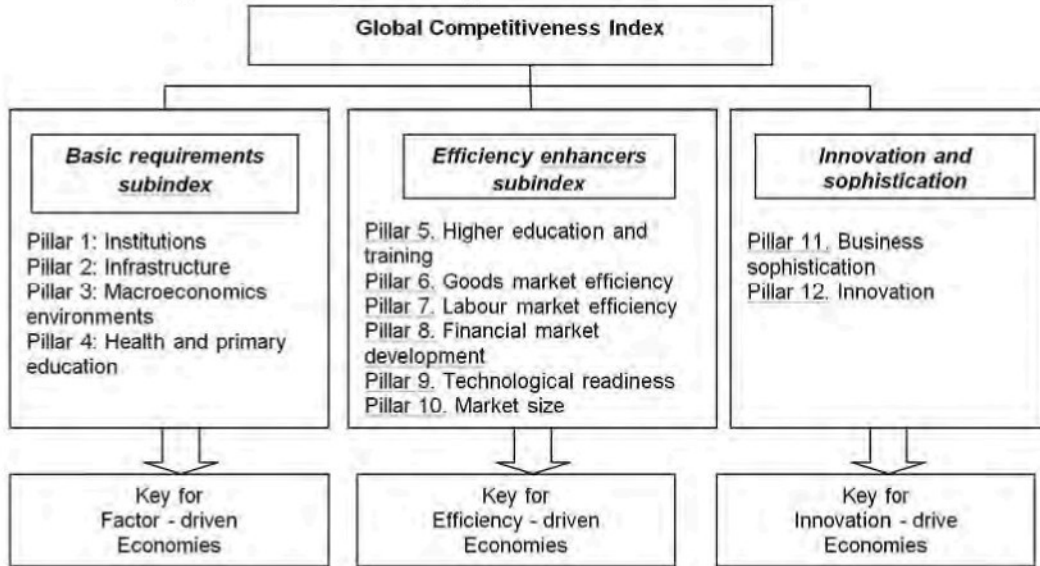
By international comparison of overall innovative performance of the Czech Republic remains below the EU-27, however, the ability to take advantage of economic benefits of innovation is deluxe. The main shortcomings of the innovative environment include low availability of financial resources for innovation (especially in venture capital) and small industrial use and legal protection. The data document "Analysis of research, development and innovation in the Czech Republic and their comparison with foreign countries in 2011" shows that competitiveness (innovative performance) CR is mainly driven by innovative activities of firms while the quality of the institutional environment is likely to be reduced.<sup>1</sup>

### 3.2 Global Competitiveness Index (GCI)

For more than three decades, the World Economic Forum's annual Global Competitiveness Reports have studied and benchmarked the many factors underpinning national competitiveness. From the onset, the goal has been to provide insight and stimulate the discussion among all stakeholders on the best strategies and policies to help countries to overcome the obstacles to improving competitiveness. The concept of competitiveness thus involves static and dynamic components. These components are grouped into 12 pillars of competitiveness (see Figure 2). [5]

<sup>1</sup> [http://ec.europa.eu/enterprise/policies/innovation/files/ius-2011\\_en.pdf](http://ec.europa.eu/enterprise/policies/innovation/files/ius-2011_en.pdf)

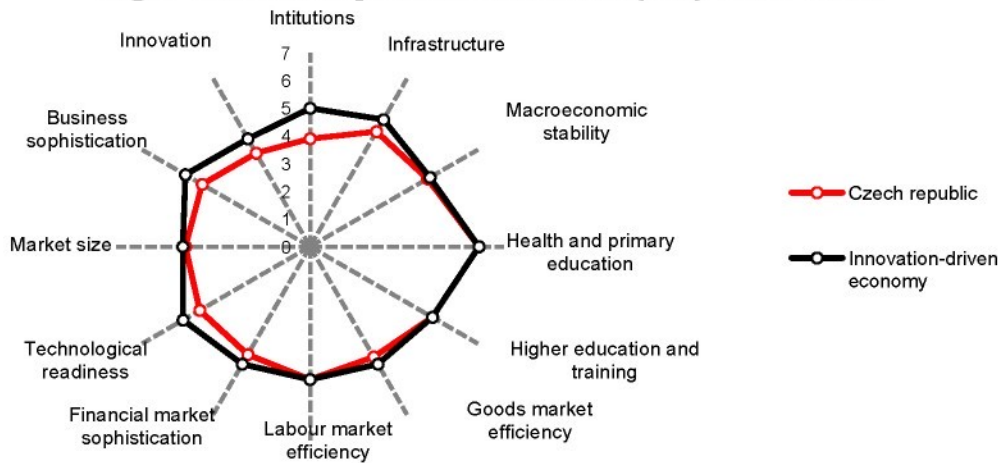
**Fig. 2 The Global Competitiveness Index framework**



Source: [5]

Innovation can emerge from new technological and no technological knowledge. Non-technological innovations are closely related to the know-how, skills, and working conditions that are embedded in organizations and are therefore largely covered by the eleventh pillar of the GCI. The final pillar of competitiveness focuses on technological innovation.

**Fig. 3 Global Competitiveness Index (GCI) 2010-2011**



Source: [5]

**Tab. 2 The 12<sup>th</sup> pillar: Innovation (GCI) 2012**

| <b>12<sup>th</sup> pillar: Innovation (GCI) 2012</b> | <b>CR</b> | <b>CR rank</b> | <b>CH</b> | <b>CH rank</b> |
|--|-----------|----------------|-----------|----------------|
| Capacity for innovation                              | 4.1       | 22.            | 5.8       | 2.             |
| Quality of scientific research institutions          | 4.9       | 26.            | 6.3       | 2.             |
| Company spending on R&D                              | 3.9       | 28.            | 5.9       | 1.             |
| University-industry collaboration in R&D             | 4.5       | 28.            | 5.9       | 1.             |
| Gov't procurement of advanced tech products          | 2.9       | 122.           | 4.3       | 22.            |
| Availability of scientists and engineers             | 4.5       | 43.            | 5.1       | 14.            |
| PCT patents, applications/million pop.*              | 18.4      | 28.            | 287.2     | 2.             |

*Source: [5]*

In 2012, the Czech Republic (CR) was ranked in the GCI ranking score at the 39th site. In the 12th Pillar Innovations the CR is doing well as it is ranked at 32nd place out of 144 countries. According to this, the pillar significantly outperforms other new member states which conversely overtake the Czech Republic under the first pillar of the GCI – the quality of institutions. The table shows the results of the various factors in a pillar of innovation for the Czech Republic and Switzerland (CH). The values range from 1 to 7). From these areas the Czech Republic has the worst rating in the Government procurement of advanced tech products indicator which amounted 122nd position. On the other hand, The Czech republic was positioned 22nd place at the pointer Capacity for innovation. In the comparison of values between the Czech Republic and Switzerland, there is the biggest difference in the protection of intellectual and industrial property. Switzerland reaches fifteen times higher rates than the CR.

GCI indicator assesses the Czech Republic in relatively better way than the index SII. It positively evaluates the business and technological advancement, the quality of higher education, the ability to innovate and the availability of the research projects and training services. However, the negative aspects are also evaluated: these are the cooperation among private sector and universities, patent applications and procurement of advanced technology, the lack of transparency in government policy, the embezzlement of funds and confidence in the political situation. Czech Republic is behind its "innovative system" and should proceed to its reformation. Same as in the classification of SII index, The Switzerland together with the Nordic countries such as Sweden, Finland and Denmark recognize the national competitiveness as one of the essential requirements in maintaining the high standard of living and their future prosperity. Therefore, these countries have built a system which is able to support innovative companies by linking them with the risk capital. This is the reason why the innovative companies have the necessary financial resources in order to establish themselves in foreign markets before their competitors. Their system includes a network of foreign agencies operating in the export promotion and supports these countries.

### 3.3 IMD competitiveness index

Another respected aggregates IMD competitiveness index is composed of nearly 330 quantitative and qualitative indicators, which reflect the competitiveness of the 4 dimensions – economic performance, government efficiency, business efficiency and infrastructure sector.

The World Competitiveness Scoreboard presents the 2012 overall rankings for the 59 economies covered by the WCY. [10]

**Tab. 3 Position of the Czech Republic in international comparison of IMD index time series in 2012**

| <b>Czech republic/WCS rank</b>                 | <b>2008</b> | <b>2009</b> | <b>2010</b> | <b>2011</b> | <b>2012</b> |
|--|-------------|-------------|-------------|-------------|-------------|
| <i>IMD competitiveness index</i>               | 28.         | 29.         | 29.         | 30.         | 33.         |
| <i>Economic Performance<br/>(78 criteria)</i>  | 20.         | 25.         | 29.         | 34.         | 29.         |
| <i>Government Efficiency<br/>(70 criteria)</i> | 33.         | 31.         | 33.         | 28.         | 30.         |
| <i>Business Efficiency<br/>(67 criteria)</i>   | 34.         | 36.         | 40.         | 35.         | 41.         |
| <i>Infrastructure<br/>(114 criteria)</i>       | 24.         | 25.         | 26.         | 29.         | 30.         |

Source: [5]

Since 2008, the position of the Czech Republic's in the international comparison of IMD index is kept around 30th partitions and stays unchanged. In 2012, the Czech Republic was ranked the 33rd place out of 58 compared countries and in 2008, achieved the 28th place.[10]

In terms of individual group of factors, the availability of basic infrastructure, a relatively stable currency, a price levels and successful participation in international trade are amongst some of the relative strengths of the Czech Republic. However, according to the IMD, the main weakness is seen in the lack of necessary economic and social reforms produced by the government together with a difficult access of businesses to the external financial market resources.

## Conclusion

In terms of science, research and innovation, it is an equal and harmonized approach which enables the reasonable comparison and correct measurement of the individual countries against their competitors. Also, it helps to identify the specific areas of their excellence and reserves. The information obtained is then used to create innovative reforms in individual countries helps them to establish and achieve a common strategic objectives in a line with the Europe 2020 strategy created in the EU preceded by the Treaty of Lisbon.



This document deals with an evaluation of innovative activities in the Czech Republic using the composite indicator Summary Innovative Index, the Global Innovative Index and IMD index.

The final position of the Czech Republic in the field of innovative performance is still below the European average but there is a trend of gradual convergence to the average innovative performance of the EU-27. However, the innovative performance and competitiveness of the country slows down inefficient management of public funds, excessive bureaucracy and poor political environment. This is clear from the international comparisons of WEF. Arising from the international comparison, the most evident limitation of the Czech innovative system is a relatively lower availability to financial resources and skilled workforce with the appropriate requirements for the development of innovative economic performance. Lack of innovation is also the number of entities that use legal forms of intellectual property protection. In the area of R & D the Czech Republic suffers with research activities support and ability to use venture capital to support individual firms with these activities. Compare to EU-27, the Czech Republic is also below average rate in using public resources spending on research and development. The communication and cooperation of the innovative system is also assessed as very weak. A little emphasis is placed at the return of investments and commercialization as the results of scientific research supported projects. Positive side of CR is the export of the high technology with the results achieving above-average. This is primarily due to the structure and openness of the Czech economy market. One of the tools for improving the environment in the area of science, research and innovation and which was also successfully used in many countries is so-called "Foresight". In Czech conditions, this is a completely new service provided by a state with the purpose to successfully identify technology areas of strategic importance. Foresight as an open system for the collection, evaluation and processing signals for strategic decision-making would enable The Czech republic to provide businesses with relevant information on new requirements, key technologies, changing markets, new sectors and new trends.

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