

# COMPETITIVENESS AND INNOVATION PERFORMANCE OF THE CZECH REPUBLIC IN INTERNATIONAL RANKINGS

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## ABSTRACT

Czech economy is being stimulated by global changes to searching sources of competitive advantage in qualitative intensive production. Assumptions and real effects of changes in companies' behaviour with the aim to maintain and gain the competitive advantage are connected with innovative behaviour of all economic subjects, or with innovative potential of the economy. The first aim of this article is to reflect on the methodology used in assessment of competitiveness of the economy based on international comparison (we focus on three rankings: World Competitiveness Yearbook, Global Competitiveness Report, European Innovation Scoreboard). The second aim is to analyze the recent competitive position of the Czech economy and to identify strengths and weaknesses of the Czech Republic resulting from these international rankings. The third aim is to describe discussion about options of increase in innovative performance of companies and to identify differences in innovative behaviour in the perspective branch of hi-tech industry according to the size of the enterprise. The fourth aim is to summarize impacts of economic recession on innovative activity of companies. Research methodology is following: the primary research was based on questionnaire survey about current economy difficulties and opportunities for business companies. To evaluate answers of respondents we used the method of comparison and analysis. The main results of primary research in Czech business sphere are following: firms regard partly flexibility and innovation activities as important assumptions of maintaining competitive position in the market.

## JEL CLASSIFICATION & KEYWORDS

■ E20 ■ O11 ■ O30 ■ COMPETITIVENESS ■ INNOVATION  
■ RANKING ■ CZECH REPUBLIC

## INTRODUCTION

In the first part of this paper we mention difference between the traditional concept of competitiveness and global competitiveness with regard to the roles of firms and national states. Then we will focus on the methodology of three most frequently mentioned international comparisons of competitiveness (World Competitiveness Yearbook, Global Competitiveness Report, European Innovation Scoreboard) and on the current position of the Czech Republic according to these comparisons.

The competitiveness of firms is characterized as the ability to continually reach growth in productivity, which means to achieve higher output with limited inputs of labour and capital. The competitiveness of firms is reflected in acquiring, maintaining and increasing national and international market share. According to the OECD definition competitiveness of national economies is defined by the ability to produce goods and services that will stand the test of international competition and at the same time by the ability to maintain or increase GDP. In the broader concept

competitiveness can be characterized as a set of preconditions for achieving sustainable growth performance of the economy, thereby even increasing the economic level in terms of internal and external balance.

The specific ranking of countries according to competitiveness can be seen as a way to assess the country's future economic potential and opportunities for its further development and growth. In international studies, there is therefore a tendency to capture the future economic consequences of non-economic activities, decisions and policies which determine long-term growth of countries, therefore, to assess how the company cares about the environment, which is critical for the proper function of the economic sphere. The methodological problems (which indicators choose, what weight attribute to them, etc.) results from the facts mentioned above, using of soft data based on impressions of the respondents need not objectively describe the state of the economy. The other problem follows from differences between competitiveness of firm and competitiveness of national state. While competitors in the traditional sense are enterprises and it results in more demanding conditions for the activities of the enterprise sector, a prerequisite for success in the global competition for competitiveness is to adapt states to the requirements of multinational companies (low taxation, investment incentives, etc.) and pressure on public finances connected with it. „Competitiveness is basically in all multi-criterial evaluations of the country's attractiveness to global operating investors ... both the choice of indicators and the manner of their implementation express the ideas, wishes and requirements of the business sphere, especially of foreign investors towards the nation states ....“ (Klvačová, 2008). So the question is whether an excessive emphasis on the best possible position of the country in these rankings is consistent with the overall long-term prosperity of the economy measured not only by increasing GDP per capita, but also by a satisfactory state of public finances and social and political stability. The article is elaborated as one of outputs of researching project New theory of economy and organizations' management and their adaptation processes registered at MŠMT of the Czech Republic under registration number MSM 6138439905.

## Competitiveness of the Czech Republic in international comparison

Three major competitiveness charts, which we are going to compare (World Competitiveness Yearbook, the Global Competitiveness Report, European Innovation Scoreboard), differ in the level of utilization of hard and soft data and their weights during the construction of aggregate indicators of competitiveness. While the WEF relies more on questionnaires (four fifths of individual parameters), the IMD uses only one third of the indicators based on the results of surveys. The reason for the diversity of approaches is the absence of a clear consensus on the importance of individual factors and their impact on competitiveness.

## World Competitiveness Yearbook

World Competitiveness Yearbook (World Competitiveness Yearbook – WCY) is published since year 1989. Ranking of 59 countries is specified on the basis of evaluating quality of environment for domestic and global competitiveness of companies operating in the economy.

Evaluation of countries' positions in the concept of the International Institute for Management Development (IMD) is based on the 331 criteria, of which 248 are used to calculate the Overall Competitiveness rankings (132 hard and 116 survey data). The remaining 83 criteria are presented as background information and are not included in any aggregation of data to determine rankings. As most of the criteria are scaled differently, a comparable standard scale is used to compute the overall, factor and subfactor results. The Standard Deviation Method (SDM) is used. It measures the relative difference between the economies' performances; therefore, each country's relative position in the final rankings is more accurately assessed. First, for each criterion, IMD computes the average value for the entire population of economies. Then, the standard deviation is calculated using the following formula:

$$S = \frac{\sqrt{(x - X)^2}}{N}$$

Finally, IMD computes each of the 59 economies' standardized values (STD) for the 248 ranked criteria. The STD is calculated by subtracting the average value of the 59 economies from the economy's original value and then dividing the result by the standard deviation.

$$STD = \frac{x - X}{S}$$

Where: x = original value, X = average value of the 59 economies, N = number of economies, S = Standard Deviation (IMD World Competitiveness Yearbook 2011).

Criteria, that enable to evaluate the competitive position of the country, are divided into the following four groups:

1. The economic performance of the domestic economy (78 criteria) - characterized on the basis of the evaluation criteria, describing the domestic economy (size, growth, wealth, developmental prognosis).

The evaluation of economic performance is based on the following assumptions: the current prosperity of the country is a reflection of the previous economic performance, market competition improves economic performance, stronger competition in the domestic economy determines the competitiveness of domestic companies abroad, the success of countries in international trade results from the competitiveness of domestic firms, openness to international economic activities improves the economic performance, international investment allocate economic resources more efficiently, export-based competitiveness is linked to the growth orientation of domestic economy.

2. Government Effectiveness (71 criteria) - characterized on the basis of evaluation of criteria (public finance, fiscal policy, institutional framework (central bank, the state's effectiveness, justice, security), business legislation (openness, regulation of the competition, labour market and capital market). Following recommendations are essential for a favourable evaluation of the effectiveness of government - state intervention in the corporate sector should be minimized, the government should create predictable macroeconomic and social conditions, thereby

reduce external risks for businesses. The government should flexibly adapt the economic policy to changes in international environment, provide adequate, affordable educational opportunities of a high quality and support the development of knowledge-based economy.

3. Efficiency of enterprises (68 criteria) - characterized on the basis of the evaluation criteria, describing the firms' productivity and quality of the labour market, the quality of the financial sector (the efficiency of banks, stock market, and company's own financial resources), management practices, impact of globalization.

4. Infrastructure (114 criteria) - characterized on the basis of the evaluation criteria, describing the basic, technological, scientific infrastructure, health and the environment, value system of society.

The Table 1 shows the changes in the evaluation of the Czech Republic in the last five years.

Key Factors of Competitiveness (rank)	2007	2008	2009	2010	2011
Overall Competitiveness	32	28	29	29	30
Economic Performance	29	20	25	29	34
Government Efficiency	41	33	31	33	28
Business Efficiency	36	34	36	40	35
Infrastructure	27	24	25	26	29

Source: IMD World Competitiveness Yearbook (2011)

The table shows that compared with the previous year a deterioration in the position of the Czech Republic occurred in all four dimensions of competitiveness of the countries. The availability of basic infrastructure, a relatively stable currency, the price level development and participation in international trade can be referred as relative strengths of the Czech Republic in the last two years according to the evaluation of the IMD. Weak points are identified primarily in government and enterprises' efficiency - particularly in the slow pace of economic and social reforms and the restricted access to external sources in the financial markets.

## Global competitiveness report

Global Competitiveness Report (Global Competitiveness Report - GCR) is published annually by the World Economic Forum (World Economic Forum - WEF). The annual report of competitiveness increasingly works with soft data, which allows us to watch more countries than in the World Competitiveness Yearbook. In the current issue of the report 142 countries are evaluated on the basis of 113 qualitative and quantitative indicators describing the macroeconomic and microeconomic factors of competitive advantage. Values of individual indicators are ranging from 1 (worst) to 7 (best result).

These indicators are grouped into 12 categories (pillars). Positive results in the group of factors identified as essential prerequisites (requirements) are a prerequisite for positive results in the group called efficiency enhancers and innovative factors. The evaluated countries are divided into three groups → the criterias for dividing the countries are: GDP per capita and the share of exports of primary products in total exports (see Table 2). Different economic performance of compared countries is reflected in the calculation of the index in the different weights assigned to three groups of factors of competitiveness (see Table 3).

The Czech Republic is in terms of GDP and the share of exports of primary products in total exports included among

**Table 2: Income thresholds for establishing stages of development**

Stage of development	GDP per capita (in USD)
Stage 1: factor driven	< 2,000
Transition from stage 1 to stage 2	2,000-3,000
Stage 2: Efficiency driven	3,000-9,000
Transition from stage 2 to stage 3	9,000-17,000

Source: WEF – The Global Competitiveness Report 2011-2012 (2011)

**Table 3: Weights of the free main subindexes at each stage of development**

Subindex	Factor-driven stage (%)	Efficiency-driven stage (%)	Innovation-driven stage (%)
Basic requirements	60	40	20
Efficiency enhancers	35	50	50
Innovation and sophistication factors	5	10	30

Source: WEF – The Global Competitiveness Report 2011-2012 (2011)

the economies driven by innovation. In 2011, the Czech Republic ranked on the 38<sup>th</sup> location of the 142 countries under comparison, which means a deterioration of 2 bars compared to 2010. In terms of individual groups of factors of competitiveness the best relative position of the Czech Republic is in the field of higher education – 30<sup>th</sup> place - and the Innovation (33<sup>rd</sup> place, 27<sup>th</sup> place in previous year), the worst location in the field of pillars has been achieved in the evaluation of the quality of institutions – 84<sup>th</sup> place (72<sup>nd</sup> position in previous year). The best position on the level of individual indicators determination competitiveness of the economy "pulled by innovation" was recorded in the capacity of innovation (25<sup>th</sup> place) and in the quality of scientific research institutions (26<sup>th</sup> place), but there is necessary to mention the deteriorating trend.

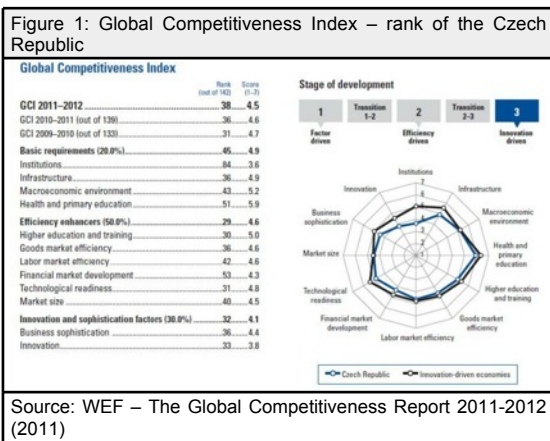
The relatively weakest part is the institutional environment - (84<sup>th</sup> position in 2011 - a deterioration of 12 bars compared with the previous year), in which other factors play an important role: the barriers imposed by government regulations (120<sup>th</sup> place), favouritism in decisions of government officials – 123<sup>rd</sup> place, insufficient transparency of government policy (96<sup>th</sup> place), and the factor resulting from all public trust of politicians which puts the Czech Republic on the 134<sup>th</sup> position among compared countries. National Economic Council of the Government based even the final report Framework for a Strategy of competitiveness of the Czech Republic on the WEF's competitiveness evaluation methodology. In the so-called pyramid of competitiveness, the individual pillars are used and arranged so that the determination of indicators, included in an effective and innovative sub-index by quality of factors included in the sub-indices of basic assumptions, is obvious - the basic assumptions are placed at the bottom of the pyramid. Color coding indicates the success of the Czech Republic in this area.

The following figure taken from the Global Competitiveness Report summarizes the current evaluation of the position of the Czech Republic by the Global Competitiveness Index.

**Innovation performance of Czech Republic**

**Innovation union scoreboard**

The main tool for international comparison of innovation environment and innovation performance at the level of



European countries was considered European Innovation Scoreboard, compiled annually since 2001. The new tool the Innovation Union Scoreboard (IUS) was firstly published in February 2011. The former list of 29 indicators in the EIS 2009 has been replaced with a new list of 25 indicators, which ought to capture better the performance of national research and innovation systems considered as a whole. The Innovation Union Scoreboard actually consists of 25 indicators that are arranged into three main groups (activators, firm activities, outputs) and 8 categories. Considering changes in the methodology (an important change in year 2008 and 2010) and monitored indicators we cannot pronounce definite conclusions about the development of our economy in time.

When constructing the index for year 2010 category "Open, Excellent and Attractive Research Systems" was newly added to the group of activators and it includes following three indicators:

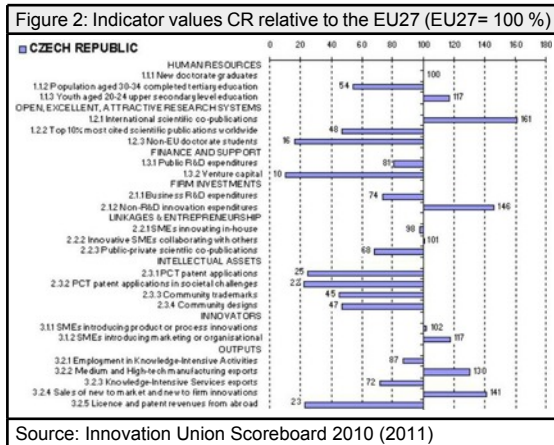
- International scientific co-publications per million population,
- scientific publications among the top 10 % most cited publications worldwide as % of total scientific publications of the country,
- non-EU doctorate students as % of all doctorate students.

The category of innovative activators includes human and external financial resources and newly indicators, which measure international competitiveness in Science and Research (see above), too. The category of corporate activities involves inward companies' investments, innovation links, cooperation, entrepreneurship and the protection of industrial property. The group of innovative outputs includes indicators focused on potential great sources of innovations (for example a number of innovating small and medium enterprises) and on economic effects of innovations.

In year 2009 the Czech Republic belonged according to the rating of the dynamics of innovation performance (calculated on the basis of development of particular indicators making up SII in previous five years) with an average annual growth of 4.8% was among the country's well above average (annual average growth of EU-27 amounted to 1.8%), in year 2010 the average annual growth in innovative performance of the Czech Republic is lower - only 2.6%, while an annual average growth of EU countries amounted to only 0.85 %. Reducing the growth rate of innovation performance is caused by the impact of economic crisis on the rated country.

It can be stated that according to the evaluation by the innovation index is the position of the Czech Republic in the EU stable, but slightly below average.

On the fig. 2 there is the position of the Czech Republic in particular components of SII compared to EU 27 average.



Innovation performance of the Czech Republic in comparison with innovation leaders

In the following text we are going to focus on some characteristics entering to the global evaluation of innovative performance in great detail. As it was mentioned above, conditions for innovative activity and its effects can be measured by:

- input indicators which include e.g. expenses on research and development, number of workers in research and development (relevancy results from the presumption that human capital and research work are the most important determinants of innovations' rise), amount of venture capital entering to start up and expansion period,
- output indicators – number of patents, licences and innovations, bibliometric analysis or by expression of company's goodwill through of intangible assets.

Using input indicators is debatable because it automatically supposes effective usage of them which need not be always fulfilled. It implies from the Czech Republic's evaluation mentioned above that problems with low Summary Innovation Index (SII) rises more as a result of input indicators than output ones. The issue of input indicator and their settings in order to reflect the impact on the environment for innovation is not easy and the EU now face questions about how to set up the innovation support. The material Green Paper - From Challenges to Opportunities: Towards a Common Strategic Framework for EU Research and Innovation funding was given to all EU countries for discussion and it should lead to finding solutions for better formulation of innovation increasing programme.

Improvement in future programmes should focus mainly on

- clarification of objectives and methods to reflect the supported activities,
- decreasing complicity,
- increasing the value added and leverage effect.

Innovation leaders, which means states with the highest innovation index (Sweden, Finland, Denmark and Germany), reach also values below the average in some indicators (except Germany), which are on the other hand dealt by significantly above-average values of other

indicators. In all these countries the education and intellectual property is highly evaluated, which both can be rather sorted into the field of innovative inputs. However, it is correct to state that the point is inputs, but with expected long-term impact on country's prosperity. These inputs indicators are aimed the way that while effective using innovations of higher levels can be reached. All these countries reach an above-average result in the output of Licence and patent revenues from abroad, which shows that the point is countries that are really on other qualitative level – they do not use innovations internally for creation of own products, but they sell them directly. Plenty of innovations are also implemented by the help of so called new innovations there. It is a new approach with an assumption that firms use both internal and external thoughts and solutions to problems.

Forms of selling licences are mainly well-known from systems that are known from the USA and that support by commercialization the universities' efforts in a form of licences to the results of university research, which leads to supporting the innovations of higher level and their widening. On contrary to this system, creating the spin-off firms struggles in Europe and also in the Czech Republic.

On the other hand there are areas of outputs in which the Czech Republic has got a better position that the innovation leaders, it includes above all Medium and Hi-Tech Manufacturing export (the Czech Republic reaches 120 % of the EU average, Sweden 110 %, Denmark 87 % and Finland 110 %) and Sales of new to market and new to firm innovations (the Czech Republic reaches 141 % of the EU average, Sweden 69 %, Denmark 86 % and Finland 118 %).

Impacts of economic crisis on innovative activity of companies

In the terms of quickly questionnaire research we asked enterprises in year 2010 (primary research of VŠE) how the economic recession took shape in different areas of business activities. In following table possible steps against crisis are evaluated by managers of the firms. Representatives of the firms answered this question through a choice from the evaluation: Which steps will you probably accept in the nearest period (the end of the year 2009 and 1.Q 2010)?

**Table 4: Steps against crisis realized by firms**

% of respondents	Definitely yes	Rather yes	I do not know	Rather no	No
Reduction of investments	18	29	15	30	8
Gaining new employees	13	20	14	35	18
Innovations of higher levels	18	30	22	24	6
Change in enterprise's strategy	7	30	14	32	17
Strengthening mergers, acquisitions or by property entering	6	14	3	35	32
Change in marketing strategies	9	33	14	35	9
Extending product portfolio	18	36	16	27	3
Change in employees' motivation, new instruments of stimulation	14	29	26	27	4
Change in organizational structure	9	26	19	35	11

Source: Results of primary research (2010)

Prevailing strategy of the firm is gaining customers by the way that the product portfolio of the enterprise is extended (54 % of respondents). An extended product portfolio should be reached according to the respondents by implementing

innovations of current products or services (48 % of questioned). With regard to the average size of answering company (according to the number of employees and turnover), 67 % of respondents expressed themselves negatively in the case of possibility to strengthen the competitive position in the market by implementing a merger, eventually an acquisition. Because the enterprises gave notice mainly to workers with lower qualification and agency, they do not consider the change in structure of employees as a priority (alternative not was chosen by 53 % of respondents). As well the change in organizational structure of the enterprise is not considered as a measure of high importance (alternative not was chosen by 46 %).

If we divide the companies of processing industry according to the technological exigency and evaluate the importance of barriers to implementing innovations we come to following conclusions:

- a. in industries with lower technological exigency the main barrier of innovation activities is the lack of financial resources, which can result from high financial intensity of innovations in this group,
- b. in industries with higher technological exigency the lack of human resources was perceived as a burning issue.

It can be expected that in connection with economic crisis the influence of insufficient financial resources strengthens and the importance of the lack of human resources slightly declines. A decline in demand and increase in companies' financial problems in the period of recession lead to a change in business strategies. Firms above all try to lower their costs. Because investments into R&D and other innovative activities are not important for short-term survival of firms in the market, while an intermediate reaction of firms to the economic decline therefore their reduction happens. If we would compare in a long-term way the development of firms' investments to R&D and development of GDP, we come up to a solution of correlation of both indices.

On the level of enterprises we can follow two different types of firms' strategies of investments to innovative activities:

- a. reduction of investments into projects with a longer term (which means R&D and innovation projects),
- b. reduction of operational costs (e.g. re-organization) and acceleration of investments into innovation projects with the aim to stabilize the competitive advantage to the future.

From this conclusion it results that firms regard expenses on R&D as strategically important from the point of view of competitive advantage and therefore they lower them after exhaustion of other alternatives.

Enterprises were also questioned in the research about factors which restrict their activities R&D on long-term basis. These factors showed themselves to be the most above all (in the sequence from the most important): economic factors – difficult access to external financing, economic risks and cost on R&D, insufficient flexibility of the legislature, market barriers – customer resistance to new products, low dynamic and innovative market, lack of information about markets, lack of qualified workers and technical equipment (large enterprises feel it more importantly), inflexibility of business organizational structure and insufficient spaces.

In the terms of the questionnaire enterprises also evaluated measures of the state with the aim to moderate impact of the economic crisis on R&D activities, in the sequence from the measures with largest contribution: lowering of social and health insurance, because it enables to lower wage

costs, tax allowance on purchased research (positively evaluated mainly by small enterprises), accelerated depreciation of equipment and machinery (positively evaluated mainly by medium and large enterprises), providing soft loans and subsidized vouchers for purchasing smaller studies.

Mentioned measures offered by firms are in a direct connection to weaknesses of the whole republic, which impedes strengthening the competitiveness based on knowledge (Klusáček at all, 2005). These weaknesses involve above all: low interest of R&D institution in commercial usage of outputs of their work, low level of enterprises' cooperation of with R&D institutions, unsatisfactory legislative and fiscal conditions for founding spin-off firms and using venture capital, absence of system instruments of support to business incubators and scientific-technical parks, insufficient institutional ensuring and quality of services of technologies' transfer and so on and intellectual property (e.g. low knowledge and interest in protection of intellectual property).

In the Czech Republic the innovative performance is still lower than the European average (Innovation Union Scoreboard, 2011), because industries with higher technological exigency prevail, in which the share of firms with innovative activities is globally lower. In the period of economic recession firms are confronted mainly with insufficient demand and increasing financial problems. Firms' management reacts to the created situation by searching and choosing appropriate short-term and long-term measures. On the short-term basis, firms above all try to economize on costs which are not key for maintaining the firm in the short run. During the decision making process about reduction of the costs, the right choice of optimization, which will stimulate the long-term competitiveness of the firm, is basic. Therefore from the research of TC AV ČR (Pazour, Mráček, Kučera, 2009) results that large firms try to maintain the level of expenses on R&D with regard to future market position of the enterprise and to successful overcoming of the recession's results. While lowering expenses firms prefer decline in administrative costs, costs on production investments and wage costs. They come up to a decrease in costs on R&D after exhaustion of other possibilities, while the tendency to maintain qualified workers is obvious and therefore to create an assumption for implementing innovative activities, which are the presumptions for maintaining the competitive advantage.

#### Headline

The international evaluation of competitiveness shows that the Czech economy's advantages include the relatively low level of public sector debt, both education and qualification of the workforce (on the international level, we have an above-average share of employment in the qualification demanding jobs). It is necessary to reflect these advantages in practice, both at government level by an active support of the innovation process and creation of pro-innovation environment, and at the level of the enterprise sector as well.

The innovative potential of the Czech Republic measured by Summary Innovation Index ranks the Czech Republic among moderate innovators. By analyzing the index we can mark weaknesses in the Czech innovation environment, which are mainly on the input side - low levels of intellectual property, insufficient funding of R & D and access to capital. On the other hand, the Czech Republic is successful in implementing some of the outputs on the support of which it should focus in the future – it includes especially products of hi-tech industry.

## Conclusion

In the context of economic recession and the process of globalization, the pace of real convergence of the Czech economy towards the advanced EU economies is influenced by the changed competitive conditions. It is no longer sustainable to rely on applying the formerly traditional competitive advantage of Czech exporters based on lower costs. Changes in the competitive position of the Czech economy are reflected in the pace of real convergence. Competitive conditions in global markets have changed in connection with impacts of economic crisis and the dynamic development of Asian and Latin American countries. A prerequisite for real convergence and hence the competitiveness of Czech economy is in the given conditions of "redirection of growth model". Therefore it is necessary to focus on creating and strengthening quality-based competitive advantage. Estimates of post-crisis process of real convergence in Central European countries refer to both the factors that are likely to slow down the convergence process and also mention the conditions necessary to sustain the current pace of convergence, respectively factors that could accelerate the convergence process. We can consider as the internal factors limiting the development and maintenance of competitive advantage (and leading to slow down the convergence process): more cautious lending to firms and households, the negative state of public finances, which leads to a reduction in public expenditure, but also the expected increase in household savings. The term of redirecting growth model emphasizes the necessity of building future competitive advantage of the Czech economy not on lower costs, but on focusing on quality-based competitive advantage, which means innovate. Due to economic crisis, the influence of insufficient financial resources strengthens and the importance of a lack of human resources slightly declines. The following sequence of factors (according to importance from firms point of view) is a result of our primary research and the research of Technologic centre ASCR: economic risks – difficult access to external financing, economic factors and cost on R&D, insufficient flexibility of the legislature, market barriers – customer resistance to new products, low dynamic and innovative market, lack of information about markets, lack of qualified workers and technical equipment (large enterprises feel it more significantly), inflexibility of business organizational structure and insufficient spaces. The main results of primary research in Czech business sphere are following: firms regard partly flexibility and innovation activities as important assumptions of maintaining competitive position in the market. Innovating firms regard innovations as an important strength and at the same time the greatest opportunities are connected to it. A low share of innovations and slow implementing of new products were repeatedly mentioned by respondents as a weakness of their firm. As a significant opportunity they regarded leaving of competitors from the market and increase in unemployment, because qualified workers are better accessible then.

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