

# The Competitiveness Yearbook Czech Republic

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Centre for Economic Studies – University of Economics and Management  
National Observatory of Employment and Training – National Training Fund

**Anna Kaderabkova  
et al.**



**ANALYSIS**



# **THE COMPETITIVENESS YEARBOOK 2005 CZECH REPUBLIC**

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## Introduction

The Competitiveness Yearbook of the Czech Republic has been published by two research teams – Centre for Economic Studies and National Observatory of Employment and Training. The yearbook comprises a broad range of indicators enabling a comprehensive assessment of the Czech Republic position within the enlarged EU in terms of four pillars: institutional quality, innovation performance, and human resource quality, within the framework of macroeconomic stability and performance.

\* \* \*

### Macroeconomic performance and stability

The first part of the analysis is divided into three chapters. The first is devoted to growth performance and to the processes of real and nominal convergence to the average level of EU. The second chapter examines the changes in the structure of the Czech economy from the point of view of gross value added, labour productivity and employment. The third chapter characterizes supply and demand side and macroeconomic stability. Growth factors on the supply side are divided into the growth of labour, capital and total factor productivity. Macroeconomic balance is analysed from the point of view of national saving and domestic investment with resulting impact on external balance.

**Growth and convergence** (Vojtěch Spěvák, Růžena Vintrová, Václav Žďárek): The chapter shows various causes of low growth performance in the second half of the 90's and the factors which led to acceleration of economic growth in the years 2001–2005. Particular attention is paid to the inflow of foreign direct investment and to growing portion of companies under foreign control. Economic growth is measured not only by the gross domestic product, but also by alternative indicators of real income. These take into account the effect of the terms of trade and processes of primary and secondary distribution of income with the rest of the world. The indicators of real income show better results in the economic development of the Czech Republic in the long run than on the basis of GDP. The catching up of the economic level of developed countries of the EU by the Czech Republic went with large swings in the 90's. Turn for the better supervened in the years 2000–2005, when convergence proceeded at rapid pace. The real convergence is accompanied by nominal convergence which results in narrowing the differences in national price levels, rates of inflation, interest rates and wage level.

**Structural changes** (Marek Rojíček): This chapter is focused on the industrial structure of the Czech economy from the point of view of the gross value added and employment. The analysis goes from the macroeconomic view based on the main producing sectors to individual industries, whereas the manufacturing is emphasised. The attention is paid to trends in labour productivity. The comparison is made in the time series as well as among selected EU countries. Besides the analysis on the level of individual sectors and industries the attention is paid to the groups of activities by technological and knowledge intensity in the manufacturing and services. In addition to industrial view the product view is applied for imports and exports of high-tech products. Comparison of the output multipliers between 1995 and 2002 and also among selected countries was made. This is important for estimating the influence of individual industries on the total economy performance. Also in this part the classification by technological and knowledge intensity was used. Cluster

analysis based on complex coefficient matrix was used for defining industrial complexes.

**Supply, demand and stability** (Mojmír Hájek, Vojtěch Spěvák, Václav Žďárek): The chapter examines the factors influencing the growth of gross domestic product on the supply and demand side with their impact on macroeconomic stability. The analysis of growth factors on the supply side takes into account the growth of labour, capital and total factor productivity and shows that the growth of the Czech economy was predominantly covered by the growth of total factor productivity. Labour market was in the years 1996-2004 characterised by the declines in total employment and only in the year 2005 the situation on the labour market started to improve. On the demand side the Czech economy was characterised by the fact that domestic demand (final consumption and gross capital formation) grew faster than domestic supply (GDP) without worsening of external balance. The evaluation of macroeconomic stability is based on the relationship of domestic supply and demand and on the relationship of national saving and domestic investment with resulting impact on the current account balance.

### Institutional quality

The second part of the analysis is divided into two major chapters. The first is assessing quality of governance and the second one concerns doing business. Both chapters are built on the projects of the World Bank, supplemented with material of other specialized analytical institutions. Institutional quality is measured with public expenditures and with competitiveness indices. The second chapter evaluates situation of doing business in the Czech Republic not only within the European Union, but also in broader international comparison. Evaluation includes wide range of characteristics and results are measured in relation with other economic and institutional indicators as tax burden, index of economic freedom or corruption.

**Quality of governance** (Milan Žák): Assessing and measuring governance quality is based on the data published in the World Bank project called Governance Matters, supplemented with wide range of further sources. Author aims to assess the quality of governance in the Czech Republic within transition countries and within all the European Union. Aggregate governance quality index is based on the evaluation in following areas: voice and accountability, political instability and violence, government effectiveness, regulatory quality, rule of law and control of corruption. When exploring these fields, author uses also additional sources which in most cases verify his previous results. This chapter is also concerned with dynamics of institutional changes of new member countries in the EU in relation with public expenditures as a percentage of GDP and with competitiveness index published every year by the World Economic Forum. According to the results, we distinguish among two groups of countries leading to different types of capitalism.

**Doing business** (Anna Kadeřábková, Václav Šmejkal): The chapter presents results of World Bank survey in 2005 undertaken within the project *Doing Business*, with special regard to the Czech Republic position. Doing business conditions are assessed particularly according to the regulation burden and its impacts on entrepreneurship. The structure follows ten indicators of doing busi-

ness conditions covered in the survey in 2005: starting and closing a business, dealing with licenses, hiring and firing workers, registering property, getting credit, protecting investors, paying taxes, trading across borders, enforcing contracts. The paper includes explanation of the specific features of the Czech Republic legislation, and already undertaken, recommended or prepared changes directed to improvement of most critical points. Moreover, there are presented the relations between regulation quality and other economic and institutional indicators: tax burden, economic freedom and corruption levels.

### Innovation performance

The third part is divided into three chapters. The first covers the assessment of quality-based competitive advantage in terms of comprehensive analytical framework. The sources of the advantage and technology knowledge have been differentiated. The second chapter analyzes in a more detailed way the inputs (financial and human, including specific preconditions) and output of innovation performance (mainly based on the results of innovation surveys). The third chapter evaluates the characteristics of information society, particularly in terms of the related role of ICT expenditure, quality of the corresponding infrastructure, supply of services and exploitation of applications by the key ICT actors from the macro to the company levels.

**Competitive advantage** (Anna Kadeřábková): Competitive advantage is analyzed in terms of matrix and diamond to identify policy appropriateness with regard to the achieved development of country competitiveness. The matrix specifies competitive advantage as low-cost/price based vs. innovation based, and innovation capacity as based on external vs. internal technology knowledge. Country positions in the matrix are further differentiated as to development stages of competitiveness (driven by factors, efficiency, or innovation) and mode of knowledge exploitation (passive technology transfer, adoption to local needs, own innovation capacity). The diamond evaluates country positions in a more sophisticated way according to four pillars, each of which includes four indicators ranked ascendingly as to their role in achieving innovation-based competitiveness. The pillars include four sets of indicators - on production technology development, completeness of value chain, competitive pressure, and advancement of networking. Specific attention was given to the role of technology transfer within global value chain considering the position of new EU entrants. The analytical results within EU-25 quite clearly show the cross-country gaps vis-à-vis the targeted innovation-based competitiveness.

**Inputs and outputs of innovation performance** (Anna Kadeřábková, Karel Muller): The evaluation is based on the concept of national innovation system. The analysis of inputs includes the issues of national research and development system, describes the dynamics and structural changes of research and development sectors and specific problems of their internal structuration and mutual interfaces. The scope of inputs covers also wider factors influencing the innovation performance, like the availability of the highly qualified experts, the level of scientific and technological activities, scale and growth rate of government expenditures for research and development, cooperation of universities with firms and availability of venture capital for the innovating firms. The innovation outputs are reflected by help of innovation performance of firms, the analysis of which is possible due to regular surveys of innovations in the EU member countries as well as the

other innovation surveys, which have been carried out in the CR. The analysis is accomplished by references to specific conceptual and methodological problems of statistical surveying and measurement of innovation.

**Information society** (Josef Basl, Jan Pour): Information and communication technologies (ICT) and the whole economic, commercial and information environment have been moving every year. This trend is significantly inter-linked with important changes in the organizational and professional structures, management methods and procedures. The term of information society is generally used for such global approach to the ICT potential. The paper is aimed at the analysis of some impacts of various ICT products and applications on the society development and capabilities of various enterprises and institutions. It includes comparisons of some information society characteristics in the Czech Republic in the relationship to other well developed countries mainly within the OECD. There is a special focus taken to ICT in the small and medium enterprises at the company level. The paper analyses the state and predicted growth of the demand and offer on the ICT market. Especially it is focused at the market segments of ICT applications and services such as outsourcing, systems integration and others.

### Quality of human resources

The fourth part of the analysis is broken down into three chapters. The first chapter is concerned with evaluation of various components of the literacy of the 15-year-old and adult population. The second chapter analyses the participation of young people and adults in education and assesses investment in education. The third chapter examines human resources in technology-intensive industries and the inflow of graduates of tertiary education, and evaluates the quality of tertiary education.

**Knowledge and flexibility of the population** (Zdeňka Matoušková): The chapter deals with the education structure of the population and educational mobility. The level of knowledge and skills of the 15-year-old population is evaluated based on the average levels of various types of literacy, and on the proportions of pupils with the highest levels of mathematical literacy. A similar approach is adopted to analysing the literacy of the adult population. Moreover, computer literacy and occupational and geographical mobility are also issues under review.

**Lifelong learning** (Věra Czesaná): The chapter is focused on an analysis of the participation of young people in secondary and tertiary education, and of the participation of adults in formal, non-formal and informal education. Participation in continuing education is examined in relation to age, educational attainment and gender, as well as in terms of the links between its forms. Specific attention is paid to retraining. Public and private expenditure on education and its effectiveness is also a subject of analysis.

**Human resources for a knowledge-based economy** (Věra Havlíčková, Zdeňka Šimová): The chapter deals with human resources in technology-intensive manufacturing industries and knowledge-intensive service industries. Furthermore, ICT professions in the economy and the inflow of graduates of tertiary education are examined with a particular focus on science and technology programmes and doctoral studies in these disciplines. The quality of tertiary education is assessed based on its capacity to produce well-educated specialists and to contribute to the development of science.

## **Macroeconomic performance and stability**



## 1. Growth and convergence

This section focuses on growth performance and convergence of the Czech economy during 1996–2005. Economic growth is a result of a number of diverse factors and determines the economic level of a particular country and the process of convergence towards the level of developed countries. Growth performance of the Czech economy measured by real growth of GDP and alternative indicators of real income is analysed. The analysis of real convergence shows divergence of the CR's economic level from the European average during the recession in the second half of the 90's and the subsequent rapid convergence during the following period. Studies of relations between real convergence and nominal convergence focus mainly on development of the price and wage levels. Special attention is paid to the level of unit labour costs as an indicator of price-based competitiveness in international comparison.

### 1.1 Economic performance

Growth performance is one of the basic criteria used for assessing economic development of countries and how successful countries are in individual periods and on an international scale. **Gross domestic product** (GDP) calculated in constant prices is the main and the most frequently used indicator describing economic growth of the domestic economy.<sup>1</sup> According to this indicator the CR has achieved relatively low growth performance on a long-term basis. The average annual growth of GDP in the CR during 1996–2004 was only 2.1 % and the CR was the 22<sup>nd</sup> of the 25 EU countries. However, **two distinct periods** need to be differentiated during this decade: the period from 1996 to 1999 characterised by very slow growth of GDP (on average by less than 1 %) and the period from 2000 to 2004 characterised by rapid acceleration of GDP growth (on average to 3.2 %).

**The period 1996–1999** was strongly marked by the recession in the Czech economy during 1997–1998, when a number of hindering factors had an impact on the Czech economy:

- Structural deformation from the past with a dominant role of heavy industry and insufficiently competitive industrial sectors;
- Problematic course of privatisation, which delayed the vital restructuring process in companies;
- Institutional barriers, in particular a critical situation in the banking sector;
- Weak inflow of foreign direct investment;
- Stagnating investment;
- Restrictive economic policy.

The economic growth **during the period 2000–2004** accelerated significantly as a result of positive impact of some factors:

- Strong inflow of foreign direct investment and increasing importance of companies under foreign control;
- Fast growth of domestic investment and export;
- Improvement in the institutional environment in connection with preparation and accession to the EU;
- Privatisation and restructuring of banks (consolidation of this sector);

- Pro-growth economic policy (decreasing interest rates and expansive fiscal policy).

However, even this period was influenced by some hindering factors, such as the persisting relatively low quality of the institutional environment, unsolved legislative issues (act on bankruptcy), excessive regulation, insufficient innovation activity, lagging behind in science and research, and slow improvement in the quality of human resources.

The CR moved to the centre of the growth scale of EU countries, where leading positions are held by the Baltic states and Ireland and Slovakia follow (see Figure 1). Different growth dynamics of GDP in the CR and other EU countries during 1996–1999, 2000–2004 and throughout the period are shown in Table 1.

Table 1: Real GDP (percentage average annual change)

	1996–2004	1996–1999	2000–2004
EU-25	2.3	2.6	2.1
EU-15	2.3	2.6	2.0
Belgium	2.2	2.4	2.0
Czech Republic	2.1	0.9	3.1
Denmark	2.0	2.7	1.5
Estonia	6.2	5.0	7.2
Finland	3.6	4.6	2.8
France	2.3	2.6	2.1
Ireland	7.7	9.8	6.1
Italy	1.5	1.6	1.3
Cyprus	3.4	3.5	3.4
Lithuania	5.8	4.3	7.1
Latvia	6.3	5.0	7.4
Luxemburg	5.2	6.6	4.0
Hungary	3.8	3.7	3.9
Malta	2.4	4.1	1.1
Germany	1.4	1.7	1.2
Netherlands	2.4	3.8	1.3
Poland	4.1	5.4	3.1
Portugal	2.5	4.1	1.2
Austria	2.3	2.8	1.8
Greece	3.9	3.2	4.4
Slovakia	4.1	4.1	4.1
Slovenia	3.9	4.4	3.4
Spain	3.6	3.8	3.5
Sweden	2.7	3.0	2.5
United Kingdom	2.9	3.0	2.8

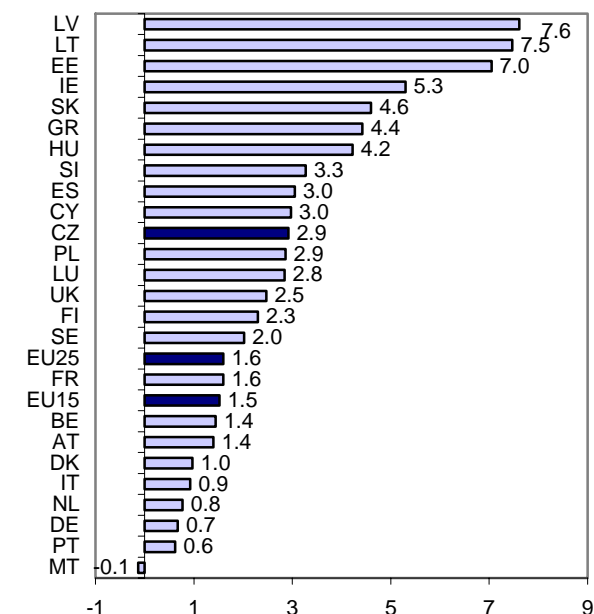
Note: Data are not fully comparable because countries are gradually passing to the calculations of GDP in prices of preceeding year and to the standards of ESA 1995 (for example reallocation of FISIM). Source: Kadeřábková a kol. (2005), s. 13, own calculations.

Gradual acceleration in the economic growth brought first significant results in 2004, when GDP growth reached 4.7 %, and in 2005, when the growth rate increased to 6 %. The economic growth in the CR became healthier with regard to growth factors on the supply and demand side. The restructuring and modernising process was accelerated by strong inflow of foreign direct investment, which in turn strengthened investment and export. However, most analyses carried out by international organisations point out growth barriers arising from rigidity of the labour market and unsolved institutional obstacles, such as a complex legislative environment for conducting busi-

<sup>1</sup> Methodological definition, problems with measurement and basic details of this indicator can be found in Kadeřábková a kol. (2005), p. 7.

ness. Analyses of the institutional environment, innovation activity and the quality of human resources show that the CR lags behind developed Western European countries in these aspects.

**Figure 1: Real GDP (percentage average annual change in 2001-2004)**

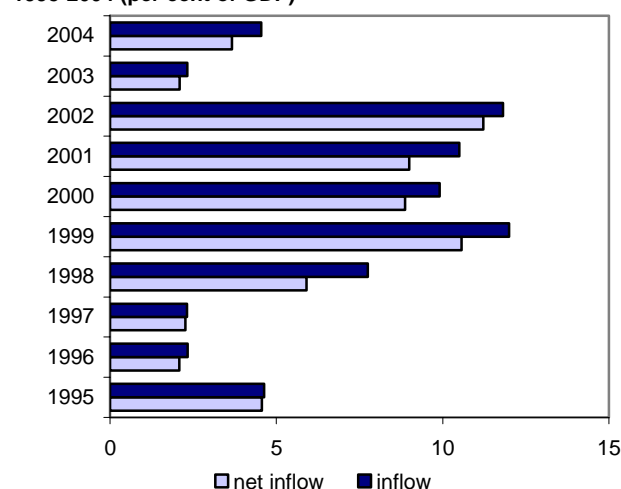


Source: EUROSTAT (2005a).

## 1.2 Impact of foreign direct investment

The impact of FDI became an important factor in development of the Czech economy in the second half of the 90's (see Figure 2). Adopting an act containing investment incentives for investors represented a major motivating factor for increased inflow of FDI. Most of FDI before 1998 was directed for companies sold directly to foreign investors and for those privatised by other methods. However, the share of green-field investment was very small.

**Figure 2: Inflow and balance of foreign direct investment in 1995-2004 (per cent of GDP)**



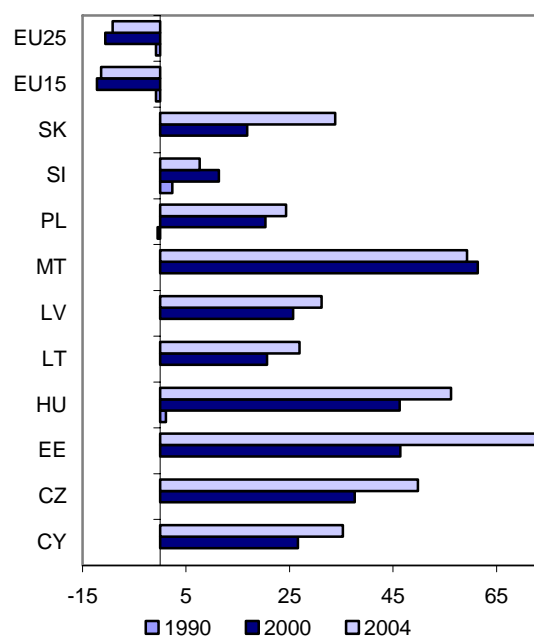
Source: ČNB (2005b), ČSÚ (2005a), own calculations.

The inflow of investment after 1998 (mainly to the sector of telecommunications, car industry, processing industry, and to the financial sector) was to a large extent associated with the next wave of the privatisation process. In addition to that, a range of new green-field investment started to appear (for example the trade sector with the penetration of multinational companies).<sup>2</sup> The period 1999-2002 was characterised also by considerable inflow of FDI due to the privatization of major banking institutions.

The FDI balance during 2003-2004 was negatively influenced by the temporary absence of revenues from privatisation, transformation of a part of FDI into portfolio investment, withdrawal of capital from Český Telecom, purchase of Eurotel shares and outflow of capital connected with participation of domestic companies in privatisation abroad (for example ČEZ in Bulgaria). On the other hand, new investment of foreign companies in administrative and logistic centres in Prague or technological and strategic services centres had a positive impact. Stronger orientation on services and gradual involvement of domestic small and medium-sized enterprises represent a positive aspect of the development of FDI in comparison with the previous period.<sup>3</sup>

The CR is the fourth on the scale of new EU members according to cumulative inflow of FDI in relation to GDP, after Estonia, Hungary and Malta (see Figure 3) and holds the first place in the inflow of FDI per capita.

**Figure 3: Cumulative stock of net foreign direct investment (EU-10, per cent of GDP)**



Note: For Cyprus, Malta, Poland, Slovenia and EU-15 for the year 2004 the estimates of UNCTAD are used. Source: UNCTAD (2005), s. 308-312.

<sup>2</sup> This inflow of FDI is associated with a strong increase in competition among traders and pressure on prices of sold commodities. It is one of the major factors influencing a low increase in prices in the economy as a whole.

<sup>3</sup> However, some investments have proven unprofitable (excessive reliance on cost-based advantages of production located in the CR) and investors abandoned their original plans. The Flextronics company in Brno was the first case. The situation of LG. Phillips Displays in Hranice is slightly different.



### Structure of FDI

Investors from the EU-15 account for the largest share in the territorial structure of FDI (more than 87 % of the total inflow), followed by investors from the USA (5.5 %), Switzerland (almost 3 %) and Japan (2.3 %). The industrial structure of FDI is characterised by a significant share of the manufacturing industry (more than 44 %), financial services (almost 15 %) and trade and intermediation (almost 13 %), (see Table 2).

**Table 2: Cumulative stock of foreign direct investment by industries in the Czech Republic in 2004**

	Mil. USD	In percent
Manufacturing (D)	20 726.9	44.2
Electricity, gas and water supply (E)	3 168.5	6.8
Wholesale and retail trade (G)	5 982.0	12.7
Transport, storage and communicat. (I)	2 801.4	6.0
Financial intermediation (J)	6 898.8	14.7
Real estate, renting, bus. activities (K)	4 313.4	9.2
Other (A + B + C + F + H + L + Q)	3 029.3	6.5
Total	46 920.2	100.0

Note: Data included in the cumulative stock in the year 2004 are preliminary. Conversion rate 25,701 CZK/USD. Source: ČNB (2005b), s. 59–65; ČNB (2005c), own calculations.

### Influence of companies with participation of foreign capital

Companies under foreign control tend to have very different performance characteristics from domestic companies, which are less involved in international trade. Foreign companies are a source of additional capital, which allows restructuring and increasing the company's effectiveness. They also provide transfer of technologies, i.e. know-how. Their involvements generally improve performance of the relevant company or even the entire national economy.

Countries with a high share of companies owned by foreign investors face a certain risk of developing a dual economy. This risk is especially strong in the case of insufficient interconnections between companies under foreign control and domestic companies. Some domestic companies also have negative experience with abuse of the economic power of companies under foreign control. Multinational companies can put pressure on domestic companies because medium-sized and small companies alone can rarely succeed in export markets.

According to the latest study (see ČSÚ, 2005g) that focused in detail on non-financial companies with 100 or more employees over the period 2000–2004, the number of companies under foreign control increased by more than one quarter, while the number of employees in these companies increased by almost one half and the increase in the volume of value added was identical. Comparison of the growth of labour productivity measured by the *level* of value added *per employee* in companies under foreign control with the rest of non-financial companies shows virtually identical dynamics, while the level of labour productivity in companies under foreign control remains higher by approximately one third.

International comparison of the share of employment, revenue and labour productivity in foreign investment companies on totals for the national economy of selected new EU members is summarised in Table 3. Labour productivity in companies with domestic capital showed positive development and the gap between these companies and companies with FDI was gradually reduced (except for Poland). This fact suggests higher involvement of domestic companies in international links and growing pressure on their restructuring and productivity, which lowered the risk of dual economy.

Stronger orientation of FDI companies towards import and export is a significant characteristic of these companies. This shows their pro-export (or in many cases pro-import) orientation, which contributes to improvement of deterioration of the trade balance.

Adoption of new technologies, procedures, etc. (spillover effect) is conditional on the will to apply these methods (see OECD, 2005c, p. 31). What's more, technological transfer can be complicated by protection of corporate know-how. Transfer is less complicated in industries such as retail trade as it can occur through the so-called learning by watching. Another, different example is the selection procedure for new employees in automobile factory operated by the TPCA consortium in Kolín, which is based on the modern approach learning by doing.

The question that arises in this context is how the support of foreign investors can be turned to services in scientific and technical parks rather than production in assembly lines. According to the government agency CzechInvest projects in the pharmaceutical industry, ITC and R&D should be supported (in particular in the form of lower limits for obtaining appropriate public support).

**Table 3: Non-financial corporations under foreign control in the Czech Republic in 2000–2004**

	2000	2001	2002	2003	2004	Index (2004/2000)
Number of corporations (in percent of total)	22.1	24.4	25.6	27.1	28.3	128.1
Number of employees (in percent of total) <sup>1)</sup>	23.8	28.3	29.5	31.8	34.8	146.2
Accounting value added (share of total, in percent)	31.8	37.0	38.6	42.1	46.3	145.6
Accounting value added on employee (corporations under foreign control, thousands of CZK)	595.0	633.4	643.3	724.9	814.9	137.0
Accounting value added per employee (total of non-financial corporations, thousands of CZK)	445.4	483.8	490.7	547.4	611.5	137.5
Total revenues from sales of goods and services (share of total, in percent)	36.5	41.1	43.5	47.1	50.5	138.4
Net profit (share of total, in percent) <sup>2)</sup>	60.6	56.0	48.5	55.3	51.0	x

Note: <sup>1)</sup> Adjusted number of employees. Total is related to non-financial corporations. <sup>2)</sup> Net profit in the year 2004 is calculated as a sum of quarterly gross profits after deduction of 28% income tax.

Many companies continue to operate with foreign rather than domestic R&D departments. New investment should be targeted at high-tech industries, i.e. industries with high intensity of R&D. In 2002, the share of these industries in gross value added in the manufacturing industry in the CR was 10.2 % (see OECD, 2005b, p. 167).<sup>5</sup>

This type of strategy will require adequate structure of workforce with regard to education and qualification and one of the main conditions (*sine qua non*) is that there are a great number of domestic companies wanting to be involved in business relationships in the Czech economy. What's more, this strategy does not solve the problem of high unemployment because the structure of unemployed persons generally does not correspond to required qualifications. The spillover effect may not occur if the significant differences in technologies between companies with FDI and domestic companies with low absorption capacity persist. The gap between these two types of companies would not continue to decrease in this case and the adverse (dual) character of the economy would persevere.

The analysis shows that the inflow of FDI to the CR led to major changes in the structure and international links of the economy and contributed significantly to the economic growth during 2000–2004. However, the economic policy should now influence the inflow of FDI towards greater use of qualitative growth factors with positive impact on competitiveness of the country.

### 1.3 Alternative methods for measuring growth performance

Measurement of a country's growth performance cannot be limited to a single indicator. International comparison is conditional on methodological comparability. Although the comparability is not absolute, the use of the European System of Accounts (ESA 1995) ensures comparability at the macroeconomic level in the EU. Besides the GDP indicator, indicators of final use of production (consumption, investment and net export) and indicators of real income are used for comprehensive description of economic performance.<sup>6</sup>

For example, the real growth of total domestic demand (final consumption and investment) in the CR exceeded the growth of GDP annually on average by 0.5 p.p. during 1996–2004 (2.6 % compared to 2.1 %). Yet, the growth of domestic demand is more important for increasing living standard and future growth of the economy than the growth of GDP. However, this is conditional on maintaining macroeconomic balance.

Development of aggregate real income indicators, which take into account the benefit or loss arising from terms of trade changes and processes of primary and secondary distribution of income between the domestic economy and the world, needs to be analysed in order to obtain a more comprehensive and objective idea of development in the economy. All real income indicators grew faster than real GDP in the CR during 1996–2004. The average annual growth of real gross domestic income was 3 %, i.e. higher than the GDP growth by 0.9 percentage point. The growth of real gross national income during the same period was

2.5 % due to the relatively significant and increasing outflow of primary income abroad. The growth of gross disposable income did not differ significantly from the growth of real gross national income.

**Table 4: Gross domestic product and indicators of real income (constant prices of preceeding year, annual percentage change)**

	GDP	RGDI	RGNI	RGDIil
1996	4.2	5.8	4.7	4.3
1997	-0.7	-0.5	-0.7	-0.6
1998	-1.1	2.3	2.2	2.4
1999	1.2	0.9	0.4	0.5
2000	3.9	2.1	1.9	1.5
2001	2.6	4.3	3.1	3.2
2002	1.5	3.7	2.4	2.2
2003	3.2	3.3	3.7	3.7
2004	4.7	5.0	4.5	4.0
1996–2004	2.1	3.0	2.5	2.3

Note: RGDI – real gross domestic income, RGNI – real gross national income, RGDIil – real gross disposable income. The figures in last row express an average annual rate of growth in the years 1996–2004. Source: ČSÚ (2005a), own calculations.

The faster growth of real income indicators compared to the growth of GDP allowed for expenditure on final consumption and gross capital formation exceeding the growth of GDP without deteriorating trade balance. Foreign relationships (whether due to changes in terms of trade or owing to primary and secondary distribution of income) therefore played an important role in the economic development in the CR. As the positive influence of changes in terms of trade weakened in 2003 and 2004, so did the lead of real gross domestic income over GDP. Terms of trade deteriorated in 2005 due to a strong growth in prices of fuel and other commodities and this led to a situation when GDP grew by 6.0 % while real gross domestic income only increased by 4.2 %.

The currency and fiscal policy, but also policy relating to development of wages should take into account this different development of macroeconomic indicators of economic performance (see Table 4). The faster growth of real income indicators compared to the growth of GDP caused especially by positive development in terms of trade reflects the impact of qualitative factors and growth in competitiveness of the Czech economy.

### 1.4 Convergence of the Czech economy towards the EU level

Real convergence reflects approaching of the relevant country's economic level to the level of selected developed countries or their groups. The economic level is measured by GDP per capita in purchasing power parity to eliminate differences in price levels. This indicator shows the "physical volume" of goods and services available to the relevant economy for consumption and investment (including the foreign trade balance). The economic level of the Czech Republic is on the 17<sup>th</sup> place in the EU. The CR surpassed Portugal in 2005 and Malta in the previous year. The CR ranks among the most developed countries in the group of new member states from Central and Eastern Europe (EU-8), Slovenia being the only country in this group with a higher economic level (see Figure 4).

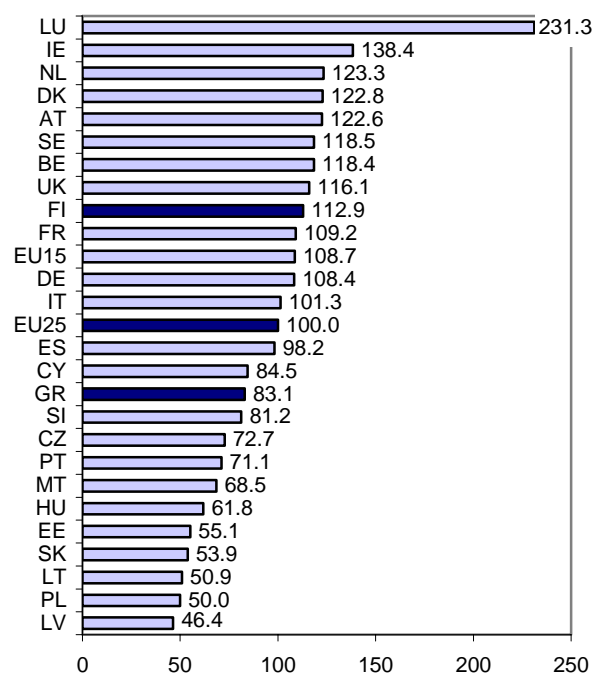
<sup>5</sup> Data for comparison - Hungary 9.6 %, Poland 5.5 % (in 2000) and Slovakia 7.9 % (in 2001) (see the study mentioned above).

<sup>6</sup> For more details see Spěváček (2005a), Vintrová (2005a).



After recovery from the second recession during 1997–1998, the real convergence is successful and the position of the CR improved by 9 p.p. during a short period of 5 years (between 2000 and 2005), (see Table 5). GDP per capita in purchasing power standard was approximately 73 % of the EU-25 average in 2005, while the same figure in 2000 was only 64 %.

Figure 4: GDP per capita in PPS<sup>1)</sup> (EU-25, 2005)



Note: <sup>1)</sup> PPS – Purchasing Power Standard, unit of purchasing power parity on the basis of EUR, expresses average price level in countries EU-25. Source: EUROSTAT, Structural Indicators (11. 1. 2006).

Convergence towards the EU level is a result of higher growth rates of GDP per capita in the CR compared to the EU average. The average annual growth rates during 2001–2005 were 3.5 % in the CR and 1.2 % in the EU-25. However, the dynamics of real convergence in long-term cannot be assessed solely based on an advantage in growth rates of GDP per capita in constant (domestic) prices, although this factor is crucial. “Convergent” growth rates differ due to changes in terms of trade, which are not included in the indicator of GDP in constant domestic prices, and due to differences in recording structural changes in purchasing power parity calculations.

Table 5: Gross domestic product per capita in EU-8 (in PPS, 1996–2005, EU-25=100)

	1996 <sup>1)</sup>	2000	2005 <sup>1)</sup>	Difference in p.p.	
				1996–2005	2000–2005
Czech Republic	70.3	64.0	73.0	2.7	9.0
Hungary	48.7	53.2	62.0	13.3	8.8
Poland	42.3	47.0	50.1	7.8	3.1
Slovakia	45.6	47.3	54.0	8.4	6.7
Slovenia	69.2	73.2	81.5	12.3	8.3
Estonia	34.9	41.2	55.3	20.4	14.1
Lithuania	34.8	38.3	51.0	16.2	12.7
Latvia	30.3	35.1	46.5	16.2	11.4

Note: <sup>1)</sup> Estimate of EUROSTAT. Source: EUROSTAT, Structural Indicators (11. 1. 2006).

## Development of the CR's economic position in the EU-8

The economic advantage the Czech Republic had over other Central and Eastern European countries at the beginning of the transformation process weakened significantly in the 90's. While the CR was still on the first place according to the level of GDP per capita in purchasing power standard in mid 90's, it was surpassed by Slovenia after the critical year 1997 and the gap between other countries and the CR decreased. Due to the second (post-transformation) crisis, the position of the CR in relation to the EU improved by not even 3 p.p. between 1996 and 2005, while other countries recorded improvement by 8 to 20 p.p. (see Table 5).

The CR's economic position in relation to the EU was at its worst (64.0 %) in 2000. A rapid progress of real convergence started after this year as the CR approached the economic level of the EU-25 by 9 p.p. between 2000 and 2005 and was the most successful Central European country during this period. This is a somewhat surprising finding, which is in contrast with standard ideas based solely on monitoring development of GDP.

The growth of GDP, which is used to measure the progress of real convergence, is not the only indicator of economic performance. Long-term improvement of terms of trade (T/T) in relation to abroad (see subchapter 1.3) is a specific attribute of the Czech economy, which is characteristic in the European context. This is why the Czech economy has been characterised on a long-term basis by a faster growth of RGDI than GDP. The difference between the average annual growth rate of RGDI and the average annual growth rate of GDP between 1996 and 2004 was 0.8 p.p. and this difference increased to 1.1 p.p. during 2001–2004. The differences between the two indicators in other Central European countries are lower and in some cases they even are negative. Slovenia recorded a significant lead of the RGDI growth rate over the GDP growth rate during 2001–2004 and Hungary recorded a less significant difference. The growth of RGDI in Poland and Slovakia by contrast was lower than the growth of GDP (see Table 6).

Table 6: GDP and real gross domestic income per capita 2001–2004 (percentage average annual change)

	GDP per capita	RGDI per capita	Difference in p.p.
EU-25	1.3	1.5	0.2
Czech Republic	3.2	4.3	1.1
Hungary <sup>1)</sup>	4.3	4.5	0.2
Poland	3.0	2.8	-0.2
Slovakia	4.7	4.3	-0.4
Slovenia	3.1	3.6	0.5

Note: <sup>1)</sup> Data are not fully comparable due to different stage of national accounts revisions implemented by reason of new methodology of allocation of financial services (FISIM) and of new method of calculation of constant prices by chain linking. Hungary recorded the biggest changes due to these revisions – the rate of growth of GDP and RGDI increased in the years 2001–2004 more than by 0.4 percentage point annually. Source: Data for CR from CSO, for other countries own calculations by using EUROSTAT, National Accounts (12. 1. 2006).

The picture of economic dynamics in international comparison arising from the RGDI indicator is different from conventional one based on development of GDP in constant prices. The Czech Republic is frequently presented as a country with relatively slow dynamics of economic

growth in the EU-5. However, long-term improvement in terms of trade reflected in the RGDI indicator made the growth rate of this indicator one of the highest of the five Central European countries.

Improvement in terms of trade is also reflected in faster progress of real convergence. Real convergence in spatial comparison is measured by GDP per capita in current purchasing power parity to reflect the actual price levels in the relevant year. Improvement in T/T is reflected as an increase in the volume of total GDP in current parities because the expenditure component of GDP – net export is recorded in prices actually paid for imports and achieved prices of exports converted by the market exchange rate. This differentiates development of indicators in current purchasing power parities from development in “domestic” constant prices.

**Table 7: Gross domestic product per capita (EU-25=100) in current PPS and according to rates of growth in constant prices**

	2000 Current PPS	2004		
		Cur- rent PPS	Adjusted by GDP growth <sup>1)</sup>	Diffe- rence in p. p.
Czech Republic	64.0	70.6	68.9	1.7
Hungary <sup>2)</sup>	53.2	60.4	59.8	0.6
Poland	47.0	49.1	50.1	-1.0
Slovakia	47.3	52.1	54.0	-1.9
Slovenia	73.2	79.5	78.8	0.7

Note: <sup>1)</sup> Calculated as relation of country to EU-25 in the year 2000 in current PPS (column 1), multiplied by relation of indices of growth of GDP per capita in a given country to the average of countries of EU-25 in constant prices. <sup>2)</sup> The year 2000 before revision, the year 2004 after revision including the impact of FISIM; comparable figure for the year 2004 in current PPS is almost by 2 percentage points lower and the difference is -1,4 percentage points. Source: EUROSTAT, Structural Indicators (11. 1. 2006), own calculations.

While the progress of convergence in the Czech Republic, Slovenia and Hungary is faster than the recorded lead in the GDP growth rates, the situation in Slovakia and Poland is quite the opposite (see Table 7).

#### Linkages between real and nominal convergence

Nominal convergence means convergence of nominal values – price levels, inflation rates, interest rates, nominal wages, etc. The progress of nominal convergence in relation to the European Union is typically described by the fulfilment of Maastricht criteria, which represent a condition for accession of member states to the euro area. However, these criteria are defined for the purpose of maintaining the stability of common currency. They do not convey the linkages of real and nominal convergence in the context of the Czech economy ensuring its steady economic growth.

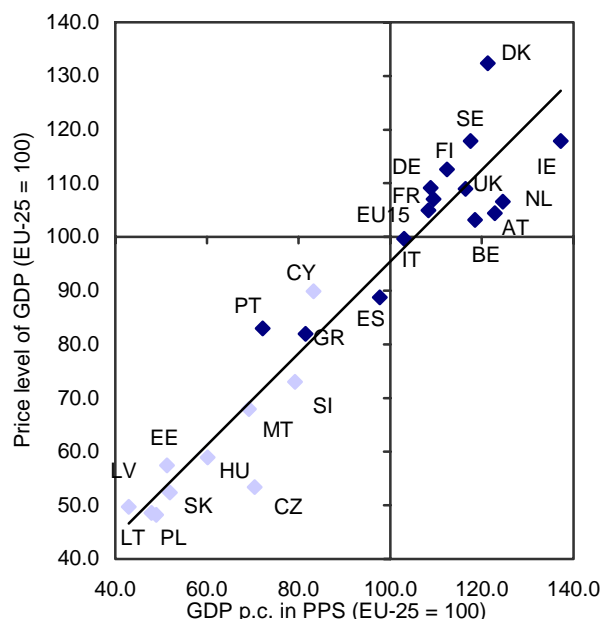
Real and nominal convergences occur simultaneously and influence each other. Countries with low economic level are also characterised by low price levels compared to economically more advanced countries and their wage levels or levels of labour costs tend to be even lower. The price level grows with an increasing economic level, real appreciation of the currency occurs and the relative wage levels also increase. Less developed countries base their competitiveness on the international scale mainly on low wages and low total production costs. Countries with

developed economies have better conditions for non-price (qualitative) competitiveness.

A harmonized progress of adjusting the economic level (based on an advantage in the growth of labour productivity), price level and wage level is vital for a smooth course of the integration process. An excessively fast increase in the consumer price levels unsupported by a sufficient advantage in the growth of labour productivity and the relating increase in wage levels can jeopardize development of the living standard as a result of decreased real wages and all real income of the population. Excessively strong pressure on wages unjustified by increased labour productivity would on the other hand lead to a decline in competitiveness of the business sector, deceleration of the economic growth and ultimately to increased unemployment.

The extent of the gap in relation to developed EU countries in individual recorded basic macroeconomic parameters varies. In 2005, the economic level in the Czech Republic measured by GDP per capita in PPS was approximately 73 % of the EU-25 level and the level of labour productivity measured by GDP per employee was 67 %. Yet, the price level of the overall GDP reached only 58 % and shows a large deviation downwards on the regressive curve, which measures interdependence of the economic and price levels. The largest gap occurs in the level of labour costs, which in nominal terms (exchange rate adjusted) per employee do not reach even one third of the average figure for EU-25 countries. These facts suggest that the fastest dynamics in the process of convergence will be in nominal wages (expressed in euros), followed by real wages (in purchasing power standard) and price level. The overall economic level, where the existing difference in relation to the European Union average was “only” 27 % in 2005, will have the slowest convergence.

**Figure 5: Relationship between the price level and the economic level in EU-25 countries (EU-25=100, 2004)**



Note: Luxembourg not included. Coefficient of correlation = 0,95. Source: EUROSTAT, Structural Indicators, National Accounts (30. 1. 2006), own calculation.

Correlation between the economic level measured by gross domestic product per capita in purchasing power

standard and the price level of the overall GDP is very close in the EU-25. However, the price level in the Czech economy differs significantly from the price level in the European Union on a long-term basis and this difference is greater than the gap between the economic levels would justify. This is one of the differences between the Czech economy and economies of other post-communist new member states. Their price level is either directly on or very close to the regression curve that measures the interdependence between the economic level and the price level. Differences in the group of developed countries can be observed in Scandinavian countries and Germany – their price levels show upward divergence, or in Belgium, Ireland, Netherlands and Austria where the price levels diverge downwards (see Figure 5).

The downwards divergence of the price level in the Czech Republic from the curve is exceptionally high in relation to the rest of the EU and this characteristic needs to be considered when assessing the outlook for future development.

#### Convergence of the price level and appreciation of the exchange rate

The gap between GDP per capita in nominal terms and the EU average is greater than the gap between economic levels in real terms, which is caused by relatively low price levels in less developed EU countries. GDP per capita in euros (exchange rate adjusted) in the Czech Republic in 2004 was less than 38 % of the EU-25 level. This is very close to the level in Hungary (36 %), where the gap between the local level and the EU level in nominal terms is partly narrowed by a slightly higher price level compared to the CR. Similarly to the real terms, Slovenia maintains the highest level of GDP per capita in euros in the EU-5, and the lowest level is achieved in Poland, where GDP per capita represents as little as 24 % of the EU-25 average.

The Comparative Price Level (CPL) of the total GDP in the CR is slightly higher than one half of the average level in the EU-25. The CPL was 54 % in 2004, while the price level of final household consumption was between 55 % and 56 %. (According to estimates by EUROSTAT the CPL increased in 2005 to 58 %).

The price level of the total GDP compensates for a significantly higher price level of gross fixed capital formation (influenced by a high share of import of machinery and equipment, including means of transport, from countries with higher price levels) with an exceptionally low price level of public consumption (general government final consumption), where a low level of wages in relation to abroad is reflected in constructed evaluation of this mainly non-market item (wages have a high weight in this expenditure component of GDP). Changes in CPL are influenced by different development of prices and development of nominal exchange rate in relation to other compared countries.

As the price level approaches the reference level, **the progress of nominal convergence is significantly faster than the progress of real convergence**. While the annual average growth rate of GDP per capita in real terms (in constant prices) in the CR during 2001–2004 was 3.1 % and the excess of the EU was 1.8 p.p., the GDP per capita in euros (exchange rate adjusted) increased annually by 9–10 % and approached the EU level with an overlap in growth rates of 6.6 p.p. The position of

the CR in GDP per capita in euros in relation to the EU-25 thus improved in 4 years by more than 8 p.p.

Besides the fast growth of GDP in real terms, the dynamics of nominal convergence were also significantly influenced by appreciation of the nominal CZK exchange rate and to a lesser extent by the positive inflation differential of the GDP deflator. Appreciation of the nominal and real CZK exchange rate over a short period may be influenced by random fluctuations, including speculative influences of financial markets. Appreciation of the exchange rate over a longer-term period is a result of faster growth of labour productivity in the relevant country and is accompanied by steady convergence of the local price levels to levels of developed countries. This process is simultaneous with real convergence and reflects increasing welfare of the relevant country.<sup>7</sup> This process will not cease after adopting the common currency as some analysts erroneously assume. Instead, it will take its course through a single channel – the inflation differential. However, ensuring that nominal appreciation of the exchange rate or the positive inflation differential does not lead to deterioration of the foreign trade balance is necessary in order to maintain long-term balanced development.

The price levels in all transitive countries have been approaching the average values for economically more advanced “older” EU members in long-term development since 1990, although the extent of this convergence in individual countries differs. Hungary has been and remains the closest to the average price level in the EU of all compared Central European countries (EU-4 excluding Slovenia). The price level of total GDP in the Czech Republic approached the EU price level the fastest of all Central European transitive countries. This indicator increased in relation to the EU-25 during 1995 and 2004 almost by 15 p.p. (see Table 8). However, the price level in the CR remains low in relation to the achieved economic level.

**Table 8: Changes in comparative price levels (CPL) of GDP in EU-5**

	EU-25 = 100			CZ = 100
	1995	2004	Difference in p. p.	2004
Czech Republic	38.6	53.4	14.8	100.0
Hungary	43.8	58.9	15.1	110.3
Poland	44.0	48.2	4.2	90.3
Slovakia	40.9	52.4	11.5	98.1
Slovenia	74.4	73.0	-1.3	136.8

Source: EUROSTAT, National Accounts (11. 1. 2006), own calculations.

The course of currency appreciation and price level increase should not be precipitate or with severe fluctuations as these aspects complicate the position of exporters, decrease price-based competitiveness of the relevant country in foreign trade and can deteriorate the external economic balance.

<sup>7</sup> Some authors (for example Singer, 2005, p. 7) propose alternative “euro” indicators of economic growth as they recommend converting GDP into euros with the nominal exchange rate and subsequently deflating this indicator by the average inflation in the euro area. However, this approach results in intermixing indicators of real and nominal convergence.



### Labour productivity and unit labour costs

Growth of labour productivity is an essential factor in real convergence. The CR lags behind the EU average according to labour productivity measured by GDP per employee or working hour slightly more than according to GDP per capita. The economic level is relatively higher due to a greater participation and employment rate and partly due to certain demographic factors (relatively small numbers of supported persons, especially children, in the CR).

GDP per employed person in PPS was 65 % of the EU-25 level in 2004 (compare to 73 % in GDP per capita) and the CR was on the 20<sup>th</sup> place on the scale of EU countries. Labour productivity places the CR on the 3<sup>rd</sup> place in the EU-8 – after Slovenia and Hungary. However, compared to 1995 GDP per employed person increased in 2004 in relation to the EU-25 by 8 p.p., while the relation in GDP per capita practically stagnated. The process of catching up in labour productivity was therefore faster than the process of catching up in the economic level. This is because the increasing labour productivity was accompanied by a decrease in employment rate and in the rate of economic activity.

Comparison of the “net” labour productivity measured as GDP per working hour in PPS produces even less positive results for the CR. According to this comparison, which is only available in relation to the EU-15, the CR is surpassed not only by the EU-8 states listed above, but also by Slovakia. While GDP per employed person was approximately 59 % of the EU-15 level in 2003, GDP per working hour was as low as 46 % (51 % in Slovakia). The higher number of hours worked in the CR compared to the average values for the “old” member states is diminished by the impact of lower productivity per hour.

**Table 9: Average gross monthly wages in EU-8 and their comparison with Austria, 2004**

	In market exchange rate		In PPS	
	EUR	Austria = 100	EUR/PPS	Austria = 100
Czech Republic	565	22.2	1047	41.1
Hungary	579	22.8	986	38.7
Poland	505	19.8	1034	40.6
Slovakia	395	15.5	748	29.4
Slovenia	1190	46.8	1597	62.8
Estonia	466	18.3	791	31.1
Latvia	314	12.3	641	25.2
Lithuania	335	13.2	687	27.0
Austria	2545	100.0	2545	100.0

Source: Podkaminer, Hunya et al. (2005), s. 101–105, own calculations.

Labour productivity in the EU-8 lags behind the average figure for the European Union significantly less than the level of wages and total labour costs in nominal representation. This leads to generally very low aggregate unit labour costs in EU-8 countries and consequently high price-based competitiveness. The level of Czech nominal wages (exchange rate adjusted) was EUR 565 in total in 2004, which is slightly more than one fifth of Austrian wage level. The same comparison of real wages shows that the wage level in the CR was more than two fifths of the wage level in Austria due to the lower price level in the CR (see Table 9).

Unit labour costs (ULC) calculated as gross wages plus indirect costs (including employers' contribution to social security) exchange rate adjusted per unit of GDP in real terms range between the lowest level of 38 % to 39 % in relation to the EU-25 (in Slovakia, Poland, Latvia and Lithuania) to 47 % in Estonia, 48 % in the CR and 52 % in Hungary. Slovenia records the highest level (77 %), (see Table 10).

**Table 10: Labour productivity and unit labour costs in EU-8, 2004 (EU-25=100)**

	GDP per person employed <sup>(1)</sup>	Labour costs per person employed <sup>(2)</sup>	Total ULC <sup>(3)</sup>
Czech Republic	64.4	30.9	48.0
Hungary	68.2	35.7	52.3
Poland	62.2	24.5	39.4
Slovakia	59.1	22.6	38.2
Slovenia	75.3	57.6	76.5
Estonia	51.1	24.0	47.0
Latvia	42.8	16.2	37.9
Lithuania	49.7	19.4	39.0

Note: Labour productivity measured by gross domestic product per employee in PPS, labour costs of employed person calculated according to compensation of employees converted by exchange rate. Source: EUROSTAT, Structural Indicators (8. 2. 2006), own adaptations (1); Podkaminer, L., Hunya, G. et al. (2005), s. 21 (2); own calculations (3).

Frequently repeated statements about high labour costs in the CR, which tend to appear in the press and numerous statements by business associations, are misleading and incorrect. While it is true that the CR has higher labour costs than China, Ukraine, Bulgaria or Romania, none of these countries is comparable to the CR in their economic level or history of industrial development. Although the share of contributions to social and health insurance is relatively high in relation to gross wages in the CR, other indirect labour costs are exceptionally low and the basic component of labour costs, i.e. average wages, is especially low. The total volume of labour costs in relation to labour productivity represents the essential value for business calculations. In the CR, these costs are below the level adequate for a country with the same level of economic development. The Czech economy has high price-based competitiveness in the EU especially due to relatively low labour costs.

### Prospect of convergence and economic growth strategy

The priorities of new member states in the EU-5 are very different from those of stabilised Western European countries, which did not experience a long period of isolation from development in the developed world and thus do not face the necessity of “catching up”. A robust economic growth ensuring convergence to the economic level of advanced EU countries while maintaining a high level of employment represents the basic priority of their economic strategies. Nonetheless, on the broader, worldwide scale even the “old Europe” feels the need for reforms in the transition to a knowledge-based economy and the line between the processes of catching up in new member states and the Lisbon Strategy processes tends to be blurred to some extent under this challenge.

## 2. Structural changes

Over the last approximately ten years the Czech economy has gone through a stage of active structural adjustment to market economy conditions. Although the most significant changes took place as early as the beginning of the 90's, the process occurring during this period can be more appropriately described as gradual abolition of the former rigid planned economy system. This reflected at the macroeconomic level in changing weights of the basic production sectors in value added and employment, where the share of the primary and secondary sectors succumbed to the dynamic growth in the tertiary sector. However, changes within these sectors have been taking place continuously and this trend will persist as the conditions on the domestic and the worldwide market change. The aim of this section is to analyse the development on the supply side of the economy and describe major trends that have occurred over the last few years and can be detected through statistical indicators.

### 2.1 Development of industry structure

Examination of the supply side of the economy can be undertaken with various degrees of detail, from performance of the national economy as a whole to a variety of defined production sectors or individual entities. The more detailed the assessment is, the more it allows us to identify the driving forces behind the economic development. On the other hand, the vision of the economy as a whole is obscured with increasing detail. This is why a combination of macro, mezzo and micro approaches appears to be the best solution. Industry analysis in this case serves as a link between macroeconomic analysis and analysis at the company level. The study begins with the macroeconomic approach, focusing on development of economic indicators within the national economy as a whole and the basic production sectors, and gradually proceeds to the more detailed industry level. The final part of the study discusses the impact of individual industries on performance of the economy as a whole and the relationships between individual industries.

#### Macroeconomic view: development of basic sectors

From the point of view of the share of the main sectors in gross value added (GVA) and employment, services are a sector with the greatest share in creation of gross value added, while agriculture is a sector with the smallest share. As Table 1 shows, the structure of the Czech economy changed very slowly between 1995 and 2004. The share of agriculture (from 4.6 % to 3.3 %) and construction decreased slightly (from 9.1 % to 6.9 %), while gradual growth in the share of services could be observed (from 55.5 % to 58.8 %). The share of industry in GVA remained virtually unchanged – around 31 %. Similar development was detected in the overall employment. Development in fixed prices was somewhat different due to different development in prices as measured by GVA deflators in individual sectors. While the gross value added deflator in agriculture, forestry and industry between 1996 and 2004 was lower on average than the deflator for the entire national economy, the situation in construction and services was quite the opposite. This influence was especially significant in construction, where the share of GVA in the overall GVA in fixed prices decreased from 9.1 to 4.9 % during 1995–2004. This was influenced the most by the major increase in prices of

construction work compared to the average development in prices of other products and services. Development of the GVA deflator in agriculture and forestry had the opposite impact on the structure of the economy according to GVA. As the GVA deflator for this sector decreased on average by 1 % per year during 1996–2004, the share of GVA for this sector in the overall GVA in fixed prices grew from 4.6 % to 5.5 %.

**Table 1: GVA and employment structure in the CR (%)**

	GVA				Employment	
	current p.		const. p. 1995			
	1995	2004	1995	2000	1995	2004
Agriculture	4.6	3.3	4.6	5.1	6.3	4.3
Industry	30.8	31.0	30.8	33.7	30.3	29.1
Construction	9.1	6.9	9.1	5.3	10.5	8.6
Services	55.5	58.8	55.5	55.9	53.0	57.9

Source: ČSÚ, Annual NA database (1. 10. 2005), own calculations.

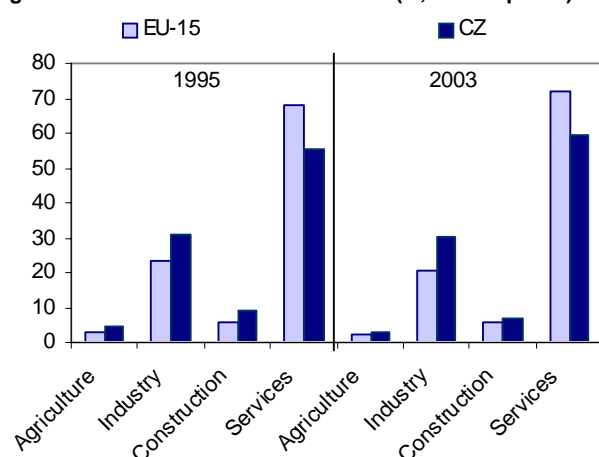
The Czech Republic has a notably low share of services in gross value added compared to other EU countries (see Figure 1, complete overview of EU countries is shown in Table 1A). Ireland is the only country with an even lower share of services in GVA and France records the highest share of all EU countries. Comparison of the structure of the Czech economy against the EU-15 average shows that the share of industry in the CR in 2003 was higher by approximately 10 percentage points and the share of services was lower by approximately 12 percentage points. The structure of the Slovenian economy resembles that of the Czech economy the most of all so-called new EU member states.<sup>1</sup> Comparison of the structure between 1995 and 2003 shows that most EU countries experienced a growth in the share of services to the detriment of the share of industry. This development suggests an increasing trend of transferring a part of production from industry to services. An increasing rate of outsourcing secondary activities through external suppliers is one of the reasons behind this trend.

The degree of structural changes over time can be illustrated in a condensed form by the so-called indicator of structural change intensity. Figure 2 shows that during 1995–2002 the Czech Republic was one of the countries with the most stable economic structure in terms of the gross value added structure (Denmark was the only monitored country with a more stable structure). Lithuania and Slovakia recorded the most dynamic changes in their economic structures of all new member states and Austria reported the greatest changes in the economic structure in the EU-15 group. The period from 1995 to 2002 saw more significant changes in the CR in terms of employment in individual industries than in terms of the industry structure of value added (see Figure 2). Nonetheless, the intensity of structural changes in employment was still lower than in other transitive economies included in the comparison (Slovakia, Poland, Hungary).

<sup>1</sup> Comparing the structure of GVA is problematic due to different price relations in individual countries. As a rule, the higher GDP per capita the relevant country records, the higher the price levels in services are (the so-called Balassa-Samuelson effect).

Comparison of structural changes according to GVA in the Czech and Slovak economy reveals that the coefficient of intensity of structural changes in Slovakia was influenced by significant changes of shares of a number of industries in the overall GVA. This concerns especially trade and transport, other services, chemical and coke industry and power engineering. The indicator of structural change intensity in the Czech Republic was influenced mainly by development of GVA in construction, agriculture and services provided to companies. However, the intensity of structural changes according to GVA between 1995 and 2002 in the Czech Republic was on average significantly lower than in Slovakia.

**Figure 1: GVA structure in the CR and EU (% current prices)**



Source: EUROSTAT, New Cronos\Economy and Finance\National Accounts (1. 10. 2005), own calculation.

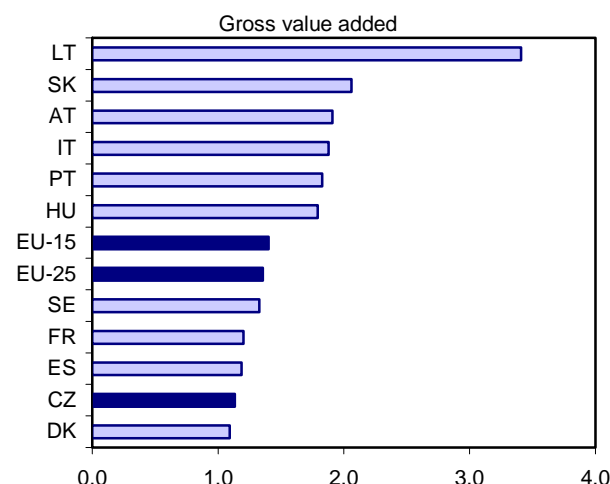
It is important to bear in mind that the intensity of structural changes in Central and Eastern European countries over the monitored period is not high because major part of these changes took place before 1995. Data included in Table 2 illustrate this fact and show that the greatest structural changes in the Czech economy occurred during 1990–1995, while the following years brought far less significant changes. This is because the structure of the Czech economy was greatly deformed and substantial structural changes had to take place after 1990 due to changes in the internal and external demand.

The indicator of structural change intensity over the period 1995–1999 in the Czech Republic was relatively higher than during 1999–2003 according to the structure of gross value added, as well as the structure of employment. Major changes in the structure of value added during 1995–1999 concerned most industries, with the greatest impact of the decline in the share of construction and agriculture in the overall GVA. Structural changes according to employment were relatively evenly distributed in two periods. Significant changes in the share of construction, agriculture, commercial services and transport in the overall employment occurred between 1995 and 1999. The period 1999–2003 on the other hand saw major changes in the share of most branches of the manufacturing and other services in the overall employment.

The impact of individual factors on the growth of gross value added needs to be examined in connection with sources of economic growth (see Table 3). The average increase in the overall GVA for the period 1996–1999 was

as low as 0.8 %. Industry and services contributed to this increase equally, while the contribution of the construction industry was negative. The average annual increase in the overall GVA of 3.2 % for the period 1999–2004 is attributable to industry and services, while agriculture and the construction industry delivered a neutral effect.

**Figure 2: Structural changes intensity comparison within selected EU countries between 1995 and 2002**



Note: Coefficients were calculated on the level of 17 industry groups (A+B, C, DA, DB+DC, DD+DE, DF+DG, DH+DI, DJ, DK, DL, DM, DN, E, F, G+H+I, J+K, L+M+N+O+P, see table 2A). Data on the GVA structure by NACE subsections are not available for Poland. Source: EUROSTAT, New Cronos\Economy and Finance\National Accounts (1. 10. 2005), OECD (2005d), own calculation.

Despite the significantly greater weight of services, the contribution of industry and services to the growth of GVA remained relatively balanced throughout the period 1996–2004. This was due to the more dynamic overall real growth of GVA in industry compared to services, although even services represented a rather heterogeneous sector. The shares of both sectors in the contributions for the individual years differ to a great extent. Production of office machines, computers, television sets, coupling devices and twin-track motor vehicles was the main driving force behind the growth in the manufacturing. On the other hand, coal mining, coke production and water industry were among declining industries.

**Table 2: Structural changes intensity in the Czech Republic**

	1990–1995	1995–1999	1999–2003
GVA	3.86	1.01	0.87
Employment	..	0.89	0.77

Note: Coefficients were calculated on the level of 17 industry groups (A+B, C, DA, DB+DC, DD+DE, DF+DG, DH+DI, DJ, DK, DL, DM, DN, E, F, G+H+I, J+K, L+M+N+O+P, see table 2A). Source: ČSÚ, Annual NA database (1. 10. 2005).

Telecommunications recorded the most dynamic growth of all sectors in services. This was a logical outcome of the widespread use of mobile phones. Banking, wholesale, wholesale procurement and processing data also experienced a rapid growth. The largest decline in the gross value added was recorded in catering and accommodation, research and development and other social activities. In industry mainly progressive sectors involving computers and other electronics quite understandably



experienced dynamic growth, while heavy industry recorded a decline. The situation in services, where telecommunications and data processing reported a very dynamic growth, was similar.

The decline in research and development is somewhat disturbing as its already low share compared to other European countries had a declining tendency. The decline in catering, recreational and social activities is surprising as a growing trend would have seemed logical in this area (activities connected with leisure time). However, it is necessary to point out in this context that comprehensive illustration of the economy tends to be very problematic in these sectors (small enterprises subject to sample surveying, stronger tendency towards interfering with accounting records, fast formation and dissolution of enterprises, etc.).

**Table 3: Contributions of main sectors to total GVA growth in 1996–2004 (% , constant prices)**

	1996–1999	2000–2004	2003	2004
<b>Total GVA</b>	<b>0.8</b>	<b>3.2</b>	<b>2.9</b>	<b>4.7</b>
Agriculture	0.1	0.0	0.1	0.1
Industry	0.8	1.4	2.1	1.9
Construction	-0.9	0.0	0.3	0.0
Services	0.7	1.7	0.4	2.8

Source: ČSÚ, Annual NA database (1. 10. 2005).

## 2.2 Qualitative aspects of structural changes

Catching up in the level of labour productivity plays a crucial role in catching up with the economic standard of developed countries. Labour productivity represents the main factor determining the living standard in individual countries. The labour productivity in the CR grew on average by 2.4 % per year during the period 1996–2003. Gross value added by contrast only grew by 1.8 % per year. To compare these figures for example with Hungary and Slovakia, the average annual growth in GVA in these countries over the same period of time was more than twice of that in the CR (3.8 % and 4 % per annum respectively). The average annual growth of labour productivity in the CR during the second half of the monitored period, i.e. during 2000–2003, was slightly higher than during 1996–1999 - 2.6 % compared to 2.2 %. However, the difference in the growth rate of GVA was even greater - 2.8 % compared to 2.1 %.

Development in individual industries differed to a great extent during the period 1996–2003. Production of means of transport recorded the strongest growth. The GVA in this sector grew on average by 15.3 % per year and labour productivity reported a growth of 12.1 %. Power engineering was on the other side of the spectrum with an overall decline in GVA and labour productivity. The average annual growth in productivity for industry as a whole sector was 4.2 %. The construction industry with the annual decrease of 3 % was a sector with the greatest decline in productivity.<sup>2</sup> On the other hand, agriculture

reported the average growth in labour productivity of 7.6 %, mainly due to a strong decrease in employment (see Table 4).

Commercial services by contrast recorded a far greater increase in gross value added (2.4 % per year) compared to the growth in labour productivity (0.5 % per year). Employment in this sector grew significantly during the monitored period (by 1.9 % per year on average). Sectors with the greatest increase in labour productivity in services included trade, catering, transport and communications – on average by 2.8 % per year. This increase can be mainly attributed to the dynamic growth in telecommunications, while accommodation and catering reported a decrease in the real GVA. Other services recorded a slight decrease. However, measuring labour productivity in this sector is very complicated as most of the production is of a non-market character.

**Table 4: Comparison of the level and dynamics of labour productivity and gross value added by industries (%)**

	Labour productivity (thous. CZK, current p.)		GVA growth	LP growth
	1995	2003		
<b>Total</b>	<b>270</b>	<b>490</b>	<b>15.1</b>	<b>21.1</b>
Agriculture, forestry, fishing	200	341	18.3	79.0
Industry	275	503	28.9	38.6
Mining	337	580	-17.6	62.6
Manuf. of food and tobacco	284	540	-12.5	-3.1
Manuf. of textile and footwear	124	256	-7.0	46.2
Manuf. of wood, paper, printing, publishing	207	423	107.3	91.3
Manuf. of coke, refined petrol. prod., chemicals	559	788	-4.2	15.1
Manuf. of rubber, plastic prod., mineral products	238	581	76.0	47.4
Manuf. of metal products	284	426	6.0	17.2
Manuf. of machinery and equipment	212	398	20.9	45.8
Manuf. of office mach., TV, optical and medical instr.	188	406	204.8	131.0
Manuf. of transport equip.	206	575	212.6	149.8
Manuf. of furniture, manuf. n.e.c.	177	316	57.1	53.1
Energetics	860	1427	-28.6	-7.4
Construction	236	394	-38.0	-21.5
Trade, transport, hotels and restaurants	272	501	23.7	25.2
Financial and business services	471	719	21.3	4.4
Other services	208	406	0.1	-1.7
Variation coefficient	0.66	0.54	x	x

Source: ČSÚ, Annual NA database (1. 10. 2005).

Mining recorded the most pronounced difference between the development of labour productivity and gross value added as a decline in value added for this sector was accompanied by a significant increase in labour productivity. The strongest increase (more than threefold) in value added was recorded in production of means of transport and electrical and optical apparatuses (on average by 15.3 % and 15 % per year, respectively). Both of these

<sup>2</sup> The development of real GVA in the construction industry was influenced significantly by the differing development in production and intermediate consumption and their deflators. While production in the construction industry declined during 1996–1999 and did not achieve a significant increase until 2002, intermediate consumption only declined during 1996 and 1998 and started to grow significantly in 2001. This difference had a strong impact on GVA due to the high share of intermediate consumption in production in the construction industry (around 80 %) and caused

completely different development in GVA and the construction production index.

sectors experienced strong inflow of foreign investment, the cumulative figures as at the end of 2003 being approximately CZK 110 billion (and CZK 67 billion) (see ČNB, 2005c).

Evident differences between individual industries can be observed not only in the dynamics, but also in the level of labour productivity. The average labour productivity in the national economy measured by gross value added per employee in 2003 was CZK 490 thousand in current prices. Power engineering recorded the highest labour productivity, which exceeded CZK 1.4 million. Banking, insurance industry, commercial services and oil-refining and chemical industry were among sectors with results high above the average figure. On the other hand, the lowest value added per employee was reported in textile and leather industry, other manufacturing and agriculture. Development of the variation coefficient suggests that the differences in productivity between individual sectors showed predominantly declining tendency between 1995 and 2003, although this development is not quite uniform (see Table 4).

Some sectors are characterised by significant differences between the dynamics of gross production and gross value added. This applies to most industries especially after 1999. The share of GVA in gross production grew between 1999 and 2003 in agriculture and power engineering only. Other sectors reported either stagnating or declining trends. This decrease was the strongest in electrical industry, from approximately 25 % to less than 16 %. This development clearly relates to production of computers and computer components in the processing regime, where value added comprises almost exclusively wages of employees and production involves assembly operations only. Production of means of transport is a sector with the second lowest share of GVA in gross output; the recorded decrease was from 20.5 % to 17 %.

The overall development of productivity in the national economy may be influenced by development of productivity in individual industries, as well as changes in the structure of employment. The overall increase in labour productivity in the national economy can be divided into individual contributions through the so-called share breakdown analysis. The total increase in productivity over a certain period is divided into three factors. The first factor expresses net impact of changes in the structure of employment on the economy, while the third factor describes net impact of intra-industrial labour productivity. The second factor expresses combined impact of productivity and structure of employment.

**Table 5: Factor contributions to labour productivity growth rate in the CR between 1995 and 2003 (%)**

	TOTAL	I.	II.	III.
Productivity growth rate	21.0	0.9	0.1	20.1
Factor shares	100.0	4.3	0.5	95.3

Note: Contributions were calculated on the level of 17 industry groups (A+B, C, DA, DB+DC, DD+DE, DF+DG, DH+DI, DJ, DK, DL, DM, DN, E, F, G+H+I, J+K, L+M+N+O+P, see table 2A). Source: ČSÚ, Annual NA database (1. 10. 2005).

Peter Havlik completed the breakdown of contributions to labour productivity into individual factors in his study of new EU member states (mostly for the period between 1995 and 2002, see Havlik, 2005, p. 15). As Table 6 shows, the intra-industrial effect had a dominant impact

on the total increase in labour productivity in all studied countries. This effect is the strongest in Slovenia, where it occurs in combination with a negative factor of dynamic changes. This is consistent with the structural burden hypothesis. This factor in all other monitored countries is positive or neutral (which is the case of Estonia). Results for Hungary showed the weakest impact of the intra-industrial effect on the total increase in productivity of all studied countries.

Changes in the structure of employment in Hungary had a relatively significant impact on the total increase in productivity, accounting for approximately 8 % of the impact. Latvia by contrast recorded the highest share of the effect of dynamic changes in the impact on the total increase in productivity of all studied countries, approximately 6 %. The effect of static changes was slightly negative. This can be explained by the fact that while employment in industries with rapidly growing productivity increases relatively significantly, the level of productivity in these dynamic industries is not yet higher than that in less dynamic sectors.

Major part of an increase in the aggregate productivity in new EU member states during 1995–2002 can be attributed to an increase in productivity in individual industries. This is consistent with the progress in developed market economies, although this situation can be somewhat surprising in view of the extensive structural changes occurring in the new member states. The reason behind this may be the fact that a major part of structural changes took place prior to 1995, as was the case in the CR – see Table 2. Comparison of the indicator of structural change intensity (see the previously mentioned Figure 2) does not show a very significant gap between the old and the new EU member states.

**Table 6: Decomposition of the aggregate productivity growth in selected European transition economies (%)**

	Static change effect	Dynamic change effect	Intra-industry effect
CZ	3.3	1.0	95.7
HU	8.2	3.1	88.7
PL	3.8	2.3	93.8
SK	5.9	1.6	92.4
SI	3.3	-2.9	99.7
EE	4.6	0.0	95.4
LV	-0.4	6.1	94.2
LT	2.3	0.3	97.4

Source: Havlik (2005), p. 15.

A similar method for breaking down an increase in the aggregate labour productivity over time can also be used when comparing differences in the aggregate labour productivity between individual countries. The economy of a country or a group of countries (such as EU-15) towards which other compared economies are meant to converge is typically used as a reference. Germany was selected as the reference country in this case. As purchasing power standard rates are not available for individual industries, the comparison needs to be based on data in current prices converted to EUR using the nominal rate. This type of calculation does not take into account the impact of different price levels in individual countries. However, this is not relevant with regard to the studied objective, i.e. contributions of individual factors to the overall growth in labour productivity.



As Table 7 shows, compared to Germany Slovakia had the lowest productivity of all studied countries in 2002 (17.2 %), followed by the Czech Republic (21.7 %) and Hungary (24 %). Differences in productivity in individual industries have clearly the strongest impact in all compared countries. Results for the Czech Republic show the lowest share of the first factor, i.e. the structure of employment in the Czech economy is the closest to the German employment structure. Hungary on the other hand recorded the highest impact of the structure of employment on lagging behind in the standard of labour productivity of all compared countries. However, Hungary is ahead of the other two countries in its standard of intra-industrial productivity. All of the studied countries are characterised by a positive contribution of the second factor, i.e. the share of employment in industries with rapidly increasing productivity grows fast. This effect is the weakest in the Czech Republic and the strongest in Slovakia.

**Table 7: Contribution of individual factors to labour productivity difference of selected EU countries to Germany (%)**

	Difference to Germany	I.	II.	III.
CZ	-78.3	-4.3	3.8	-77.8
HU	-76.0	-9.4	5.6	-72.2
SK	-82.8	-7.8	6.4	-81.4

Note: Coefficients were calculated on the level of 17 industry groups (A+B, C, DA, DB+DC, DD+DE, DF+DG, DH+DI, DJ, DK, DL, DM, DN, E, F, G+H+I, J+K, L+M+N+O+P, see table 2A). Source: EUROSTAT, New Cronos/Economy and Finance/National Accounts (1. 10. 2005), own calculation.

### Development of activities according to their technological intensity

The importance of activities with high technological intensity<sup>3</sup> (high-tech industries) in a particular country is important for the position of the country's economy in the global production chain. These industries typically contribute to the economy with a range of positive effects, such as high wages and profits, rapid growth in trade and productivity and high level of innovation, which is in addition associated with distribution of positive externalities. High-tech industries of products of these industries are capable of competing with their quality despite relatively high prices. Higher prices mean higher income for expended production factors and this has a positive impact on the amount of the national income.

Classification of economic activities according to their technological intensity is based on a methodology by OECD, which divides manufacturing sectors according to their demands on research and development into four groups: high-tech, medium high-tech, medium low-tech and low-tech. Services can also be divided into a number of groups according to the standard of knowledge utilised in individual sectors (see Table 3A). While high-tech industries are characterised by production and use of advanced technologies, in the case of knowledge industries the emphasis is placed on the use of technologies without the requirement to produce new tech-

nologies. This term therefore concerns mainly services, although production of new technologies is increasing even in this sector (this applies to telecommunications, data processing and science and research).

As Table 8 shows, the share of higher and high-tech activities in value added and employment in the manufacturing increased between 1995 and 2003. The share of these activities in GVA of the manufacturing in 1995 was 31.7 % and in 2003 the share increased to 37.7 %. Similar growth occurred in the share of high-tech activities in employment in the manufacturing. However, the period from 1995 to 2003 saw a decline in the share of value added in gross production especially in high-tech industries (a decline from 28.6 to 12.8 %). This development can be clearly attributed to increased production of computers and office machines in the inward processing regime, where imported components are assembled and subsequently mainly exported with a minimal share of value added. While the share of exports after processing of high-tech products in 1999 was less than 5 %, the same share in 2003 was 94 %.

**Table 8: Shares of activities by technology and knowledge intensity on GVA and employment in manufacturing and services in the Czech Republic (%)**

	Gross value added		Employment		GVA to gross output ratio	
	1995	2003	1995	2003	1995	2003
HT	5.6	6.8	5.4	6.6	28.6	12.8
MHT	26.1	30.9	27.0	29.3	25.4	22.0
MLT	33.9	30.2	27.6	27.9	27.1	26.9
LT	34.3	32.1	40.1	36.2	24.6	27.2
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>25.9</b>	<b>23.6</b>
KIS_HT	5.6	8.3	5.0	4.8	56.8	54.8
KIS_MS	21.7	20.5	12.7	14.7	53.8	47.2
KIS_FS	5.8	4.8	2.9	2.7	48.3	38.6
KIS_OT	15.5	16.2	22.5	21.6	56.0	57.9
LKIS_MS	39.7	37.3	42.4	41.2	48.5	46.9
LKIS_OT	11.7	13.1	14.4	15.1	64.6	60.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>52.7</b>	<b>50.0</b>

Note: Technology and knowledge intensity in manufacturing: HT – high, MHT – medium-high, MLT – medium-low, LT – low, knowledge intensive services (KIS): HT – high-tech, MS – market, FS – financial, OT – other. Knowledge less intensive services (LKIS): MS – market, OT – other. Source: ČSÚ, Annual NA database (1. 10. 2005).

The share of high-tech activities in gross value added in services also increased between 1995 and 2003, from 5.6 to 8.3 %. This was accompanied by a slight decrease in the share in employment, which suggests a strong increase in productivity of the high-tech group. Telecommunications have the greatest weight in this group. However, market services with lower technological intensity are a sector with the highest weight in gross output, value added and employment and account for approximately 40 % of services as a whole. These sectors include trade, catering and accommodation and land transport.

Comparison of the level and dynamics of GVA and labour productivity between 1995 and 2003 is shown in Table 9. The table shows that compared to other groups high-tech industries are not among the sectors with the highest labour productivity. In 2003 low-tech group re-

<sup>3</sup> "Demands on research and development activities as illustration of the achieved level of knowledge is the key criterion for including industries in the high-tech group. These demands are expressed as a share of expenditures of research and development in production (turnover or value added)" (Kadeřábková, 2005, p. 1).

corded the highest labour productivity and high-tech industries were third in the comparison of labour productivity. Pharmaceutical industry had the highest labour productivity of all high-tech sectors. On the other hand, the high-tech group recorded the highest dynamics of real value added and labour productivity between 1996 and 2003, achieving the average annual growth of 20.7 % in GVA and 18.8 % in LP. Stating the figures for the manufacturing as a whole for reference, gross value added in the manufacturing between 1996 and 2003 increased on average by 5.6 % per year and labour productivity rose on average by 5.7 % per year. The pharmaceutical industry is an exception in the high-tech group with the average annual growth in GVA over the same period by 0.8 % and decline in labour productivity.

**Table 9: Comparison of the level and dynamics of the labour and GVA (groups of activities by technol. intensity, in %)**

	Labour productivity (thous. CZK. current p.)		GVA growth	LP growth
	1995	2003	1996–2003	
<b>TOTAL manufacturing</b>	<b>234</b>	<b>454</b>	<b>54.3</b>	<b>56.1</b>
High-tech	244	462	351.9	295.5
Aircraft and spacecraft <sup>b)</sup>	139	371	49.2	93.3
Pharmaceuticals <sup>a)</sup>	776	798	6.3	-16.6
Office machinery	293	275	4953.1	2520.7
Radio, TV, comm. equip.	143	461	143.7	80.6
Medical, optical instrum.	210	419	45.8	35.1
Medium-high-tech	227	479	87.4	83.2
Electrical machinery	188	395	149.7	82.5
Motor vehicles	228	614	304.1	147.4
Chemicals <sup>a)</sup>	408	748	35.4	48.7
Railroad equipment <sup>b)</sup>	183	447	-0.3	77.1
Machinery, equip. n.e.c.	212	398	21.3	46.5
Medium-low-tech	288	493	12.4	12.6
Coke, refined petr. prod.	897	1168	-87.6	-56.3
Rubber and plastic prod.	175	578	149.0	42.6
Other mineral products	267	583	51.6	58.9
Ships and boats <sup>b)</sup>	32	166	576.9	276.3
Basic metals	352	528	-15.8	39.1
Fabricated metal prod.	233	385	21.3	7.9
Low-tech	200	403	21.8	24.9
Manufacturing n.e.c.	177	316	23.5	20.7
Wood, prod of wood	144	318	89.8	86.6
Paper, publish., printing	293	545	106.2	75.0
Food and tobacco	286	540	-18.1	-9.2
Textile prod., footwear	124	256	-6.5	47.6

Note: Data in real terms were obtained by using GVA deflator a) for manufacturing of chemicals (NACE 24), b) for manufacturing of other transport equipment (NACE 35). Source: ČSÚ, Annual NA database (1. 10. 2005).

The relative trade indicators grew compared to production in the Czech Republic between 1995 and 2003. This development involved the share of export in production and indicators of import penetration. The share of export in the local production in the manufacturing grew from 42 to 52 %. The indicator of import penetration also rose, from 45 to 52 % (see Table 4A). While the share of export in production shows the importance of foreign trade for the relevant industry, the indicator of import penetration expresses the share of import in the local demand and

reflects the competitiveness of local companies in relation to imported products.

In 2003, high-tech sectors recorded the largest share of export in production, to be exact 62 % in sectors with high technological intensity and 70 % in sectors with higher technological intensity (see Table 4A). This share has increased since 1995 by 5 and 12 percentage points respectively, reflecting the growing importance of foreign markets for high-tech industries. The share of import in the local demand for high-tech products decreased between 1995 and 2003 from 79 to 69 % (see Table 4A) unlike in other products, where the share increased slightly (see Tables 4A, 5A). Closer examination of individual industries with higher and high technological intensity reveals the highest share of production intended for export in machinery and equipment, to be exact a share of 84 % in 2003. On the other hand, the share of production intended for export in industries with low and lower technological intensity is significantly lower than in technologically advanced industries. The lowest share of approximately 13 % was recorded in the food industry. The share of export in the manufacturing in the Czech Republic in 2003 was relatively high in international comparison, significantly exceeding the EU average (see Table 4A). This share was above the average level practically in all groups of industries, the highest values compared to the EU average being recorded in industries with higher technological intensity, in particular engineering.

The product approach provides a more detailed examination of the importance of high-tech industries in foreign trade. This approach defines technologically advanced industries in greater detail according to three to five-digit codes of SITC classification. The share of high-tech products in the total export of goods almost doubled between 1999 and 2003, from 6.4 % to 12.4 %. The same share decreased slightly in 2004. The strongest growth was recorded in export of computer technology, where the volume of export increased almost tenfold. Electronics and telecommunications represented the second most important group of exported high-tech products with the volume of export increasing approximately four times.

Import of technologically intensive products grew much slower and its share in the total import of goods only increased from 12.4 % to 15.9 % between 1999 and 2003. Similarly to export, this share decreased slightly in 2004. Electronics and telecommunications account for the largest share in import of high-tech products, followed by computer technology (6.4 % and 4.7 % of the total import of goods in 2003 respectively). Approximately half of the value of high-tech products imported in 2003 was imported for processing. This means that assembly was carried out in the CR and finished products were subsequently exported. This concerned especially electronic components and computer technology.

### 2.3 Input-output approach to structural analysis

Modern economies are characterised by strong inter-industrial connections. However, standard structural analysis tools focus on examining isolated industries and disregard mutual connections between these. This limitation of the structural analysis tools is eliminated by applying the so-called input-output analysis,<sup>4</sup> which uses tools for quantifying mutual connections between objects (industries or sectors) in the economy.

### Analysis of output multipliers in the CR and their comparison with selected countries

Symmetric input-output tables for 1995, 2000 and 2002 were used to calculate matrixes of direct and comprehensive coefficients. Tables for 2000 were used for the purposes of international comparison as these tables were available for all compared countries (CR, Hungary, Poland, Slovakia and Germany). Output multipliers for 1995 and 2002 were calculated for the Czech Republic. We can reasonably assume that structural changes reflecting in the value of these multipliers occurred during this period and this led to relative changes in the importance of individual industries in terms of their multiplication effect. I-O tables expressing the total consumption, i.e. local production and export, were used for the purposes of the calculation. If we were to examine exclusively the impact on the domestic output, the share of the local production in the total resources of individual industries needs to be taken into account (see Figure 3).

The construction industry had the highest value of the output multiplier in both examined years. An increase in the value of this multiplier from 2.36 to 2.54 occurred between 1995 and 2002. Closer examination of the structure of this increase (see Table 6A) shows that it was influenced from 90 % by higher consumption of subcontracted construction work per unit of construction production.<sup>5</sup> The share of local production in the overall resources in the construction industry is almost one hundred percent.

The largest increase in the value of the multiplier between 1995 and 2002 was recorded in the electrical industry as the multiplier increased by 0.29 (from 1.67 to 1.96). This was influenced mainly by production of office machines and television sets. The share of local production in the overall resources increased at the same time by 8 % (from 50 to 58 %). This means that the impact of the electrical industry on the local production between 1995 and 2002 increased significantly.

A substantial increase in the value of the output multiplier also occurred in transport and communications (land and air transport and telecommunications), other manufacturing (production of furniture), timber industry, automotive industry and agriculture. The value of the output multiplier in production of means of transport grew mainly due to increased intermediate consumption of rubber and plastic products. The increase in the output multiplier in agriculture was influenced the most by a higher share of consumption of financial and business services. Consumption of companies classified under the same industry had the greatest impact on the value of the output multiplier in other industries.

The greatest decrease in the output multiplier between 1995 and 2002 was recorded in the leather industry, where the multiplier fell by 0.3 (from 1.83 to 1.53). What's more, the share of imported leather products in the overall

resources grew significantly from 45 % in 1995 to 58 % in 2002. This means that the demand for leather products has a continuously decreasing impact on the overall performance of the economy. A significant decline in the output multiplier also occurred in the chemical and the textile industry. What's more, a decrease in the share of resources provided by local companies was recorded in both of these cases at the same time, causing a further decline in the overall impact of this industry on the total domestic production.

In order to determine the importance of individual industries in the CR in terms of their demand effect compared to other economies, output multipliers need to be calculated also for these economies. Table 10 presents comparison of five countries. The output multiplier in all compared countries reaches high values in the food and the tobacco industry and this value is the highest of all industries in Hungary and Poland. The CR and Slovakia recorded the highest values of the output multiplier in the construction industry and power engineering. Mineral mining is a sector with the lowest multiplication effect in all of the compared countries.

**Table 10: Comparison of output multipliers within selected countries (2000)**

	CZ	HU	DE	PL	SK
Agriculture	1.93	2.18	1.62	2.15	2.08
Mining and quarrying	1.38	1.17	1.24	1.37	1.12
Manuf. of food, tobacco	2.26	2.45	2.03	2.48	2.17
Manuf. of textile	1.78	1.73	1.47	1.71	1.41
Manuf. of footwear	1.60	1.66	1.36	1.68	1.55
Manuf. of wood	2.23	1.87	1.91	2.24	2.09
Manuf. of paper prod.	1.94	1.87	1.83	1.96	2.00
Manuf. of refined petrol	1.82	1.71	1.87	1.97	1.97
Manuf. of chemicals	1.54	1.53	1.74	1.60	1.65
Manuf. of rubber, plast.	1.72	1.63	1.81	1.77	1.74
Manuf. of mineral prod.	1.94	1.68	1.80	1.95	2.03
Manuf. of metals	1.95	1.71	1.85	1.97	2.13
Manuf. of machinery	1.71	1.51	1.81	1.59	1.69
Manuf. of electrical m.	1.74	1.81	1.60	1.54	1.56
Manuf. of motor vehicl.	2.12	1.88	2.05	1.86	1.96
Manuf. n.e.c.	2.08	1.74	1.76	2.03	2.00
Energetics	2.43	1.76	1.74	2.05	2.78
Construction	2.54	1.95	1.92	2.16	2.26
Trade, hotels, restaur.	1.83	1.91	1.66	1.71	2.04
Transport services	1.93	1.72	1.78	1.85	1.98
Financ., business serv.	1.80	1.53	1.45	1.84	1.68
Other services	1.74	1.53	1.42	1.48	1.66

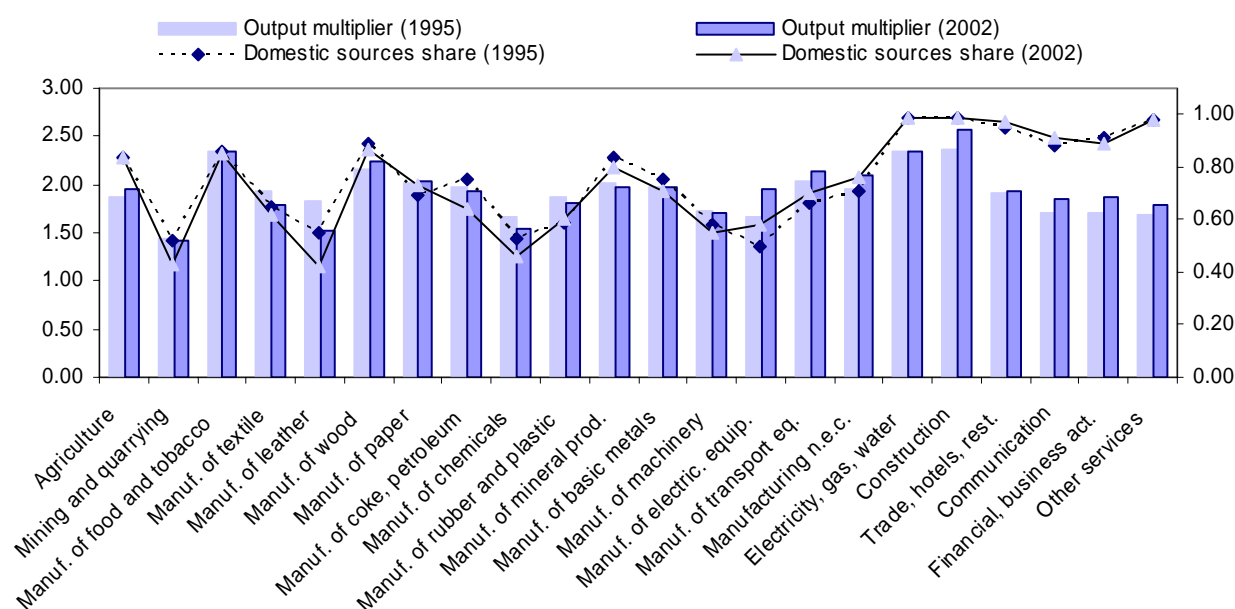
Source: ČSÚ, ŠÚSR, Input-Output tables, EUROSTAT, New Cronos\Economy and Finance\National Accounts (1. 10. 2005), own calculation.

The CR has a significantly higher multiplication effect in power engineering compared to other countries with the exception of Slovakia. Output multipliers for production of means of transport, textile industry, other manufacturing and transport and communications are also higher than in other countries. Timber industry, production of other non-metal mineral products (intended mainly for construction), metallurgy and business and financial services play a major role in the CR and Poland. Hungary and Poland have the highest values of the output multiplier for agriculture. Germany has the highest multiplier in engineering industry and production of rubber and plastic products of all compared countries.

<sup>4</sup> Publications by international institutions are also beginning to use the input-output analysis as a tool for examining competitiveness. This is for example the case of "EU Sectoral Competitiveness Indicators" (see EC, 2005), a publication comparing output multipliers in EU-15 countries at the level of 6 basic sectors.

<sup>5</sup> This conclusion may at first appear to be in contrast with the decrease in the share of the construction industry in the aggregate GVA. However, the output multiplier does not depend on the size of the relevant industry but represents a relative indicator in relation to the unit of final demand.



**Figure 3: Comparison of the output multipliers by activities in the Czech Republic between 1995 and 2002**

Source: ČSÚ, Input-output tables, own calculation.

Output multipliers were also calculated for groups of industries within manufacturing and services with the same technological or knowledge intensity (see Table 11). Comparison of individual countries shows that high-tech sectors in the manufacturing in Hungary have the highest multiplication effect and the second highest multiplication effect was recorded for the Czech Republic. The value of output multipliers in industries with low and lower technological intensity in all countries except for Hungary is higher than in industries with higher and high technological intensity. This means that activities with low technological intensity tend to have a higher multiplication effect.

The largest difference in services was detected between output multipliers for knowledge intensive and other activities in Poland. This means that the multiplication effect of knowledge intensive activities is higher than that of other services. In Slovakia and Hungary by contrast the values of multipliers tend to be higher in activities with lower knowledge intensity.

The highest value of the output multiplier in the Czech Republic, Germany and Poland was recorded in financial services, while the highest multiplier in Slovakia and Hungary was detected in market services with lower knowledge intensity, which include for example trade, accommodation and catering, and ground transport. The Czech Republic has relatively small differences between the value of multipliers in individual industry groups in services. This means that there is no significant difference in the multiplication effect of activities with higher or lower knowledge intensity.

#### Identification of industrial complexes

The analysis of inter-industrial linkages was carried out to classify industries according to their impact on the growth of the economy as a whole. However, the economic growth in the national economy depends on the industrial structure of the relevant country. The economic growth in countries where a rapidly developing

sector or industry has a significant weight will be more dynamic than in those countries where sectors or industries with slower development have the greatest weight.

In addition, the economic growth of individual industries will be influenced by the intensity of interconnections between individual industries. For example, if a certain industry successfully penetrates a foreign market, the positive impact of this development will also extend to industries with strong supplier-customer relations with the relevant industry. Identifying these interconnections allows us to envisage the impact of demand factors on individual industries and industrial complexes.

The structural analysis defines industrial complexes as groups of productive activities with intensive exchange of inputs. Identifying these groups allows us to detect the mutual influence of individual industrial complexes. Involvement in these industrial complexes brings the benefit of bulk saving, which in turn reduces cost, uncertainty and risks. What's more, the existence of these complexes increases positive externalities (spillover) of new technologies, knowledge and innovations (see Hoen, 2002, p. 133). Industrial complexes have the strongest impact if they include companies that use the same technologies or have strong supplier-customer relations. This is why inter-industrial connections and industrial complexes are two closely connected concepts.

Besides having its own analytic significance, identification of industrial complexes can also be used as a criterion for determining the level of aggregation. Input-output tables often include large volumes of detailed data and these data need to be aggregated in order to be able to work with the data or publish analysis results. The data for individual industries can be aggregated based on a similar cost structure or, for example, the intensity of mutual connections. This is why identification of industrial complexes can be used as guidance for aggregating individual industries.

**Table 11: Output multipliers by technological and knowledge activities groups (selected countries, 2000)**

		CZ	HU	DE	PL	SK
Primary sector		1.66	1.76	1.45	1.80	1.48
Construction		2.55	2.00	1.94	2.19	2.29
Energetics		2.52	1.99	1.76	2.20	2.81
Manufacturing	HT	1.63	1.84	1.52	1.42	1.43
	MHT	1.86	1.71	1.88	1.72	1.78
	MLT	1.94	1.78	1.87	2.01	2.11
	LT	2.06	2.04	1.82	2.15	1.90
Services	KIS_HT	1.85	1.63	1.46	1.85	1.75
	KIS_MS	1.75	1.52	1.39	1.84	1.66
	KIS_FS	1.97	1.70	1.84	2.09	1.72
	KIS_OT	1.75	1.58	1.41	1.51	1.63
	LKIS_MS	1.87	1.87	1.69	1.73	2.08
	LKIS_OT	1.75	1.49	1.42	1.46	1.69

Note: Technology and knowledge intensity in manufacturing: HT – high, MHT – medium-high, MLT – medium-low, LT – low. Knowledge intensive services (KIS): HT – high-tech, MS – market, FS – financial, OT – other. Knowledge less intensive services (LKIS): MS – market, OT – other. Source: ČSÚ, ŠÚSR, Input-output tables, EUROSTAT, New Cronos\Economy and Finance\National Accounts (1. 10. 2005), own calculation.

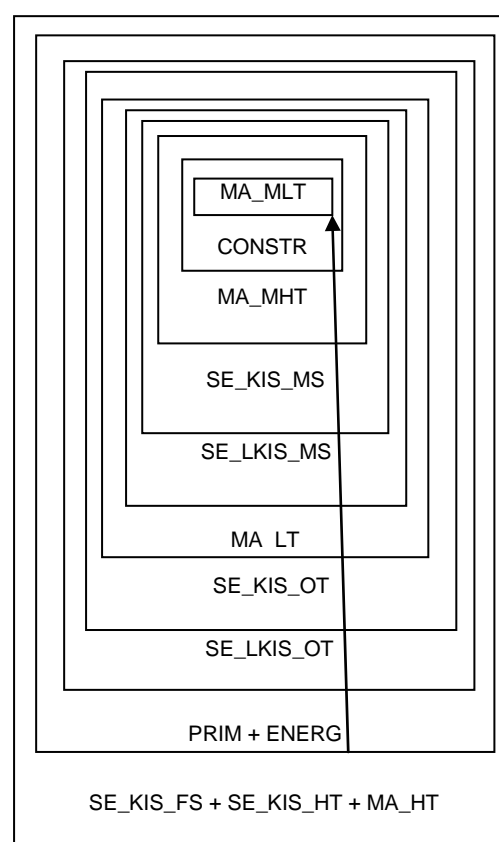
The cluster analysis can be used to identify industrial complexes. This type of analysis involves selecting a certain group of industries with strong supplier and customer interconnections and forming the so-called clusters. The input-output table with the most detailed structure available (i.e. 58 industries) for 2002 was used to identify industrial complexes in the CR.

9 industrial complexes in total were identified in the CR:<sup>6</sup>

1. Metal industry – metallurgy – secondary raw material processing
2. Power engineering – oil and natural gas processing – oil and natural gas extraction
3. Clothing industry – textile industry
4. Rubber and plastic products – chemical industry
5. Air transport – auxiliary activities in transport
6. Production of office machines and computers – production of electric machines and appliances
7. Production of furniture – timber industry – forestry
8. Catering and accommodation – tobacco industry – food industry – agriculture
9. Financial services – trade – activities of social organisations, recreation, culture – waste removal – business services.

Strong supplier-customer relations can be detected inside these complexes. This means that if the demand for the product of the first industry in a particular cluster changes, chain reaction will follow and this change will also have an impact on all other industries in the relevant cluster. This analysis only allows us to identify relation at the level of aggregation for which a symmetric table is completed. Connections inside industries determined in this manner (which tend to be the strongest) remain hidden. This is another reason why symmetric

tables should be completed with as detailed level of aggregation as possible.

**Figure 4: Linkages among industrial complexes on different technology and knowledge intensity level in the CR, 2002**

Note: Technology and knowledge intensity in manufacturing: HT – high, MHT – medium-high, MLT – medium-low, LT – low. Knowledge intensive services (KIS): HT – high-tech, MS – market, FS – financial, OT – other. Knowledge less intensive services (LKIS): MS – market, OT – other. Source: ČSÚ, ŠÚSR, Input-output tables, own modification.

<sup>6</sup> Industrial complexes are not listed according to their significance. Their importance cannot be determined using this analysis.

**Table 1A: Comparison of GVA structure within EU-25 (%. current prices)**

	1995				2003			
	Agriculture	Industry	Construct.	Services	Agriculture	Industry	Construct.	Services
CZ	4.6	30.8	9.1	55.5	2.8	31.4	6.6	59.2
DK	3.6	20.3	4.5	71.5	2.2	20.0	5.0	72.7
EE	8.0	23.2	6.1	62.8	4.2	21.9	6.4	67.5
ES	4.4	22.1	7.5	66.0	3.7	19.1	10.0	67.2
FI	4.5	28.1	4.4	63.0	3.4	25.2	5.3	66.1
FR	3.2	21.1	5.2	70.5	2.6	15.9	5.6	75.8
IE	7.3	33.1	5.3	54.4	2.7	33.0	8.2	56.2
IT	3.2	24.9	5.1	66.6	2.5	21.6	5.0	70.8
LT	11.4	25.8	7.3	55.5	6.2	24.8	7.1	61.9
CY	5.1	14.5	8.4	72.0	4.0	12.3	7.8	76.0
LV	9.0	25.2	4.5	61.3	4.3	17.2	5.6	72.9
LU	1.0	15.0	6.2	77.8	0.5	10.6	5.8	83.2
HU	6.7	26.3	4.6	62.4	3.3	25.5	4.9	66.4
MT	2.9	25.6	3.3	68.3	2.4	22.2	4.5	71.0
DE	1.3	25.4	6.8	66.6	1.1	24.5	4.3	70.1
NL	3.5	22.4	5.4	68.6	2.4	18.9	5.8	73.0
PL	6.5	29.7	7.1	56.7	3.0	24.5	6.0	66.5
PT	5.8	22.1	6.4	65.8	3.7	19.3	6.7	70.3
AT	2.7	22.5	7.8	66.9	1.9	22.4	7.7	68.0
EL	9.9	16.0	6.4	67.7	6.7	13.9	8.8	70.5
SK	5.9	33.1	5.1	55.9	4.0	26.5	5.3	64.3
SI	4.2	30.5	5.4	59.9	2.6	30.2	5.7	61.6
SE	2.7	25.7	4.4	67.2	1.8	22.9	4.4	70.8
UK	1.9	25.9	4.9	67.2	1.0	18.1	5.9	75.1

Source: EUROSTAT, New Cronos\Economy and Finance\National Accounts (1. 10. 2005), own calculation.

**Table 2A: Exports of high-tech products and exports after processing and their share on the total exports in 1999–2004 (%)**

	Exports				Exports after processing			
	1999	2001	2003	2004	1999	2001	2002	2003
TOTAL high-tech	6.4	9.2	12.4	12.1	4.8	91.0	93.4	94.1
of which:								
Aerospace	0.36	0.43	0.34	0.25	0.6	46.6	82.0	91.4
Computers-office machines	0.87	2.86	6.28	6.02	1.6	92.2	95.1	93.6
Electronics-telecommunications	1.26	2.77	3.34	3.22	2.7	137.6 <sup>1)</sup>	131.8 <sup>1)</sup>	131.4 <sup>1)</sup>
Pharmacy	0.26	0.18	0.15	0.15	0.0	11.5	13.8	8.1
Scientific instruments	0.51	0.64	0.74	0.83	7.6	72.8	57.7	61.5
Electrical machinery	1.50	1.05	0.60	0.77	0.2	91.8	87.8	83.7
Chemistry	0.38	0.22	0.22	0.19	0.1	3.8	3.4	2.2
Non-electrical machinery	0.98	0.85	0.62	0.58	20.1	28.3	26.4	25.8
Armament	0.31	0.20	0.16	0.13	5.3	11.7	1.3	0.9

1) data on total exports and exports after processing are not consistent. Source: ČSÚ, foreign trade database (1. 11. 2005).

**Table 3A: Imports of high-tech products and imports for processing and their share on the total imports in 1999–2004 (%)**

	Imports				Imports for processing			
	1999	2001	2003	2004	1999	2001	2002	2003
TOTAL high-tech	12.4	15.0	15.9	15.1	22.8	40.0	50.2	49.7
of which:								
Aerospace	0.62	0.66	0.74	0.34	5.3	5.2	4.5	5.0
Computers-office machines	2.84	4.21	4.65	4.78	16.5	41.2	53.6	51.9
Electronics-telecommunications	4.24	5.74	6.38	5.82	32.6	59.6	72.9	76.6
Pharmacy	0.84	0.70	0.77	0.69	0.1	1.0	1.0	0.3
Scientific instruments	1.32	1.33	1.45	1.38	31.1	23.4	19.7	17.9
Electrical machinery	0.58	0.68	0.41	0.63	64.9	55.5	60.4	50.6
Chemistry	0.68	0.67	0.68	0.72	12.1	8.8	5.8	6.9
Non-electrical machinery	1.19	0.97	0.70	0.68	5.3	4.8	5.3	5.2
Armament	0.06	0.03	0.08	0.06	5.7	1.4	2.7	0.8

Source: ČSÚ, foreign trade database (1. 11. 2005).



Table 5A: Import penetration and export to production ratio in activities at medium-low and low technological intensity within selected EU countries

	Medium-low-tech activities										Low-tech activities															
	Total		Petroleum refining	Rubber and plastics	Non-metallic mineral products	Shipbuilding	Basic metals	Fabricated metal products (except machinery)	Total		Other manufacturing industry	Wood and furniture	Paper and printing	Food, beverages, tobacco	Textiles, clothing, leather											
	1992	2001	1992	2001	1992	2001	1992	2001	1992	2001	1992	2001	1992	2001	1992	2001										
	Import penetration ratio <sup>3)</sup>																									
CZ <sup>1)</sup>	34	45	17	45	59	52	27	29	93	2001	41	54	29	39	28	32	35	39	19	18	39	41	14	16	56	73
AT	38	45	23	40	64	66	21	27	52	241	53	59	35	38	31	45	38	50	20	23	33	36	12	31	71	90
DK	45	46	47	42	52	58	26	31	25	42	78	82	31	32	38	51	38	44	50	50	28	30	29	43	85	143
FI	28	28	31	32	40	36	19	20	25	28	31	38	21	17	14	19	30	33	8	9	9	10	7	16	59	70
FR	22	25	22	19	27	32	15	20	14	29	42	47	12	15	22	28	27	35	16	23	17	21	16	19	39	61
DE	22	27	28	27	22	29	16	20	16	50	37	45	12	15	27	31	30	40	20	19	16	21	17	20	64	85
IT	16	20	18	17	16	22	7	9	11	35	36	45	5	7	14	21	11	18	15	16	11	16	15	19	14	26
NL	52	53	47	68	80	78	39	28	-83	13	94	104	34	29	46	49	45	51	58	48	33	31	34	39	112	131
PT	29	38	30	28	36	49	10	15	17	13	54	75	28	40	22	29	30	28	11	21	19	26	16	24	31	42
ES	17	21	23	21	22	30	8	9	18	26	27	37	13	14	14	21	18	23	14	18	14	17	10	17	22	39
SE	37	39	50	42	50	57	27	30	69	24	42	53	22	22	23	30	39	41	9	15	13	16	14	25	84	103
UK	24	27	18	27	25	26	18	19	13	8	43	50	14	18	25	30	37	39	29	31	18	18	19	22	45	68
EU <sup>2)</sup>	9	12	13	14	8	12	5	7	9	18	19	24	4	7	10	14	14	21	9	12	5	6	6	8	21	36
	Export to production ratio <sup>3)</sup>																									
CZ <sup>1)</sup>	39	46	13	27	54	48	46	44	97	59	45	50	37	48	31	33	41	54	44	30	34	39	12	13	62	72
AT	40	44	6	15	67	65	26	26	38	402	56	65	37	36	30	47	32	48	35	43	41	48	8	31	64	87
DK	43	40	42	33	54	59	32	27	54	37	54	67	35	32	48	59	61	57	42	39	18	20	51	63	82	162
FI	34	40	30	40	34	35	18	24	44	77	47	51	22	21	32	40	23	23	48	45	51	54	5	10	38	50
FR	21	24	14	16	26	31	16	20	24	49	42	45	12	14	20	26	19	26	12	18	13	17	20	24	31	51
DE	22	31	15	21	26	39	15	23	46	66	36	47	15	22	20	27	25	37	9	18	16	23	13	18	49	77
IT	17	24	14	18	23	34	17	23	11	58	22	31	12	17	19	29	33	48	5	8	9	14	9	15	30	44
NL	56	60	76	86	76	76	31	22	..	33	94	104	32	28	50	54	33	44	33	21	31	33	52	57	121	151
PT	19	25	24	13	15	34	18	20	30	19	12	42	21	33	29	32	19	22	38	42	20	25	9	13	49	56
ES	17	21	25	18	18	30	11	17	47	26	27	30	10	13	9	19	10	21	7	11	9	16	7	16	15	36
SE	39	44	48	49	45	56	17	26	71	57	52	61	25	27	28	39	34	41	36	42	40	50	6	15	58	107
UK	21	24	24	30	21	21	16	16	15	16	33	44	13	16	16	17	26	24	3	5	11	12	14	15	30	44
EU <sup>2)</sup>	9	13	12	14	9	15	7	11	24	33	14	19	6	9	8	13	12	18	4	8	6	9	6	9	14	26

1) for CR data for 1995 and 2003. 2) EU includes quoted countries except for CR. Intra-EU trade is excluded. 3) import penetration = share of imports on domestic demand (estimated as production minus exports plus imports). Production indicators is defined as group of organizations (industry classification), whereas imports and exports are classified as groups of products (product classification) and are not fully comparable. The indicators are also distorted by counting re-export (values higher than 100 %). Source: OECD (2005d), ČSÚ, annual NA database (5. 11. 2005), own calculation



### 3. Supply, demand and stability

On the supply side, this section examines the development of long-term economic growth determinants structured according to the growth accounting method into labour, capital and total factor productivity (TFP). The growth of real GDP in the CR is disaggregated into the basic national economic industries with quantification of their contributions to the growth of the macroeconomic TFP. In addition, the section compares the economic growth and development of total factor productivity in the CR and EU-15 during 1996–2004 and the development of the relative level of total factor productivity in the CR against the EU-15 as a whole.

On the demand side, this section focuses on changes in the structure of demand not only in domestic, but also in internationally comparable prices, real growth in individual demand components and their contribution to the growth of GDP. The question whether the economic growth in the CR was driven by the domestic demand or foreign trade is discussed in this context.

Macroeconomic stability is assessed according to the relationship between the domestic demand (final consumption and gross capital formation) and domestic supply (GDP) and according to the relationship between national savings and domestic investment. The gap between savings and investment is then examined according to basic institutional sectors of the economy. Partial aspects of the balance (inflation, public finance and monetary indicators) complete the comprehensive picture. The last part of this section focuses on external economic balance.

#### 3.1 Sources of economic growth

Dynamics of growth of the real GDP depends on sources of economic growth, their effective use and flexibility of their relocation. These factors determine the economic growth rate or performance of the economy on a long-run basis. The sources of economic growth are the following: labour, capital and technological progress or total factor productivity.

Throughout the period 1996–2004 the labour productivity in the CR grew faster than in the EU-15 or the EU-25 (see Table 1). What's more, this growth was more than twice as fast than in the EU-15. In the group of the new member states Estonia, Lithuania, Latvia, Poland, Slovakia, Slovenia and Hungary recorded a faster growth in the labour productivity than the CR. Ireland and Greece were the two old member states with the fastest growth in labour productivity, while Spain and Italy recorded the slowest growth of all old member states. The growth in labour productivity in the EU-25 and the EU-15 slowed down during the monitored period (2000–2004 and 1996–1999). The CR by contrast recorded an increased growth rate. The growth rate in the CR during 2000–2004 in relation to the EU-15 was two and a half times higher.

The “growth accounting” method, which is originally based on a paper by R. Solow (1957), was used to analyze the sources of this growth. The approach of Jorgenson and Griliches (1967, 1972), who used Törnqvist's (1936) index for discrete approximation, was used for empiric application. The above approach breaks down the growth rate of the product into the contribution of the labour and capital growth on one side (the weights are determined according to the income share of labour and the complement to one represents the income share of capital) and the contribution of the growth in

the aggregate total factor productivity of factors (TFP) on the other side.

As the growth rates for the product, labour and capital, and the share of labour can be determined empirically, the TFP growth rate is calculated as the residual. This type of calculation is used in the Czech Republic by the Ministry of Finance in addition to certain international institutions<sup>1</sup>.

**Table 1: Labour productivity (EU-25, average annual percentage change)**

	1996–2004	1996–1999	2000–2004
EU-25	1.6	1.8	1.5
EU-15	1.3	1.5	1.2
Belgium	1.2	1.2	1.2
Czech Republic	2.8	2.3	3.1
Denmark	1.5	1.5	1.5
Estonia	7.3	7.5	7.1
Finland	2.0	2.2	1.8
France	1.3	1.8	1.0
Ireland	3.3	3.6	3.1
Italy	0.6	1.1	0.1
Cyprus	2.0	2.3	1.7
Lithuania	6.1	4.6	7.3
Latvia	5.9	4.9	6.6
Luxembourg	1.3	2.6	0.3
Hungary	3.1	2.6	3.5
Malta	1.8	3.7	0.3
Germany	1.9	2.2	1.7
Netherlands	1.1	1.0	1.2
Poland	5.1	5.5	4.8
Portugal	1.2	2.1	0.6
Austria	1.8	2.2	1.4
Greece	3.1	2.4	3.6
Slovakia	4.4	4.6	4.2
Slovenia	3.9	5.2	2.8
Spain	0.4	0.4	0.3
Sweden	2.1	2.6	1.7
United Kingdom	1.8	1.7	1.8

Source: ECFIN (2005a), table 11, p. 50–51, ČSÚ (2005i), s. 42–43.

The calculation of TFP includes in practice:

- The impact of technological progress, i.e. implementation of new technological innovations in production (for example ICT);
- The effect of research and development;
- The contribution of growth in the quality of human resources (education, qualification and skills);
- Institutional and organizational changes;
- The impact of factor relocation between industries;
- Increasing returns to scale;
- Changes in the degree of use of factors (in the case of measurement for shorter periods).

The growth in TFP is also influenced by potential errors or revisions of the values applied (such as conversion of macroeconomic values to fixed prices).

<sup>1</sup> Both comprehensive studies by OECD (see OECD, 2003; OECD, 2004a) can be stated as an example of studies involving an analysis of the economic growth and total factor productivity.

Behavior on the supply side is analyzed from the macroeconomic, but also the industrial point of view. The industrial analysis is based on six macroeconomic industries:

- a) Agriculture, forestry and fishing;
- b) Industry;
- c) Construction;
- d) Trade, repairs and catering, accommodation;
- e) Transport and communication;
- f) Other services.<sup>2</sup>

#### Sources of the economic growth in the Czech economy during 1996–2004

The employment rate was in a long-term decline during the monitored period. On the other hand, capital resources in fixed prices grew slightly faster than the real GDP. The growth in the real GDP between 1996 and 2004 was relatively moderate – on average by 2.1 % per year. Employment decreased by 0.6 % and capital resources grew on average by 2.4 % per year (see Table 2).

The long-term decline in employment in the CR was caused by restructuring of the Czech economy, in particular the industry, and insufficient regional and professional mobility of the labour force. Legislation standards put especially persons with low qualification at a disadvantage. The market continues to be characterized by relatively high long-term and structural unemployment. In addition, rigidity of the labour market is caused by limited use of employment contracts for a definite period, the existing rent regulation system and psychological and financial obstacles in changing a location of employment. Businesses striving to increase their productivity with reduced costs and thus increase their competitiveness also present a significant factor preventing employment rate growth. This trend is the most pronounced in companies under foreign management. However, the employment rate in the national economy became to rise again at the beginning of 2005. This is a result of positive factors including accelerated economic growth, active employment support and inflow of direct foreign investment.

**Table 2: Sources of real GDP growth (average annual percentage change)**

	1996–2004	1996–1999	2000–2004
GDP	2.1	0.9	3.1
Employment	-0.6	-1.0	-0.2
Capital real	2.4	2.4	2.4
Capital/ labour ratio	3.0	3.4	2.7
Labour productivity	2.7	1.9	3.4
Capital productivity	-0.3	-1.5	0.7
Total factor productivity (TFP)	1.5	0.4	2.3

Note: GDP and capital are in constant prices. Capital intensity of labour = capital/employment. Data are rounded. Source: ČSÚ (2005a, 2005b), own calculations.

#### Development of the labour factor

Development on the labour market during 1996–2004 was characterized by overall deterioration. Overall employment in the national economy decreased on average by

<sup>2</sup> The macroeconomic industry other services includes: banking and insurance industry, real estate, business services, research and development, public administration, defence, social security, education, healthcare, veterinary and social activities, other public, social and personal services, and households employing personnel.

0.6 % per year.<sup>3</sup> The degree of economic participation declined from 73.2 % in 1996 to 70.8 % in 2004. The Czech Republic's position in international comparison gradually approaches the average level of EU-15 (and EU-25) countries, although the decrease in the CR was accompanied by an increase in the EU average level throughout the period 1996–2004.<sup>4</sup>

The labour market is significantly influenced by the positive demographic situation in the CR. Strong age groups are currently in their productive age, which is why the number of residents in their productive age (15–64 years of age) in the CR increased throughout the monitored period. The total annual increase was 0.3 % on average. However, the labour force decreased during 1996–2004 by 0.1 % per year. The development during the periods 1996–1999 and 2000–2004 differed in this case. While the labour force grew gradually during the first period (the number of unemployed people grew), the number of unemployed people stabilized or started to decrease slightly during the second period and the number of employed people for the economy as a whole declined.

Increased dynamics of the real GDP in combination with significant inflow of direct foreign investment<sup>5</sup> during 2000–2004 did not reflect significantly in a growing employment rate. The employment rate continued to decline during this period. Although the decline was slower than in the previous period, employment fell on average by 0.1 %. The trend reversed at the end of 2004 and during 2005.<sup>6</sup>

The employment rate in the CR during the monitored period 1996–2004 declined from 70.4 % to 64.9 %. Compared to other new EU member states, the situation in the CR is more optimistic. For example Poland has recorded a declining employment rate since 1998 (the employment rate over the last three years fell below 52 %), Slovakia usually records a declining employment rate and over the last two years stagnated at 57 %, and Hungary as the only country in this group reports a gradual increase almost to 57 % in 2004. However, compared to other EU countries, the situation in the CR is worse. A faster increase in the employment rate in the EU is obstructed by rigidity of the labour markets in member states (labour legislation) and a high tax burden for work leading towards technological substitution and transfer of production.

<sup>3</sup> Development on the labour market is typically accompanied by and analysis of development in labour productivity and wages (unit labour costs). This analysis presents this part in the first section – Growth and convergence. Development of time series relating to the labour market in the CR for the period between 1996 and 2004 is not fully comparable due to harmonisation of the questionnaire for SSLF ČSÚ with EUROSTAT in 2001.

<sup>4</sup> Increasing the number of employed persons was one of the objectives of the Lisbon Strategy (generally throughout the economy, plus increasing the number of female employees and older employees).

<sup>5</sup> Rapidly growing companies (typically under foreign control) focus on intensive growth factors, i.e. factors increasing labour productivity. The use of modern technologies in production, which are localised in the CR within direct foreign investment, is associated with this trend. This leads to limited creation of new employment opportunities. A study by Landesmann et al. (2004) states examples of countries (Slovakia, Hungary, Slovenia and Latvia), which successfully relieved the decline in job opportunities in other areas of the economy by creating jobs in the processing industry and services.

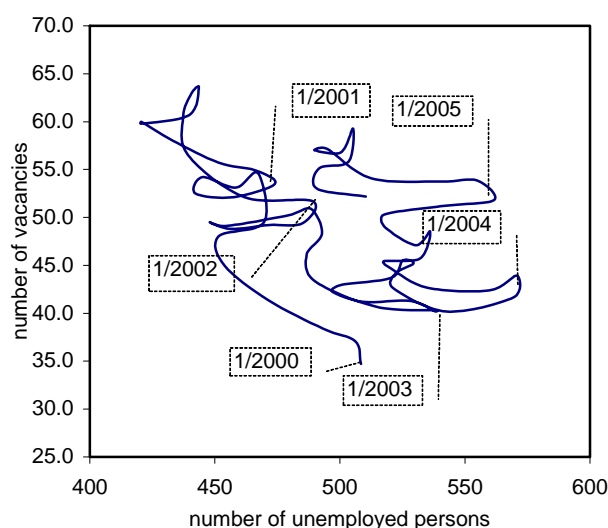
<sup>6</sup> According to ČSÚ (2005k), the total number of employed persons increased in three quarters of 2005 by 1.1 %. This led to an increased average level of employment and rate of economic participation. The number of unemployed people decreased significantly during the same period (by 3.7 %) but the share of people unemployed on a long-term basis remains high.

Demographical factors associated with the ageing population in Europe may also have a certain impact.

The unemployment rate monitored in the CR according to the methodology of the International Labour Organization (ILO) based on a sample survey of labour force (SSLF) increased from 3.9 % (1996) to 8.3 % (2004). The latest development over the first three quarters of 2005 is characterized after two years by a decline in the unemployment rate to 8 % (average figure for three quarters).

Figure 1 describes development on the labour market using an analytic tool – the Beveridge curve. The last four years (2000–2004) are characterized by alternating stages of gradual improvement and deterioration of the conditions, which do not reflect strongly the actual progress of the economic cycle (or reflect this cycle with a certain delay). For example the number of vacant positions increased during 2000–2001 and this increase was accompanied by a slight decrease in the unemployment rate. The following two years were characterized by a decrease in the number of vacant positions and an increasing unemployment rate. Although certain improvement in the labour market became apparent in 2004, the demand for labour generated by the economy is not sufficient (whether due to labour market regulation or due to other objective reasons) to manifest itself in a significant decrease in the unemployment rate. This effect is reflected in the Beveridge curve situated further from both coordinate axes – it has shifted.<sup>7</sup>

**Figure 1: Beveridge curve for the Czech Republic (2000:1–2005:12)**



note: Data are in thousands of persons, unemployed according to original definition of Ministry of Labour and Social Affairs. Source: ČSÚ (2005b), ČSÚ (2006).

The rate of registered unemployment, which was very low during the first half of the 90's, jumped in 1997 to 7.5 % and to 9.4 % in 1999. The number of vacant positions decreased significantly during the recession and the number of applicants per vacancy increased significantly. Regional differences in unemployment, which deepened throughout the period, became a serious problem.

<sup>7</sup> The chart showing cumulative development in production and employment, which allows us to recognize countries with greater changes in employment than in production, provides an alternative view of the development in the labour market (see UNECE, 1996, p. 91).

Although the prosperous stage of the economic cycle occurred in the CR and the country probably is at the peak of the cycle in 2005, the situation on the labour market (between the supply and demand for labour) has not improved significantly and imbalance persists. The most pressing problems include the high number of persons unemployed on a long-term basis in the total number of unemployed people, which has persevered for a number of years, and regional, qualification and professional structure.

The reasons why the unemployment rate fails to decrease can be seen in "artificial" barriers in the labour market (the minimum wage amount, labour legislation), as well as in "natural" barriers (such as information asymmetry between job applicants and employers, which is not always eliminated by activities of recruitment agencies).<sup>8</sup>

As there is a certain delay between the growth dynamics and the unemployment rate, further decline in the unemployment rate can be expected during the following period. This trend is also clear from the data for the first three quarters of 2005.<sup>9</sup> However, the persisting structural problems will prevent further reduction of the unemployment rate over the following years.

#### Development of the capital factor

The PIM method (Perpetual Inventory Method, see ECFIN, 2005b, p. 28) was used to calculate the real capital resources. Real capital resources and their growth rates (and subsequently growth rates of the total factor productivity) for the EU-15 countries are determined according to this method. Comparison of the CR and the EU-15 countries is used at the end of this section.

The growth rate of physical (real) capital resources decreased slightly following a decline in the creation of gross fixed capital in the CR during 1997–1999. However, the growth in capital resources increased after 1999 as a result of the accelerated growth of fixed investment. Throughout the period 1996–2004 the creation of gross fixed capital (in fixed prices) increased on average by 2.7 % and physical capital resources increased by 2.4 % per year. Capital productivity as a ratio of real GDP and capital during the monitored period decreased by 0.3 %, total factor productivity increased on average by 1.5 % per year and labour productivity increased on average by 2.7 % per year (see Figure 2).

The decline in capital productivity means that the capital coefficient ( $K/Y$ ),<sup>10</sup> which is a reciprocal value of capital productivity, increased on average by 0.3 % per year. This coefficient was 4.5 in the CR and 3.2 in the EU-15 in 1995 and 4.6 in the CR and 3.1 in the EU-15 in 2004 (ECFIN 2002, 2005a, ČSÚ 2005i, author's own calculation). The Czech economy inherited an economic system with a high weight of heavy industry, mostly misallocated to industries with low competitiveness and outdated technology. The decline in the volume of loans provided to companies in

<sup>8</sup> However, modern technologies, which should help to prevent this problem, are rarely available in problematic regions and affected entities.

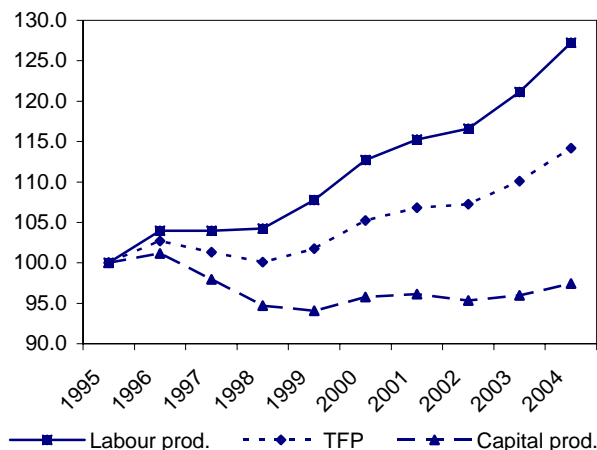
<sup>9</sup> According to the data of ČSÚ (SSLF), the unemployment rate in individual quarters of 2005 decreased compared to the same quarters of 2004, falling in the first quarter of 2005 from 8.7 % to 8.4 %, in the second quarter from 8.2 % to 7.8 % and in the third quarter from 8.2 % to 7.8 % (see ČSÚ, 2005c; ČSÚ, 2005f).

<sup>10</sup> Also referred to as capital intensity or capital/output ratio.



the second half of the 90's caused by delayed restructuring and privatization of banks probably contributed to preservation of this structure. Low added value of this unstructured sector hindered further development.

**Figure 2: Total factor productivity, labour productivity and capital productivity (indices, 1995=100)**



Source: ČSÚ (2005a, 2005b), own calculations.

Replacement of retired physical capital consumed a large part of investment resources without any direct effect. Large volume of investments in the environment and power engineering did not immediately bring a direct effect for the economic growth. These circumstances may be an explanation of the relatively high capital coefficient (see IMF, 2004, p. 5). The capital coefficient continued to grow during the recession (1997–1998) and finally reached its highest level in 1999. A decreasing trend can be observed after 1999 as a result of implemented technological progress and especially due to the strong inflow of direct foreign investment. Nonetheless, the capital coefficient remains higher than the average value for EU-15 countries.

#### Total factor productivity and qualitative factors

The growth of TPF during 1996–2004 accounted for 71 % of the growth of real GDP. The growth of TPF gradually accelerated and significantly contributed to the faster growth of real GDP during this period. The acceleration in the growth of TPF is caused by qualitative factors, which change slowly and their impact is often demonstrated with a certain delay.<sup>11</sup>

The growth of TPF due to qualitative factors in the Czech economy was supported by technological progress, i.e. implementation of new innovations in production. Massive inflow of direct foreign investment played an especially important role. The inflow of foreign investment increased gradually after 1995 and culminated in 2002 to decrease slightly over the following two years (see UNECE, 2005, p. 85). Accumulation of the inflow of direct foreign investment in the CR, i.e. its resources in relation to GDP, is also high, reaching 47.1 % in 2002, 50.1 % in Hungary, 32.2 % in

Slovakia, 22.6 % in Poland, and 16.9 % in Slovenia.<sup>12</sup> The inflow of direct foreign investment contributed to the implementation of innovations, including ICT, and thus helped to increase the competitiveness of the Czech economy, which is demonstrated in the expansion of export and especially in the above-average growth in export of machines and transportation equipment. According to the Lisbon Strategy, information and communication technologies (ICT) represent a major factor for increasing competitiveness. Only limited internationally comparable data structured into information and communication technologies exist currently with regard to expenditure on ICT in relation to GDP. The share of expenditure on information technologies in GDP in the CR in 2004 was 2.8 % (around 3 % in the EU-15) and the share of expenditure on communication technologies was 4.3 % (3.3 % in the EU-15) (see Kadeřábková a kol., 2005, p. 96).

The share of gross expenditure on research and development in GDP (GERD) in the CR is lower on a long-term basis (1995–2003) than the EU-15 average. However, this share is higher than in Hungary, Slovakia and Poland. The share of this expenditure in the CR increased from 0.95 % in 1995 to 1.23 % in 2000 and reached 1.35 % in 2003. The same figure was around 2 % in the EU-15 during 2001–2003.<sup>13</sup> The Lisbon Strategy stipulates an objective for EU countries to achieve the share of 3 % GDP in 2010 (see Kadeřábková a kol., 2005, p. 61–62).

In the structure of expenditure on research and development the CR was characterized by a decreasing share of the entrepreneurial sector and increasing share of the governmental sector, which is contrary to the Lisbon Strategy. However, this situation started to change after 2000. Expansion of companies under foreign control and pressure of banks on financed enterprises brought about increased interest in research and development not only in foreign companies, but also in Czech companies, which are forced to face intense competition.

The impact of the quality of human resources can be assessed from various perspectives and subsequently according to various indicators (comp. Kadeřábková a kol., 2005, p. 101–132). With regard to education groups, the situation in tertiary education in the CR compared to the EU-15 is not positive. Although the share of population with tertiary education increased (during 1998–2004 from 10.6 % to 12.3 %), this figure remained higher in the EU-15 throughout this period (and increased from 17.1 % to 23.1 % during the same period). On the other hand, the Czech Republic has the highest share of residents with secondary education of all EU-15 and EU-25 countries (75–77 %), followed by Slovakia. Some studies place great emphasis on the share of residents with secondary education as a basis for further qualitative development (comp. for example Mankiw, Romer, Weil, 1992).

Reallocation of factors during 1995–2004 with disaggregating in six industries had a minimal impact on the growth of the macroeconomic TPF because the main structural changes took place prior to 1995 (see Hájek, 2005). The opposite effects of qualitative factors suggest that while analysis of this low rate into a few components may be acceptable, any

<sup>11</sup> Development in the American economy is both, very informative and inspiring in this context as the American economy achieved a strong growth in the total factor productivity during the 90's. For discussion of possible causes and impacts see for example Gordon (2004, chapters 1 and 2).

<sup>12</sup> Services (especially financial agencies, trade, repairs, real estate and business services) have the highest share in the structure of direct foreign investment resources in the CR – 47.4 %, followed by the processing industry with a share of 41.9 % (see ČNB, 2005c, tab. 3.3).

<sup>13</sup> For critical comments see Potočník (2005).

further breakdown into more factors may be problematic. Working with hierarchic structures may be more appropriate in this situation (see Mihola, 2005, p. 16).

### Sources of growth in basic industries

The highest average growth rate of real gross added value during the period 1996–2004 was achieved in industry and trade, repairs, and catering and accommodation. All industries with the exception of agriculture and trade contributed to the faster growth of real added value during 2000–2004 compared to the period 1996–1999. Slower growth of employment during 2000–2004 compared to the period 1996–1999 occurred in trade and the decline in other industries was reduced. The growth of employment in other services strengthened.

The average annual growth rate of physical capital resources in individual industries declined during 2000–2004 compared to 1996–1999, except for other services where the growth rate increased (from 0.3 % to 1 %). The dynamics of total factor productivity accelerated in all industries except for agriculture and trade (while the decline in construction slowed down). Industry, other services and transport and communications contributed significantly to the acceleration of the macroeconomic TPF.

### Economic growth and total factor productivity in the CR and the EU-15

When comparing economic performance of individual countries, special caution is required due to asynchronous economic cycles. The average annual growth rate of real GDP in the CR during 1996–2004 was virtually equal to the growth rate in the EU-15 (see Table 3).

**Table 3: Real GDP and total factor productivity in the Czech Republic and EU-15 (average annual percentage change)**

	GDP			TFP		
	1996–2004	1996–1999	2000–2004	1996–2004	1996–1999	2000–2004
EU-15	2.2	2.5	1.9	0.7	0.9	0.5
Belgium	2.1	2.5	1.9	0.8	0.9	0.8
Czech Rep.	2.1	0.9	3.1	1.5	0.4	2.3
Denmark	2.0	2.6	1.6	1.0	1.2	0.9
Finland	3.7	4.6	2.9	2.3	2.9	1.9
France	2.2	2.4	2.0	0.9	1.3	0.6
Ireland	7.7	9.7	6.2	3.1	4.0	2.4
Italy	1.5	1.6	1.3	0.2	0.6	-0.1
Luxemburg	5.1	6.6	4.0	0.7	2.1	-0.3
Germany	1.3	1.5	1.1	0.4	0.4	0.4
Netherlands	2.3	3.8	1.2	0.8	1.2	0.4
Portugal	2.4	4.0	1.1	0.2	1.2	-0.5
Austria	2.2	2.8	1.6	0.7	1.1	0.3
Greece	3.8	3.2	4.3	1.9	1.5	2.3
Spain	2.2	2.4	2.0	0.9	1.3	0.1
Sweden	2.7	3.0	2.5	1.8	2.2	1.5
Un. Kingdom	2.8	3.0	2.7	1.2	1.2	1.2

Source: ČSÚ (2005a, 2005b), ECFIN (2000, 2002, 2004b, 2005a), own calculations.

Despite the decline in total factor productivity in the CR during 1997 and 1998, the average annual growth rate of TPF in the CR during 1996–2004 was approximately double of that in the EU-15 (1.5 % in the CR and 0.7 % in the EU-15). While the average annual growth rate of real GDP in the EU-15 declined during 2000–2004, the growth

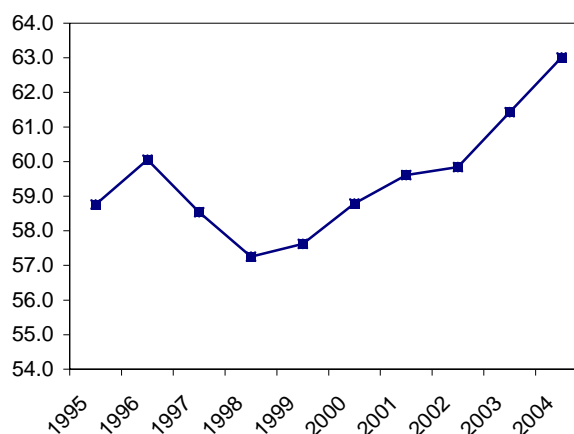
rate in the CR increased. Similarly, as the average growth rate of TPF in the EU-15 decreased (practically to one half of the original value), this growth rate in the CR grew almost six times.

This means that the reduced average annual growth rate of real GDP in the EU-15 can be attributed mostly (67 % influence) to the slower growth rate of TPF. And vice versa, the increase in the average annual growth rate of real GDP in the CR by 2.2 percentage points with growth rate of TPF increased by 1.9 percentage point means that the accelerated growth of TPF contributed significantly to the higher growth rate of real GDP (86 % influence).

### Relative level of the total factor productivity in the CR compared to EU-15

The estimate of the relative level is based on the assumption that the growth rate of total factor productivity equals a weighted sum of growth rates of labour productivity and capital productivity. If growth rates (in %) are interpreted as a difference of relevant values between two countries, the difference in TPF between two countries can be determined based on the difference in labour productivity and capital productivity and the applicable weights.

**Figure 3: Relative level of total factor productivity in the Czech Republic (EU=100)**



Source: ČSÚ (2005a, 2005b), ECFIN (2005a), own calculations.

The labour productivity in the CR in 1995 was lower than in the EU-15 by 48 % (GDP per employed person in PPS).<sup>14</sup> The capital coefficient in the CR was 4.5 and 3.2 in the EU-15. The reciprocal value of the capital coefficient, i.e. capital productivity, was lower in the CR by 29 % than in the EU-15. If a constant share of labour (weight) of 0.65 is selected and the share of capital is set at 0.35 according to the common practice in international comparisons, we can conclude that the TPF in the CR was lower by 41.2 % than in the EU-15, in other words the TPF in the CR reached 58.8 % of the EU-15 level. This initial relative level of TPF in the CR (EU-15 = 100) in 1995 was extended forward by applying growth indexes of TPF in the CR and the EU-15. Calculation therefore shows that the relative level of TPF in the CR after 1998 increased in relation to the EU-15 with acceleration in 2003 and 2004.

<sup>14</sup> Calculation according to data by EUROSTAT, Structural Indicators, May 2005 (GDP per employed person in PPS).

### 3.2 Demand side of the economy

Macroeconomic performance as comprehensive expression of the economy's competitiveness is very closely linked with development of aggregate demand. From the short-term perspective, development of individual demand elements is vital for economic growth in a market economy because the economy can only produce what is demanded. As a general rule, GDP growth must be consistent with growth of domestic demand (final consumption and investments) and development in net export. Impact of demand components on GDP growth depends on their share in GDP and their real growth rate. Macroeconomic balance is reflected in the interaction between demand and supply. Changes in the structure of the overall demand (expenditure side of GDP) in the Czech Republic are shown in Table 4. The Czech economy is characterized by a relatively high share of public consumption, foreign trade and investment. The share of private consumption has been relatively stable on long-term basis, with relatively low values compared to old EU members.

Development of domestic demand (final consumption and gross capital formation) is generally crucial for the economic growth. However, in conditions of a small open economy, such as the Czech economy, development of foreign trade also has a significant impact. Growth of main demand components is shown in Table 5.

Real GDP grew on average by 2.1 % per year during 1996–2004. The growth rates in import and export of goods and services were substantially higher. Export grew during the same period by 9.7 % per year and the annual growth rate in import even exceeded 10 %. The total domestic demand (final consumption and gross capital formation) increased by 2.6 % per year, i.e. faster than GDP by 0.5 percentage point. Private consumption (household expenditures on final consumption) as a key component of total demand, which determines development of living standard reached annual growth of 3 %. The surplus of domestic demand compared to domestic supply (GDP) was very strong in 1996 and caused significant external imbalance, which forced the economic policy to react by introducing a restrictive policy with the aim to limit domestic demand. This policy led to the second recession in the Czech economy and domestic demand fell faster than GDP during 1997 and 1998.

The Czech Republic entered the stage of dynamic and relatively stable development during 2000–2004. Domestic demand was still ahead of the growth of GDP during this period, recording the annual growth rate of 3.6 %, i.e.

the growth rate was higher than that of GDP by 0.4 p.p. Faster growth of domestic demand compared to GDP did not result in deteriorated external imbalance due to positive development in terms of trade. (For more details on this topic see Spěváček, 2005b.)

The growth in exports in 2004 was exceptionally high (21.4 % compared to 7.5 % in 2003). The growth of investment also accelerated due to growing profits of companies, low interest rates and increasing investor confidence. The average annual growth rate in gross fixed capital formation during 2000–2004 was 4.7 %. Public consumption experienced relatively significant decline in the growth rate. Slower growth of private consumption (from 4.6 % in 2003 to 3.3 % in 2004) was influenced by strongly decelerated growth in real disposable income of households.

The growth of GDP accelerated to 6 % in 2005 and the growth rate in domestic demand fell at the same time. Final consumption rose by 2.0 % and gross capital formation stagnated due to a strong decline in inventory. This significant change on the demand side is related to strong deterioration in terms of trade in 2005.

#### Impact of demand on growth of gross domestic product

The contribution of main demand components to the growth of GDP during 1996–2004 divided into the contribution of domestic demand and the effect of foreign sector shows a strong influence of domestic final utilization (final consumption and gross capital formation – see Table 6) in 1996 and during 2000–2003. The growth of GDP during these years was driven from more than 100 % by growing domestic demand, while the contribution of foreign trade was negative. A significantly positive impact of foreign trade did not occur until 2004 and 2005. The balance of foreign trade in goods and services was positive for the first time in the history of the CR in 2005 and this led to a very high positive contribution of foreign trade to the growth of GDP.

The influence of final consumption and especially private consumption (household expenditure on final consumption) played a major role in domestic demand. With the exception of 1999 and 2002, the impact of public consumption (expenditure of government institutions on final consumption) was insignificant. Major fluctuations in development of investment were reflected in their impact on the growth of GDP. The negative contribution of gross fixed capital formation during 1997–1999 was replaced by a positive contribution (1.3 p.p. of GDP growth during 2000–2004). This contribution is higher than the share of fixed investment in GDP would suggest.

**Table 4: The share of demand components in GDP (in per cent, current prices)**

	Private consumption	Public consumption	Gross capital formation	GFCF	Export	Import	Balance of foreign trade
1996	51.7	21.2	33.0	31.4	49.5	55.5	-6.0
1997	53.0	21.8	30.6	29.9	52.7	58.1	-5.3
1998	51.6	21.0	28.5	28.3	55.1	56.2	-1.1
1999	51.9	22.3	26.9	27.0	56.5	57.7	-1.2
2000	52.2	22.1	28.8	27.7	64.5	67.5	-3.1
2001	51.5	22.2	28.9	27.6	66.5	69.0	-2.5
2002	51.1	23.0	27.9	26.6	61.5	63.6	-2.0
2003	51.5	23.6	27.1	26.8	62.2	64.4	-2.2
2004	50.2	22.5	27.8	26.9	71.2	71.7	-0.5

Source: ČSÚ (2005a).

Table 5: Final demand components (percentage annual change, constant prices of the preceding year)

	GDP	Final consumption	Private consumption	Public consumption	Gross capital formation	Gross fixed capital formation	Domestic demand	Export	Import
1996	4.2	6.6	8.8	1.5	10.1	7.6	7.7	5.5	12.1
1997	-0.7	1.4	1.4	1.4	-6.2	-3.4	-1.0	8.4	6.9
1998	-1.1	-1.4	-1.5	-1.0	-2.4	-1.1	-1.7	10.5	8.4
1999	1.2	3.0	2.2	5.4	-4.2	-3.5	1.0	5.5	5.0
2000	3.9	2.1	2.9	0.2	9.2	4.9	3.9	16.5	16.3
2001	2.6	3.0	2.8	3.8	6.3	5.4	3.9	11.5	13.0
2002	1.5	3.3	2.7	4.5	3.5	3.4	3.4	2.1	4.9
2003	3.2	4.4	4.6	3.8	1.3	4.7	3.5	7.5	7.9
2004	4.7	1.5	3.3	-2.7	7.9	5.3	3.2	21.4	18.4
Average growth (1996–2004)	2.1	2.6	3.0	1.9	2.7	2.5	2.6	9.7	10.2

Source: ČSÚ (2005a).

### 3.3 Macroeconomic stability

The relationship between domestic supply (GDP) and domestic demand (final consumption and gross capital formation) is vital for the macroeconomic balance because this balance is given by the interaction of supply and demand. The main source of macroeconomic imbalance is a situation when a country consumes more goods and services than it produces (domestic demand exceeds domestic supply). This gap needs to be covered by import exceeding the level of export (net export is negative). The relationship between domestic supply and domestic demand is shown in Table 7.

The deficit of foreign trade in goods and services culminated in 1996 and 1997 at CZK 95–99 mld (i.e. between 5 % and 6 % of GDP). During 1998–1999 the deficit decreased to a very low level of approximately 1 % of GDP as a result of restrictive measures introduced by Czech National Bank and the government. The foreign trade deficit reached an acceptable level between 2 % and 3 % of GDP during 2000–2003. A negative foreign trade balance was only recorded in the balance of goods. The balance of services recorded a surplus and partially compensated for the deficit in goods.

Significant improvement in the trade balance occurred in 2004 and 2005. This was a result of a strong growth in Czech export, which benefited from a high level of direct foreign investment during the previous years and the CR's membership in the EU. The foreign trade deficit in 2004 was 0.5 % of GDP and in 2005 the net export recorded positive figures.

#### Relationship between savings and investment

Although the gap between domestic supply and demand is to a great extent the main source of macroeconomic imbalance (internal and external), in order to obtain a more comprehensive picture this relationship needs to be extended by the impact of distribution of income between the national economy and the world. In this sense creation of disposable income and its use for consumption and savings needs to be considered. Balance at the macroeconomic level can be assessed according to the relationship between national savings and domestic investment. This relationship reveals a major source of imbalance due to a lack of national savings in relation to investment. This relationship is also important as it combines internal imbalance (relationship between savings

and investment) with external balance (the gap between savings and investments needs to be financed from external sources and will therefore manifest itself as a deficit of the current account of the balance of payments). Changes in the level of investment and savings in the Czech economy are described in Table 8.

The decrease in the share of investment in GDP (investment ratio) from 32.5 % in 1995 to 27.8 % in 2004 was caused by weaker economic activities during 1997–1999, which were accompanied by relatively major decline in investment. Investment started to grow again from 2000. In international comparison, the investment ratio in the Czech Republic remains higher than in advanced EU member states. Over the last few years, the CR has held the second place in the group of new member states after Estonia. Rather than the level of investment, the structure and effectiveness of investment presents the main problem in the Czech Republic.

The decrease in the saving rate (the share of savings in gross disposable income) by almost 5 p.p. during 1995–2004 is very strong, although the saving ratio in the Czech Republic appears relatively high in international comparison (higher than in most advanced market economies). However, these savings are insufficient due to great investment needs in the Czech Republic, which arise from the process of transformation connected with necessary structural changes and an outdated infrastructure. The gap between savings and investment, which is consistent with the deficit of the current account of the balance of payment, is relatively high and during 2000–2004 was on average equal to 5.5 % of GDP.

The analysis of the relationship between savings and investment according to individual **institutional sectors** (see Table 12) shows that the long-term decline in saving ratio was mainly caused by a significant decrease in the level of household savings and a decreasing level of savings in governmental institutions.

The **household sector** is the key sector with regard to generating savings and providing these savings to other sectors because the investment needs of the sector of non-finance companies and governmental institutions tend to be higher than their savings and they are therefore dependent on borrowing from other sectors. The situation when the household sector is less capable of financing net borrowing of non-financial companies and governmental institutions leads to increasing dependency of the



economy on foreign savings. The significant increase of investment in the household sector caused by a strong growth in mortgage credit was among the factors deteriorating the gap between savings and investment.

Significantly declining creation of savings in the **governmental sector** (from CZK 83.8 mld in 1995 to 38.4 mld in 2003) and relatively large investment needs caused that the gap between savings and investment, which was still slightly positive during 1995–1999, turned during 2000–2003 to negative figures with strongly increasing tendency. This in itself predetermines a growth of the deficit in the sector of governmental institutions. A significant increase in creation of gross savings occurred in 2004 mainly due to a

rapid growth of the economy and the subsequent higher tax revenue. Net borrowing of the governmental sector increased significantly during 2001–2003.

Public finance appears from the perspective of macroeconomic stability as the weakest point of the economic development. The expected admission to Euro zone around 2010 presents a high priority for fiscal consolidation. Savings in expenditure appear as necessary from this point of view, while their enforcement is very complicated, especially in the election year 2006. Sustainability of fiscal consolidation will be gradually complicated in the following years by pressures arising from ageing of the population.

**Table 6: Contribution of demand components to GDP growth (constant prices of the preceding year, in percentage points of GDP growth)**

	GDP	Final consumption	Private consumption	Public consumption	Gross capital formation	Gross fixed capital formation	Domestic demand	Balance of foreign trade
1996	4.2	4.7	4.4	0.3	3.3	2.4	8.0	-3.9
1997	-0.7	1.0	0.7	0.3	-2.0	-1.1	-1.0	0.3
1998	-1.1	-1.0	-0.8	-0.2	-0.7	-0.3	-1.8	0.6
1999	1.2	2.2	1.1	1.1	-1.2	-1.0	1.0	0.2
2000	3.9	1.5	1.5	0.0	2.5	1.3	4.0	-0.1
2001	2.6	2.2	1.4	0.8	1.8	1.5	4.0	-1.4
2002	1.5	2.4	1.4	1.0	1.0	0.9	3.4	-2.0
2003	3.2	3.2	2.4	0.9	0.4	1.3	3.6	-0.4
2004	4.7	1.1	1.7	-0.6	2.1	1.4	3.2	1.5

Source: ČSÚ (2005a), own calculations.

**Table 7: Creation and utilization of GDP (current prices, mld. CZK and per cent of GDP)**

	GDP	Domestic demand	Balance of foreign trade	of which		In per cent of GDP		
				goods	services	total	goods	services
1995	1466.7	1529.9	-63.2	-107.7	44.5	-4.3	-7.3	3.0
1996	1660.6	1759.6	-99.0	-154.9	55.9	-6.0	-9.3	3.4
1997	1785.1	1880.2	-95.1	-155.2	60.1	-5.3	-8.7	3.4
1998	1962.5	1984.6	-22.1	-84.0	61.9	-1.1	-4.3	3.2
1999	2041.4	2065.7	-24.3	-65.8	41.5	-1.2	-3.2	2.0
2000	2150.1	2216.3	-66.3	-120.8	54.6	-3.1	-5.6	2.5
2001	2315.3	2374.0	-58.7	-116.7	58.0	-2.5	-5.0	2.5
2002	2414.7	2464.1	-49.5	-71.3	21.9	-2.0	-3.0	0.9
2003	2555.8	2612.3	-56.6	-69.8	13.2	-2.2	-2.7	0.5
2004	2767.7	2780.8	-13.1	-26.4	13.3	-0.5	-1.0	0.5

Source: ČSÚ (2005a),

**Table 8: Gross disposable income, national saving and gross capital formation (mld. CZK, current prices)**

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Gross disposable income (GDI)	1474.6	1646.3	1767.9	1944.0	2015.1	2111.3	2249.2	2313.0	2457.1	2636.4
Final consumption	1053.0	1211.3	1334.8	1424.3	1515.7	1597.8	1705.3	1789.9	1919.4	2011.2
Gross national saving (S)	421.6	435.1	433.0	519.7	499.4	513.5	543.9	523.0	537.7	625.2
Gross capital formation (I)	476.9	548.4	545.4	560.2	550.0	618.5	668.6	674.2	692.9	769.6
Balance of national current transactions (S – I)	-55.3	-113.3	-112.4	-40.5	-50.6	-105.0	-124.8	-151.2	-155.2	-144.4
Saving rate in per cent of GDI	28.6	26.4	24.5	26.7	24.8	24.3	24.2	22.6	21.9	23.7
Saving rate in per cent of GDP	28.7	26.2	24.3	26.5	24.5	23.9	23.5	21.7	21.0	22.6
Investment ratio in per cent of GDP	32.5	33.0	30.6	28.5	26.9	28.8	28.9	27.9	27.1	27.8
Difference between saving rate and investment ratio in per cent of GDP	-3.8	-6.8	-6.3	-2.1	-2.5	-4.9	-5.4	-6.3	-6.1	-5.2

Source: ČSÚ (2005a).



**Table 9: Relationship between saving and investment by sectors (mld. CZK, current prices)**

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
<b>Non-financial corporations</b>										
Gross saving (S)	176.4	217.0	177.6	232.4	260.6	322.4	336.6	300.7	352.5	388.4
Investment (I)	319.9	355.8	352.2	354.2	357.4	423.1	449.4	434.3	460.9	503.5
S-I	-143.5	-138.8	-174.5	-121.8	-96.7	-100.7	-112.9	-133.6	-108.3	-115.1
Saving rate	22.2	23.7	17.9	21.4	23.1	26.7	26.1	22.3	24.6	25.2
Net lending/borrowing	-113.6	-119.5	-140.4	-75.9	-74.3	-83.9	-88.1	-87.7	-82.9	-82.3
<b>Financial corporations</b>										
Gross saving (S)	40.0	35.7	36.9	72.9	52.3	35.3	45.8	41.1	16.4	12.1
Investment (I)	28.9	24.8	22.4	16.9	13.0	16.1	19.2	21.1	9.7	10.2
S-I	11.1	10.9	14.5	56.0	39.3	19.2	26.6	20.0	6.6	1.9
Net lending/borrowing	30.4	16.9	15.8	83.6	75.6	34.2	94.0	63.5	209.7	6.3
<b>General government</b>										
Gross saving (S)	83.8	79.0	82.0	82.6	64.4	47.1	58.6	47.2	54.1	113.2
Investment (I)	67.1	73.8	71.8	83.1	58.8	62.5	76.9	92.8	108.1	135.4
S-I	16.7	5.2	10.2	-0.5	5.6	-15.4	-18.3	-45.6	-54.0	-22.2
Net lending/borrowing	-196.3	-51.2	-43.5	-98.5	-74.4	-78.5	-137.0	-163.0	-307.2	-81.5
<b>Households</b>										
Gross saving (S)	119.4	103.2	136.4	130.3	119.8	105.8	100.8	132.9	112.4	110.5
Investment (I)	59.7	92.0	97.7	103.5	116.5	115.4	121.0	122.7	112.1	116.7
S-I	59.7	11.2	38.7	26.8	3.4	-9.6	-20.1	10.2	0.9	-6.1
Saving rate	14.2	11.0	12.9	11.6	10.3	8.8	7.9	9.9	8.0	7.5
Net lending/borrowing	222.1	39.8	62.0	50.1	22.8	19.1	6.7	48.1	21.5	15.9

Note: Saving rate of non-financial corporations is expressed as the share of gross saving of non-financial corporations on their gross value added (in per cent). Saving rate of households is measured as the share of saving of households on their gross disposable income increased by the changes in the net share of households on reserves of pension funds (in per cent). Source: ČSÚ (2005a).

### 3.4 External economic balance

The two aspects of macroeconomic balance based on the relationship between domestic supply and domestic demand and the relationship between savings and investment are reflected in the country's balance of payment because the negative gap between domestic supply and demand or between savings and investment needs to be filled with foreign resources. This concerns the balance of trade and services (performance balance) in the first case and the total balance of the current account in the second case. In the context of the domestic economy a deficit of the current account represents a negative gap between national savings and investments.

**Table 10: Current account (mld. of CZK)**

	Current account	Trade balance	Bal. of services	Bal. of incomes	Current transfers
1995	-36.3	-97.6	48.9	-2.8	15.2
1996	-111.9	-154.9	52.2	-19.6	10.4
1997	-113.0	-155.2	55.9	-25.1	11.3
1998	-40.5	-84.0	61.9	-35.1	16.7
1999	-50.6	-65.8	41.5	-46.7	20.4
2000	-104.9	-120.8	54.6	-53.0	14.4
2001	-124.5	-116.7	58.0	-83.5	17.8
2002	-136.4	-71.3	21.9	-115.6	28.7
2003	-160.6	-69.8	13.2	-119.9	15.8
2004	-143.3	-22.3	12.5	-139.5	6.1

Source: ČNB (2005a).

Table 10 shows changes of the total current account deficit and balances of four basic components of the current account. With the exception of a few years (1995, 1998 and 1999), the current account deficit was relatively high and

exceeded CZK 100 mld. The deficit of trade balance decreased significantly in 1998 and 1999 due to weak economic activity and then started to decrease again during 2002–2004, although this time the reasons were different. This decrease was mainly attributable to strong inflow of direct foreign investment, increasing influence of foreign companies and the production restructuring process. From 2001, the growing deficit of the balance of income (in particular repatriated and reinvested profit) became the main cause of the current account deficit, which is another, typically not positive aspect of strong direct foreign investment. The impact of the balance of services and current transfer is positive but not very significant.

**Table 11: Current account (in percent of GDP)**

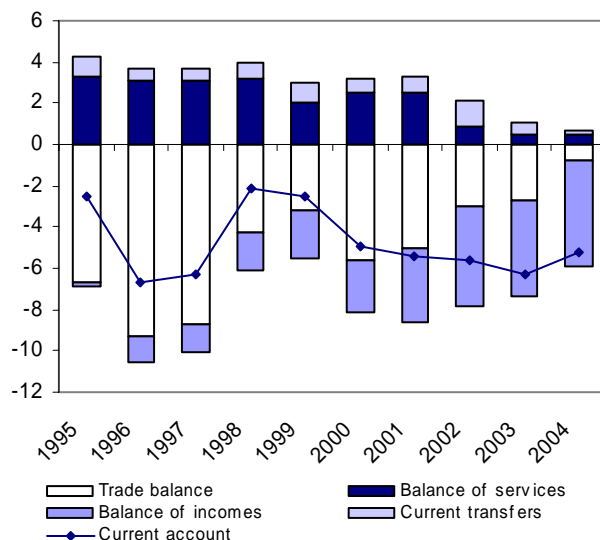
	Current account	Trade balance	Bal. of services	Bal. of incomes	Current transfers
1995	-2.5	-6.7	3.3	-0.2	1.0
1996	-6.7	-9.3	3.1	-1.2	0.6
1997	-6.3	-8.7	3.1	-1.4	0.6
1998	-2.1	-4.3	3.2	-1.8	0.8
1999	-2.5	-3.2	2.0	-2.3	1.0
2000	-4.9	-5.6	2.5	-2.5	0.7
2001	-5.4	-5.0	2.5	-3.6	0.8
2002	-5.6	-3.0	0.9	-4.8	1.2
2003	-6.3	-2.7	0.5	-4.7	0.6
2004	-5.2	-0.8	0.5	-5.1	0.2

Source: ČNB (2005a), own calculations.

Another expression of current account balances (in percentages of GDP) is especially important for international comparison (see Table 11 and Figure 4). The current account deficit during 2000–2004 was on average around 5.5 % of GDP. The deficit of foreign trade

was the main source of this high deficit in 2000 and 2001 and from 2002 the deficit was mainly attributable to the negative balance of incomes. The level of the current account deficit more or less stabilized during 2000–2004 but its structure changed dramatically. Significant improvement is expected in 2005. Assessment of the current account deficit requires more detailed examination of individual items because these have various impacts on the economy.

Figure 4: Current account (in percent of GDP)



Source: ČNB (2005a), own calculations.

When assessing the deficit of the current account, it is impossible to mechanically determine a limit that presents a threat to the country's macroeconomic stability. Literature often simplifies this issue and refers to the limit of 5 % of GDP as a warning sign from the point of view of macroeconomic balance. However, the impact of the current

account deficit depends on the manner of financing the deficit (debt and non-debt financing, short or long-term capital), the use of the deficit (for consumption or investment), the amount of foreign debt and foreign exchange reserves, and the overall macroeconomic situation of the country. From this point of view the current account deficit in the CR does not appear as dangerous because it was mainly financed by direct foreign investment, promoted growth and did not increase the country's relative foreign debt (foreign debt in convertible currencies decreased slightly in 2004 compared to 2000 from 37.6 % to 36.8 % of GDP). However, an excessive current account deficit in combination with significant reliance of the economy on the inflow of foreign capital can prove to be dangerous for the country's financial stability due to sudden external shocks. Significant external imbalance is typical also for new EU member states from Central and Eastern Europe.

External imbalance is closely connected with internal imbalance. High deficits of public finance usually account for a major part of the current account deficit. The connection between imbalance in public finance and external imbalance poses a danger of the so-called twin deficit. For example reinvested profits are a part of foreign direct investment and typically have a positive impact on the economy. On the other hand, repatriated profit represents withdrawal of income from the country with an impact on national savings, currency rate and financial situation of some companies. Reinvested profit tends to prevail in the first stage of direct foreign investment inflow, while withdrawal of capital in the form of repatriated profit becomes more frequent in the following stages. The part of the generated profit intended for strengthening investment is thus reduced to the benefit of paid out dividends. This trend has also appeared in the CR, where the share of reinvested profit fell from 78 % in 2001 to 51 % in 2004. Increasing profit of companies with a majority share of foreign capital led in 2003 and 2004 to a significant increase in the volume of dividends paid out to foreign owners, while the volume of reinvested profit stagnated.

## 4. Conclusion

The key issue for future development of the Czech economy is maintaining dynamic growth of the economy on a stable macroeconomic basis. This can be achieved by mobilizing qualitative growth factors and creating sufficient national savings to ensure the required growth of investment without excessive drawing on foreign savings.

### Growth and convergence

After the adverse development of the Czech economy in the second half of the 90's, the period 2000–2004 brought a significant increase in the GDP growth rate (to more than 3 % in the annual average). Growth culminated in 2005 at 6 %. The accelerated economic growth was positively influenced by a number of factors:

- Restructuring of the economy accelerated by strong inflow of foreign direct investment and increasing importance of companies under foreign control;
- Rapid growth of domestic investment and export adapting to the new market conditions;
- Improvement of the institutional environment as the country prepared for accession to the EU;
- Privatization and restructuring of banks (consolidation of this sector);

- Pro-growth economic policy (decreasing interest rates and expansive fiscal policy).

Foreign direct investment (FDI) became a major factor in the growth of the Czech economy. Its inflow strengthened after 1998 in connection with the adoption of investment incentives and ongoing privatization and restructuring of companies. In 2004, the Czech Republic was the fourth of the 25 EU countries in the cumulated net volume of FDI in % of GDP (after Estonia, Hungary and Malta). As the inflow of FDI strengthened, the influence of companies under foreign control increased significantly. These companies accounted for a half of all revenues in the sector of non-financial enterprises in 2004.

When the economic performance for the period 2000–2004 is measured by alternative real income indicators, more positive results are achieved. Real gross domestic income (RGDI) grew during this period at an average annual rate of 3.7 % and its growth rate was faster than that of GDP by 0.5 p.p. This was due to positive development in terms of trade. However, the situation changed in 2005 when terms of trade deteriorated due to a major increase in prices of oil and other raw materials and RGDI grew considerably slower than GDP. This also had an

impact on the growth of domestic demand (final consumption and investment), as its real growth depends on development of real income. Development of real gross disposable income, which is influenced not only by changes in terms of trade, but also by primary and secondary distribution of income between the CR and the world, is especially important in this context.

As the difficulties faced by the economy in the 90's in connection with major restructuring of the production base and complicated institutional adjustment during transition to a market economy have been overcome, the **convergence of the Czech economy** towards the EU progresses at a fast rate in the current decade. The gap in the economic level, which extended significantly during the transformation crisis at the beginning of the 90's and persisted due to the prolonged recession in the second half of the 90's, was reduced significantly during 2001–2005. GDP per capita in purchasing power standard was at 64 % of the EU-25 level in 2000 and increased to approximately 73 % in 2005.

Analyses focusing exclusively on growth rates of GDP in constant prices cannot describe the progress of convergence. For example, the OECD study *Going for Growth* states that the growth of GDP per capita in the CR over the last few years has not been sufficiently high to ensure significant convergence in the level of income. This statement is misleading and at variance with the facts because the convergence in the Czech Republic towards the EU economic level progressed over the last five years the most of all five Central European new EU members. The economic level measured by GDP per capita in purchasing power standard (PPS) moved towards the EU-25 level during 2001–2005 by 9 p.p., while the gap between the economic level of Slovakia and the EU-25 was reduced by just about 7 p.p., despite the higher growth rate of GDP in Slovakia.

The progress of convergence in the CR is faster than the economic growth rate measured by the standard GDP indicator would suggest. This is due to development of qualitative factors, which have an impact on comparison of economic levels in current purchasing power standards but are not reflected fully in growth rates of GDP in constant prices. Besides the growth rate of GDP, the accelerated convergence in the CR was also influenced by positive development of terms of trade in foreign trade. This phenomenon is also confirmed in development of real income as the real income growth in the Czech Republic in this decade is one of the fastest of all Central European new EU members. The picture about economic performance of individual new EU members therefore differs from conventional assessment.

Nominal convergence progresses alongside real convergence. Price levels, inflation rates, interest rates and in the case of large differences also wage levels converge. The difference in the price level of the CR and the average price level for the EU-25 is greater than the observed relation between the economic and price level in the conditions of European countries would suggest. The price level of the overall GDP in relation to EU-25 was just under 58 % in 2005 (the household consumption price level was slightly higher).

The Czech Republic has a low inflation rate. Over the last few years, the inflation rate measured by harmonized price index has been even significantly below the average

rate for the EU-25 and Euro Area countries. Price stability according to ECB stipulates that inflation should be “below but close to 2 %” (the average annual rate during 2002–2005 was 1.4 % in the CR, 2.1 % in the EU-25 and 2.2 % in the EU-12). This low inflation rate puts excessive pressure on appreciation of the exchange rate, which affects exclusively exporters as opposed to equal distribution of inflation throughout the economy.

The main current issue related to nominal convergence is the timing for adopting euro and determining an exchange rate to be used for conversion of CZK to euro. This involves not only fulfilling the Maastricht criteria, which ensure stability of the common currency, but also ensuring that this step supports convergence of the real economic level as much as possible. Experience of less economically developed countries that have adopted euro should be examined in this context (in particular the experience of Portugal, which is going through a stage of rapid divergence of the economic level compared to the EU-25 following the country's accession to the Euro Area).

The low price and unit labour costs levels, which in nominal terms amount to less than one third of the average level in the EU-15 countries, make the Czech economy cost and price competitive. Even with gradual increase in unit labour costs their level will remain low compared with advanced EU countries. Unit labour costs related to total GDP are less than a half of the average level for the EU-25 countries. They are slightly lower than in Hungary (slightly higher than one half of the EU-25 average), while unit labour costs in Slovakia, Poland and the Baltic states do not reach even 40 % of the average level for the EU-25.

Real convergence to the average level of EU-25 countries is to continue in future. The Czech level is likely to exceed the 75 % threshold (a limit for support from EU structural funds) within the next 2 years. However, matching the economic level of the EU-25 in 2013, as stipulated by the Strategy for Economic Growth, appears to be an excessively ambitious objective which is highly unlikely to be fulfilled. As the CR has high convergence dynamics, we can expect that if this dynamics will continue, the country may soon reach the position of Greece, Cyprus and Slovenia. These countries achieve GDP per capita in PPS in relation to the EU-25 between 80 and 85 %. How well the transition from price-based to quality-based competitiveness is managed will decide the future course of this development.

### Structural changes

Structural changes in the Czech economy reflecting in a changing structure of employment and added value were not significant during 1995–2004 with regard to basic production sectors. Major changes involving a decline in the share of agriculture and industry and an increase in the share of services occurred before 1995. Development in fixed prices was different from development in current prices due to various GAV deflators in individual sectors. This is why the intensity of structural changes between 1995 and 2004 was among the lowest in the EU. The share of services in aggregate GAV in European comparison is the second lowest after Ireland, while the share of industry is the second highest. The growth rate of aggregate GAV and contributions of individual sectors to this growth differed greatly during periods 1996–1999 and 2000–2004. The average annual growth rate of GAV during the second period was 3.2 %, while the same rate



during the first period was as low as 0.8 %. The construction industry had a significantly negative impact on the overall growth of GAV during this period. Industry and services influenced the growth rate of GAV positively during both periods and this positive impact was significantly higher during 2000–2004. Industries with the highest dynamics of gross added value during the entire monitored period included electrical industry and production of means of transport and telecommunication and financial and business services.

The increase in the total labour productivity in the national economy during 1996–2004 was higher than the increase in gross added value (2.4 compared to 1.8 %) due to a decline in total employment. Both, the level and dynamics of labour productivity differed greatly between individual industries of the national economy. The greatest differences in development of labour productivity and GAV were detected in agriculture, where labour productivity grew faster than GAV as a result of decreasing employment, and in business services, where a significant growth in employment brought about a significantly slower growth of labour productivity compared to the growth of GAV. The share of intermediate consumption in gross production increased between 1995 and 2004, especially in real representation. This was influenced especially by strengthening inter-company cooperation.

Breakdown of the increase in the total productivity into individual factors showed that the increase in productivity in individual industries had the greatest impact of the growth of the aggregate productivity, accounting approximately for 95 %. However, a change in the structure of employment to the benefit of industries with higher levels of productivity also had a positive impact. Similar development occurred in most new EU member states. Comparison of the levels of productivity in the Czech Republic, Hungary and Slovakia compared to the level of productivity in Germany also revealed that this difference is influenced the most by low levels of productivity in individual industries. The level of aggregate productivity in individual countries converted using a nominal rate ranged between one sixth and one quarter of the level achieved in Germany. The industrial structure also has a negative impact on differences in the level of productivity, this impact being the lowest in the CR.

Assessment of the situation with regard to the level of technological intensity in individual activities shows that the so-called high-tech industries in the Czech Republic are not among those with the highest labour productivity. However, between 1996 and 2003 these industries on average recorded the highest dynamics of real gross added value and labour productivity. The share of gross added value in gross production in this group of industries is also relatively low. This is largely caused by a considerable share of assembly operations in these activities. The rapid growth in the volume of export between 1999 and 2003 was mainly caused by the increased export in the active finishing regime, which accounted for 94 % of the export of high-tech products in 2003.

Comparison of the values of production multipliers in the Czech Republic between 1995 and 2002 shows the largest increase in the impact of the construction industry and electrical industry. The multiplier value also increased in production of means of transport, timber industry, other processing industry and agriculture. Especially the construction industry and power engineering, but also produc-

tion of means of transport, textile industry and transport and communication services, have a relatively higher multiplication effect compared to other countries (Poland, Hungary and Germany). From the perspective of technological and knowledge demands, industries with medium to low level of technological intensity tend to have higher production multiplier values than high-tech activities. Hungary is the only exception in this regard.

Besides the multiplication effect of individual industries, mutual connections between individual industries are also important for performance of the economy as a whole. Industries with the strongest demand links can be grouped into certain clusters, inside which demand multiplication effects reflect relatively rapidly. These clusters also created positive conditions for spreading technologies, knowledge and innovations. One industry in a particular cluster is always the primary industry and other industries are tied to it through demand connections (they supply the inputs). Primary industries in the CR include especially metal industry, metallurgy, clothing industry, production of rubber and plastic products, air transport, production of office machines, production of furniture, catering and accommodation, and financial services. However, more “refined” differentiation of these connections would require tables with a more detailed industrial structure. Assessment of the situation with regard to inter-connection of activities at various levels of technological and knowledge intensity revealed that high-tech activities in the processing industry and services are among the so-called primary industries, i.e. demand for production of these industries also reflects in increased demand for other industries.

#### Supply, demand and stability

The growth of GDP on the supply side was largely supported by the growth of total factor productivity (its impact accounted for more than 70 %). The accelerated growth of TPF during 2000–2004 was caused by qualitative factors, which change very slowly and their impact is often demonstrated with a certain delay. This involved mainly the strong inflow of foreign direct investment, which culminated during 1999–2002. Direct foreign investment contributed to implementation of innovations, including ICT, and subsequently also to the increased competitiveness of the Czech economy. This phenomenon is further confirmed by the expansion of export with above-average growth in export of machines and transporting equipment. Other qualitative factors, such as the share of gross expenditure on research and development in GDP, quality of human resources and institutional factors, changed gradually and did not reach the average level for the EU.

Development on the labour market during 1996–2004 was characterized by an overall decline in employment. The situation only started to improve from 2005. The total employment in the national economy declined on average by 0.6 % per year during 1996–2004. The economic participation rate decreased from 73.2 % in 1996 to 70.8 % in 2004, and an increase to a rate above the 71 % is expected in 2005. The position of the Czech Republic in international comparison is slightly above the EU average. While the number of unemployed persons grew during 1996–2000, unemployment stabilized at the end of the last century and subsequently started to decline.

An analysis of six macroeconomic industries showed that industry had the greatest impact on the accelerated

growth of the TPF, followed by other services and transport and communication. The average annual growth rate of TPF in the CR during 1996–2004 was twice as high as in the EU-15 (1.5 % versus 0.7 %). The difference between the TPF growth rate in the CR and in the EU-15 during 2000–2004 was very significant (2.3 % in the CR compared to 0.5 % in the EU-15). Convergence of TPF in the CR to the EU-15 level started in 1999 and this process further accelerated in 2003 and 2004. The level of TPF in the CR reached 63 % of the EU-15 level in 2004, compared to 59 % in 1995 and 57 % in 1998.

**Changes in demand** have a major impact on growth performance over short periods. Relatively significant fluctuations in development of individual demand elements were reflected in strong changes in GDP. This was the case especially in the second half of the 90's. The last five years have brought a certain degree of stabilization, especially in development of domestic demand, which also had a positive impact on the growth of GDP. The Czech economy is characterized by a relatively high share of public consumption, investment and foreign trade in the structure of demand. However, the shares of the individual components in internationally comparable prices change significantly. The share of public consumption remains very high, while the share of investment and foreign trade declines. The share of private consumption remains at approximately 50 %. The Czech economy recorded a faster growth of domestic demand compared to the growth of GDP on a long-term basis. Private consumption grew relatively fast (the average annual growth of private consumption was 3 % during 1996–2004, while GDP grew on average by 2.1 %). The higher growth rate in demand compared to GDP was facilitated by positive development of terms of trade in foreign trade. Contributions of the main demand components to the growth of GDP show a dominant impact of domestic demand on the growth of GDP until 2003. The impact of foreign trade during 1996–2003 was mostly negative. The situation changed in 2004 and especially in 2005, and foreign trade became a driving force behind the Czech economy.

The relatively fast growth of the Czech economy during 2000–2005 was accompanied by opposite trends in **macroeconomic balance**. The relationship between domestic supply and demand was characterized by higher domestic utilization of GDP compared to GDP creation. This was reflected in the negative balance of foreign trade in goods and services. The foreign trade deficit culminated in 1996 and

1997. Positive development in foreign trade led to a significant decrease in the performance balance deficit and the trade balance recorded a surplus in 2005. The balance of services was in surplus and compensated partially for a deficit in the balance of goods. However, the surplus in the balance of services has decreased significantly over the last few years. The decreasing deficit of trade balance did not have a significant impact on the total current account balance due to the increasing deficit in the balance of incomes. The outflow of primary income, especially in the form of growing reinvested and repatriated profit, started to play an important role in this regard. This was caused by a strong inflow of direct foreign investment and a growing influence of companies under foreign control. The current account balance during 2000–2004 was approximately 5 % of GDP. A positive impact of foreign trade occurred in 2005 when the current account deficit fell below 3 % of GDP. As this deficit is financed mainly by the inflow of direct foreign investment, it supports growth in investment without increasing the country's foreign indebtedness and therefore is need not to be seen as dangerous for future development of the economy.

A negative gap between national savings and domestic investment was the main cause behind the current account deficit in the domestic economy. The saving and investment ratios declined on a long-term basis. From the perspective of main institutional sectors of the economy, adverse development of savings occurred in the household and governmental institution sectors. The decrease in household savings was influenced by a strong growth in loans (especially mortgage) provided to households. The situation when the household sector is less capable to finance non-financial companies and governmental institutions leads to increasing dependency of the economy on foreign savings. Generation of savings also declined in the governmental sector. This fact combined with increasing investment turned the originally positive difference between savings and investment into a negative one. What's more, capital transfers to the benefit of other sectors led to a strong growth in net borrowing of the governmental sector, which exceeded the Maastricht criterion of 3 % of GDP during 2001–2003. The overall development of macroeconomic balance shows that a macroeconomic policy supporting growth must be linked with the aim of macroeconomic stability, which is a vital condition for balanced economic growth and full implementation of the growth potential.

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## **Institutional quality**





## 1. Quality of Governance

Empiric analyses examining the causes of differences in economic productivity between countries or groups of countries have been recently paying increasing attention to institutional factors. Institutional factors thus broaden the spectrum of variables used to explain the achieved long-term growth rates and especially persisting differences between developed and less developed economies.<sup>1</sup>

### 1.1 Assessing quality of governance

The spectrum of monitored indicators used in wider international comparisons is gradually extended (their range is systemically monitored especially in the World Bank research project focused on quality of governance and control of corruption) with the increasing interest in the role of institutional factors in explaining growth performance. However, quantification of qualitative factors necessary for monitoring their development in time and carrying out international comparisons poses significant problems. Due to the significance of qualitative aspects, many or even most of the data required for assessing institutional factors cannot be obtained in the form of commonly available statistical (hard) data. This is why expert survey methods are used to a certain extent (for example entrepreneur, foreign investor, public administration staff and international organisation polls or public polls). The possibility of distorted assessment especially due to current economic situation in the relevant country (assessment of qualitative characteristics tends to deteriorate with adverse economic development) is one of the major problems associated with the use of soft data. More comprehensive and elaborate methodologies therefore combine various types of data (soft and hard), as well as their sources (statistical databases, expert estimates, questionnaire surveys) (for more detail see Kadefábková a kol., 2005, p. 37).

The following text addresses the macroeconomic side of institutional quality assessment. The assessment is based on quality of governance defined according to the Governance Matters concept. The concept created and monitored on a long-term basis by the World Bank structures governance quality assessment into six individual indicators: democracy, political stability, government effectiveness, regulatory quality, rule of law, and control of corruption. The published figures for these six indicators for the EU-25 states are used as the basis for the following analysis.

Besides the average for the EU-25, the text works with additional groups of countries with regard to the changes that occurred in the European political and economic environment after the fall of the communist regime. To be specific, the text studies the original member states (EU-15), the group of new member states since 2004 (EU-10) and within the new member states the group of post socialist countries (EU-8, i.e. excluding Cyprus and Malta). The more comprehensive approach of the new institutional economy extended by the approach of the new comparative economy is the theoretical basis for the governance quality assessment.

<sup>1</sup> The text was written in cooperation with Petr Vymětal, who deserves acknowledgment not only for providing valuable comments but also for writing certain parts of the text.

### Aggregate indicators

A wide range of approaches to assessing the quality of the institutional environment is available, and can be used for characterising the impact of institutions on growth performance and competitiveness of the economy and even for comparing the institutional quality of various countries. The methods used in this study have been selected in view of providing data with the widest possible range of institutional characteristics and allowing comparison in time characterised as the dynamics of institutional changes.

The overall understanding of the quality of governance in this text follows the definition set out by the World Bank<sup>2</sup> in the Governance Matters project. The World Bank has studied the concept of quality of governance for approximately two decades. According to their concept, governance is defined in a relatively broad sense as tradition and institution used to exercise power in individual countries. In keeping with this definition, three basic areas are examined. These areas address the processes according to which governments are selected, monitored and replaced; the government's ability to effectively create and implement suitable policies and finally citizens' respect and the state of institutions determining economic and social interactions among citizens. These basic areas are described by pairs of indicators.

The quality of political processes is described by the **voice and accountability** indicator, which assesses the quality of political, civic and human rights and mechanism of political processes. This indicator also reflects independence of the media. The **political instability and violence** indicator reflects the possibility of destabilising the government and the probability of overthrowing the government using institutional means or violence, including the possibility of terrorism. This indicator also shows whether changes in the government have impact not only on the continuity of policies, but also on the ability of citizens to select and replace governments and policies in a peaceful manner. The government's ability to effectively create and implement suitable policies is reflected in the **government effectiveness** indicator, which addresses not only the effectiveness and credibility of government policies, but also the productivity of the administrative authorities, their independence of political pressure, the quality of public service delivery, and

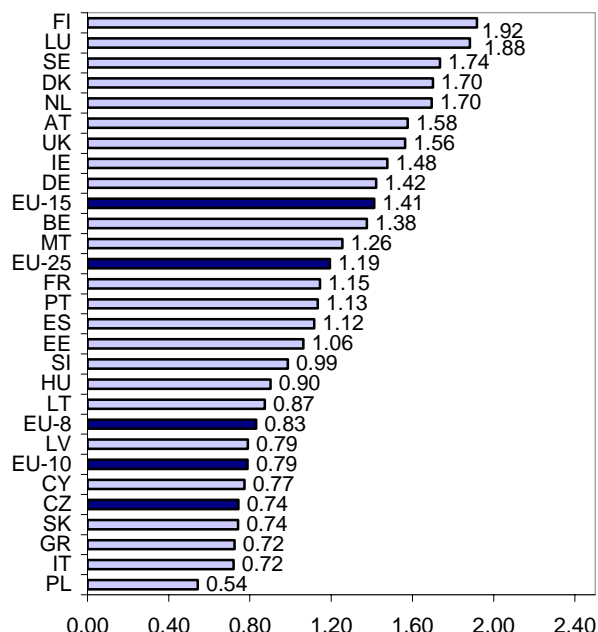
<sup>2</sup> Additional definitions worth mentioning include for example the somewhat different definitions created by UNDP or OECD. **UNDP** (2004) defines the term governance as a system of values, policies and institutions the society uses to control its economic, political and social affairs in relationships between the state, civic society and the private sector. Governance refers to the way in which the society organises itself, and adopts decisions for achieving mutual understanding, agreement and cooperation. Mechanisms and processes for voicing interests, mediating differences and enforcing rights and obligations are provided to citizens. It includes the rules, institutions and practices restricting or stimulating individuals, organisations and companies. Governance therefore includes social, political and economic dimension and functions across all levels of human interaction – household, town, municipality, nation, region and at the global level. The concept of governance in the **OECD** (OECD DAC, 1995) material reflects the use of political power and enforcing control within the society in relation to the administration of social and economic resources. This broad definition includes the role of public bodies, which create the environment for operating economic entities and determining distribution of benefit, as well as the origin of the relationship between the controlling and the controlled. For more detailed explanation see Vymětal (2005).

the **regulatory quality** indicator reflecting the use of basic policies non-conforming with the market's functioning (price regulation, unsuitable regulation of the banking sector) and studying their impact on local and foreign investors.

The willingness of entities to observe laws, effectiveness and predictability of judicature, protection of proprietary rights, quality of enforcing contracts, functioning of the Police or the probability of violent and non-violent crime form the **rule of law** indicator. The **control of corruption** indicator expresses to what extent the public power is perceived to be exploited for personal gain, whether with regard to the major (political) and minor (bureaucratic) corruption or with regard to the ability to influence adopted policies and laws referred to by the term state control.

The **aggregate governance quality index** used to evaluate the overall quality of governance in individual countries or groups of countries comprises the six indicators referred to above, expressed as an arithmetic mean. Figure 1 arranges individual countries according to the value of their aggregate governance quality indexes and illustrates their position within the EU-25.

Figure 1: Aggregate governance quality index (year 2004)



Source: World Bank (2005), own modification.

Figure 1 shows that although none of the countries within the EU-25 achieves a negative value of the aggregate governance quality index with a range from -2.5 to +2.5, none of the countries achieve the aggregate governance quality index value 2. Comparison of individual countries and their positions is shown in the four averages included (EU-25, EU-15, EU-10, EU-8): the average for the EU-15 is higher than the average for the EU-10, which means that accepting new member states in 2004 reduced the overall quality of governance in the EU-25. The averages included allow dividing countries into a few groups, where the extreme positions have significant information value and especially in the case of the first group also great inspirational value.

The group exceeding the average for the EU-15 includes countries where the overall quality of governance can be

evaluated as above the average and these countries can be considered role models of institutional organisation for other states. This group includes especially Scandinavian countries (Finland, Denmark and Sweden), Luxembourg, Netherlands, Austria, Great Britain, Germany and Ireland. The second group of countries is between the EU-15 and EU-10 averages. The third group with results lower than the EU-10 average is very interesting as it includes Cyprus, Czech Republic, Slovakia, Greece, Italy and Poland. We can therefore conclude that the quality of governance in these countries is insufficient and may be associated with an impact on the productivity of the economy and the need for changing the economic policy. The fact that the Czech Republic is included in this group is a warning signal and a strong call and incentive for making changes.

Figure 1 shows assessment of the situation in 2004. As the Governance Matters project has been in progress since 1996, basic trends in the development of this aggregate indicator (all data for individual countries) can be derived from the available data. Table 1 includes the development in the aggregate governance quality indicator for individual groups of countries and the Czech Republic.

Table 1: Development in the aggregate governance quality index

	1996	1998	2000	2002	2004
EU-25	1.14	1.20	1.20	1.25	1.20
EU-15	1.49	1.53	1.51	1.52	1.42
EU-10	0.62	0.71	0.73	0.85	0.86
EU-8	0.57	0.63	0.69	0.81	0.81
CZ	0.88	0.76	0.70	0.81	0.74

Note: The values stated are unweighted averages. Source: World Bank (2005), own modification.

We will begin the assessment by studying the **development in the quality of governance** and comparing this development between the EU-15 and EU-10 countries. While an obvious trend towards gradual improvement in the quality of governance can be observed in the EU-10 countries between 1996–2004, the trend in the EU-15 turns for the worse between 2002 and 2004 and this change in the trend is very significant, with values dropping virtually below the 1996 level. This is a positive situation for possible adjustment of the new member states. Although the gap remains excessively large, it has been reduced by about one quarter (from 0.87 to 0.56). This development reflects in general in the aggregate development of the indicator in the EU-25. The development of the aggregate index in the Czech Republic is documented the best in comparison of development in the CR and the EU-8. The Czech Republic is assessed in the quality of governance for 2004 below the EU-8 average for the first time in the history, and we can therefore conclude that the country has wasted the advantage it had in 1996 over the remaining transforming economies. This makes the position of the CR even more alarming than the mere comparison of 2004 assessment would suggest.

The following sections will primarily focus on the values and development of individual governance quality indicators: voice and accountability (GM 1), political instability and violence (GM 2), government effectiveness (GM 3), regulatory quality (GM 4), rule of law (GM 5) and control of corruption (GM 6). Each of the indicators will be addressed in a separate part where individual detailed data

will be analysed, additional data clarifying the development or supplementing data will be presented and alternative corresponding and opposing approaches that have appeared in the literature dedicated to these topics will be presented.

Development of individual indicators from 1998<sup>3</sup> to 2004 provides some interesting comparisons in the EU-15 and EU-10 groups. Table 2 also shows a comparison against the development in the Czech Republic.

**Table 2: Governance quality indicators**

		EU-15	EU-10	CZ
GM1	1998	1.33	0.95	1.14
	2004	1.32	1.09	1.03
GM2	1998	1.24	0.90	0.97
	2004	1.00	0.82	0.84
GM3	1998	1.77	0.62	0.72
	2004	1.56	0.78	0.63
GM4	1998	1.23	0.75	0.78
	2004	1.40	1.12	0.97
GM5	1998	1.66	0.54	0.62
	2004	1.52	0.75	0.69
GM6	1998	1.93	0.48	0.35
	2004	1.73	0.59	0.30

Note: Unweighted averages of values for individual countries.  
Source: World Bank (2005), own modification.

The decline of the aggregate governance quality indicator for the EU-15 referred to in table 1 is a result of the following changes. While the quality of democracy (GM 1) remains virtually unchanged, the political stability (GM 2) deteriorated. Deterioration was recorded also in other individual indicators and this was due to the increased regulatory burden (GM 4) and occurrence of corrupt behaviour (GM 6). The only positive change can therefore be observed in the quality of legal environment (GM 5) and this is reflected in the deteriorated evaluation of the entire EU-15 mentioned above. The situation in the new member states is in sharp contrast to this development in the EU-15. With the exception of political stability, assessment of this group of countries improved significantly in all studied areas. However, the situation in the Czech Republic does not quite correspond with these overall results.

**Table 3: Development in the components of the aggregate governance quality index for the CR**

	1998	2000	2002	2004
GM 1 voice and accountability	1.14	0.99	0.90	1.03
GM 2 political instability and violence	0.97	0.84	1.07	0.84
GM 3 government effectiveness	0.72	0.70	0.72	0.63
GM 4 regulatory quality	0.78	0.67	1.12	0.97
GM 5 rule of law	0.62	0.59	0.69	0.69
GM 6 corruption	0.35	0.40	0.36	0.30

Source: World Bank (2005), own modification.

According to the Governance Matters project, the Czech Republic in 2004 compared to 1998 was a less democratic and less politically stable country with a less efficient government, a country that successfully deals with the

regulatory burden and slightly improves the quality of the rule of law. Corruption presents the most serious problem pointed out by the World Bank analyses within this project. The corrupt environment in the CR received the lowest value of all indicators within the interval from -2.5 to +2.5 and the assessment in 2004 was even worse than the values achieved in the previous research in 2002. The development in individual areas in the CR from 1998 to 2004 is documented in table 3.

One individual and not very flattering conclusion can be drawn for the Czech Republic from the details listed above: The CR behaves like a stable democracy; although it achieves worse positions than most of the EU-15 countries, it demonstrates the weakest positive development in the evaluated areas of all EU-8 countries.

### Voice and accountability

The **voice and accountability** sub-index reflects the quality and progress of democratisation procedures in the politics, civic rights, human rights and independent media. Assessment of the quality of democracy will be extended by economic freedom as a key area of a democratic system, which is considered one of the basic institutional conditions of economic productivity. To do this, we will use approaches of two independent institutions, which regularly publish economic freedom indexes – The Heritage Foundation and Fraser Institute. Additional supplementary view will be provided in selected details from the World Competitiveness Yearbook IMD<sup>4</sup> (political parties, public administration and bureaucracy).

Firstly, we will study the values and development of the voice and accountability sub-index from the Governance Matters project. Table 4 states values of this sub-index for individual groups of countries – the structure is identical to that used in the aggregate index. The comparison in time is also included. However, note that 1996 was a preparatory year and 1998 is therefore considered the relevant year for examining the long-term development.

**Table 4: Voice and accountability sub-index**

	1996	1998	2000	2002	2004
EU-25	1.22	1.18	1.20	1.26	1.23
EU-15	1.45	1.33	1.31	1.42	1.32
EU-10	0.87	0.95	1.03	1.03	1.09
EU-8	0.82	0.88	0.97	1.01	1.08
CZ	1.06	1.14	0.99	0.90	1.03

Note: Unweighted averages of values for individual countries.  
Source: World Bank (2005), own modification.

Table 4 shows development of democratisation processes and mechanisms. The advantage of the EU-15 countries with consolidated democratic systems over the EU-10 countries remains significant but the gap between the two groups has decreased by more than a half (from 0.58 to 0.23). This is caused not only by a greater rate of the democratisation processes in the EU-10, but also by a relatively stable level of democracy in the developed European countries. The development of the Czech Republic's position (21<sup>st</sup> place ahead of Lithuania, Cyprus, Latvia and Greece) is alarming. The loss of the relatively

<sup>3</sup> 1998 was used because the data for the first year of research (1996) have been retrospectively revised according to the changing methodology and cannot be therefore considered fully comparable.

<sup>4</sup> The IMD research excludes 4 economies: Cyprus, Lithuania, Latvia and Malta. This is why averages are calculated without these countries, i.e. as an average for 21 countries in the EU-25 indicator and an average for 6 countries in the EU-10 indicator.



good position (16<sup>th</sup> –18<sup>th</sup> place in 1996) suggests that the efforts to achieve the standard of Western European democracies are not successful. Virtually no change occurred between the two extreme points of the monitored period. The CR lost its initial, relatively good position and the advantage over the EU-10 countries is negligible. Comparison against the average for the transforming countries is also interesting; the CR now lags behind these countries and this further highlights a certain degree of stagnation in development of the quality of democracy.

The **economic freedom** indexes represent the basic supplementary material. The first of them - the index published by the Fraser Institute (FI) has been published in the annual study Economic Freedom of the World for more than thirty years (since 1970).

**Table 5: Development in the values of the economic freedom index according to the Fraser Institute**

	1975	1985	1995	2000	2001	2002	2003
EU-25	5.7	5.9	6.5	7.0	7.1	7.2	7.2
EU-15	5.7	6.3	7.3	7.5	7.4	7.4	7.4
EU-10	..	..	5.4	6.3	6.6	6.8	6.8
CZ	..	..	5.9	6.8	6.8	6.7	6.8

Source: Fraser Institute (2005), own modification.

Development in the values of the economic freedom index according to the Fraser Institute moderates the adverse position of the CR mentioned above (see table 5). Although the index points out the gap in enforcing economic freedom between the new and the old EU countries, the Czech Republic is assessed at a level equal to the EU-10 average.

**Table 6: Economic freedom index - Heritage Foundation**

	EU-25	EU-15	EU-10	Czech Republic
1996	2.60	2.29	3.05	2.33
1997	2.50	2.21	2.94	2.29
1998	2.47	2.20	2.88	2.43
1999	2.43	2.18	2.80	2.14
2000	2.40	2.17	2.73	2.20
2001	2.26	2.10	2.48	2.10
2002	2.26	2.13	2.46	2.29
2003	2.23	2.10	2.43	2.35
2004	2.21	2.11	2.38	2.39
2005	2.17	2.09	2.30	2.36

Source: Heritage Foundation (2005).

The second economic freedom index has been published by the Heritage Foundation – HF since 1995. This index includes a broad spectrum of institutional factors determining economic freedom. Economic freedom is defined as a lack of governmental pressure or restriction with regard to production, distribution or consumption of assets and services exceeding the level of the essential (vital) need to protect and maintain the freedom. All countries worldwide apply certain restrictions or pressure (through taxation or providing public assets) but these restrictions of pressure must not exceed a certain minimum limit to violate human rights. Despite this, governments restrict or enforce certain behaviour, production, consumption or distribution, people's behaviour changes and the change is rarely for the better. Unlike the FI index, examination of the economic freedom index according to HF (see table 6) confirms to a great

extent not only CR's lagging behind but especially its stagnation – the value of the index remains virtually unchanged. The gap between the EU-15 and EU-10 decreased during the monitored period. Development in the index for the Czech Republic stagnates and as the remaining transforming countries develop, the CR lags behind. This places the CR among countries with values below the European average.

### Political instability and violence

The **political instability and violence** indicator reflects the potential for upsetting the stability and monitors the likelihood of violence used to solve political disputes (from the threat of putsch to settling personal conflicts in the politics and the threat of civil war, extremism and terrorism). Political risk indexes published by the Political Risk Service Group (PRSG) and political instability risk indicators from the IMD 2004 research will be used as supplementary indicators.

**Table 7: Political instability and violence sub-index**

	1996	1998	2000	2002	2004
EU-25	1.01	1.10	1.10	1.09	0.93
EU-15	1.15	1.24	1.30	1.14	1.00
EU-10	0.80	0.90	0.80	1.01	0.82
EU-8	0.82	0.89	0.78	1.03	0.80
CZ	1.08	0.97	0.84	1.07	0.84

Note: Unweighted averages of values for individual countries.  
Source: World Bank (2005), own modification.

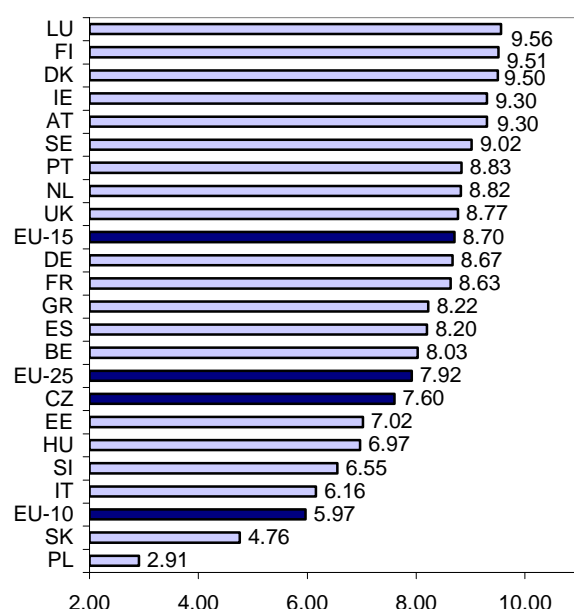
The values of the political stability sub-index are included in table 7. Once again the table shows a clear difference between the developed European countries with consolidated political systems and the new member states. Nonetheless, examination of the EU-15 and EU-10 averages reveals that despite a certain decrease in the values of this index, the former candidate countries were the only to record some progress over the last few years and thus were able to catch up with the developed European countries to a certain extent. We can only guess the reasons behind this development. After excluding the threat of a civil war or a putsch, the threat of terrorism remains as the factor that significantly decreased this indicator. The decrease in the index for the EU-15 is obvious in 2002, as well as in 2004, when the entire Europe was affected by this development.

This may suggest that no progress occurred due to the more intense perception of the threat of terrorism. However, this explanation applies only to a certain extent. Countries more actively involved in the global fight against terrorism perceive terrorism as a threat more sensitively (especially in the case of Great Britain). On the other hand, the deterioration of the index is also caused by a variety of other factors – political instability, scandals in the politics and internal conflicts (Italy, Poland) or increasing extremism on both wings of the political spectrum. Although the Czech Republic achieves a slightly better results in this comparison than in the democracy sub-index (19<sup>th</sup> place in 2004), it has lost its favourable position from the mid 90s (13<sup>th</sup> place in 1996).

Another supplementary factor – the IMD assessment strives to answer the question whether the risk of **political instability** is or is not high. A score of 10 means a low risk, while zero is a high risk. The results are shown in

Figure 2. Logically, these risks are higher in transitional economies where the societies have not sufficiently absorbed the democratic principles. Although the Czech Republic is above the EU-10 average, this average is significantly affected by the negative assessment of Poland (2.91) and Slovakia (4.76). We can therefore conclude that countries achieving values of this index higher than seven can be considered politically stable and the CR (7.60) meets this condition.

Figure 2: Political instability risk (year 2004)



Source: IMD (2004), own modification.

### Government effectiveness

The **government effectiveness** sub-index includes a variety of variables related especially to the quality of bureaucracy and public services. Although the gap between the EU-15 and EU-10 countries decreases over time, this development is not rapid. This suggests that the government effectiveness in the new member states represents a serious and persistent problem. While developed countries strive to deal with their extensive bureaucracy, the EU-10 countries need to tackle ineffective bureaucracy, poor structure of public expenses and institutional failures, and the quality of public services is continuously lagging behind.

Table 8: Government effectiveness sub-index

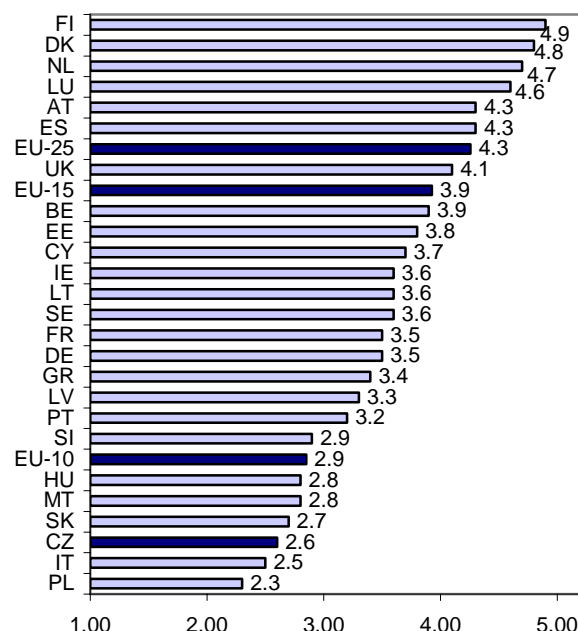
	1996	1998	2000	2002	2004
EU-25	1.29	1.31	1.25	1.36	1.25
EU-15	1.74	1.77	1.64	1.74	1.56
EU-10	0.62	0.62	0.66	0.79	0.78
EU-8	0.45	0.49	0.59	0.71	0.72
CZ	0.78	0.72	0.70	0.72	0.63

Note: Unweighted averages of values for individual countries.  
Source: World Bank (2005), own modification.

The Czech Republic did not achieve any significant progress during the monitored period and lost its advantage over the EU-10, as well as EU-8 countries and its current position is worse than the average positions for these groups. The fall to the end of the line (23<sup>rd</sup> place ahead of Italy and Poland) further documents the poor efficiency of

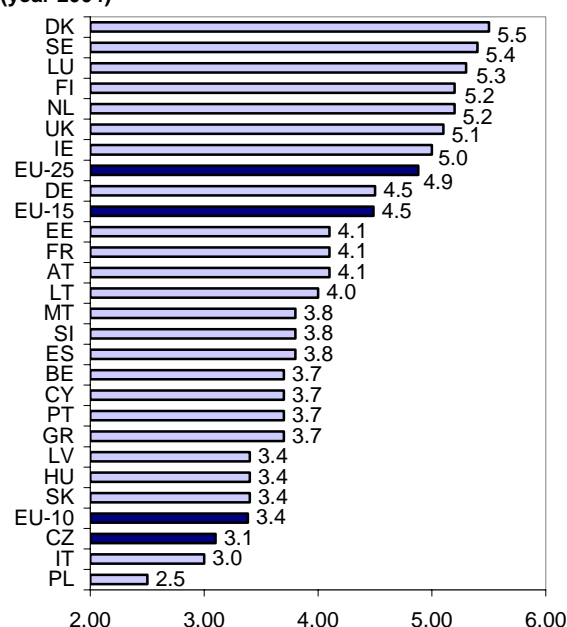
the administrative authorities, numerous delays and repeated institutional failures associated with activities of the state and the public sector. This also reflects in poor management of the growing public debt, inflexible enforcement and implementation of changes in public policies, and corruption in the state administration (see table 8).

Figure 3: Wasting public resources (year 2004)



Source: WEF (2004), own modification.

Figure 4: Transparency of government's decision making (year 2004)



Source: WEF (2004), own modification.

Additional indicators are obtained from two sources: the Global Competitiveness Report 2004–2005 by the World Economic Forum and the data published in the World Competitiveness Yearbook 2004 by IMD. The first source provides indexes that assess wasting public resources and the transparency of the government's decision making, with



values recorded in Figures 3 and 4. The first index assesses whether the public expenses in the economy are used for essential goods and services not provided by the market (value 7) or whether public expenses are wasted (value 1). The second index evaluates whether the government informs companies about changes in policies or regulations sufficiently (value 7) or insufficiently (value 1).

As the Figures show, the Czech Republic's position in both cases is less than gratifying. Our government is evaluated as wasteful and non-transparent. The CR's position on the 23<sup>rd</sup> place only ahead of Italy and Poland in both cases confirms the assessment according to GM.

### Regulatory quality

The level of regulation and its quality is one of the basic institutional characteristics. Monitoring of regulatory quality is therefore a major signal for the economic policy with regard to the efforts focused on increasing competitiveness. Regulation is generally considered necessary as long as it does not prevent free enterprise. The regulatory burden sub-index GM assesses the regulatory quality but not the level of regulation (see table 9).

Table 9: Regulatory quality sub-index

	1996	1998	2000	2002	2004
EU-25	1.10	1.03	1.11	1.36	1.29
EU-15	1.41	1.23	1.36	1.58	1.40
EU-10	0.63	0.75	0.74	1.03	1.12
EU-8	0.67	0.72	0.73	0.99	1.08
CZ	1.18	0.78	0.67	1.12	0.97

Note: Unweighted averages of values for individual countries. Source: World Bank (2005), own modification.

The table clearly shows how the EU-10 countries are starting to catch up with the old EU member states, decreasing the difference from the initial value of 0.78 in 1996 to 0.28 in 2004. Despite this significant improvement a number of problems persist – excessive regulation in certain sectors, non-transparent and complicated taxation systems, and market-unfriendly activities on individual markets. In addition, it is necessary to bear in mind that from the worldwide perspective the entire Europe appears over-regulated.

The situation in the Czech Republic does not warrant great optimism and its favourable initial position rapidly deteriorated (a fall from the 13<sup>th</sup> place in 1996 to the 20<sup>th</sup> place in 1998 within the EU-25). The situation improved after 2000 – the major banks and companies with majority share owned by the state were sold, the VAT rate was reduced and certain modifications were introduced in individual markets (telecommunication, power engineering). Despite this improvement, the CR remains on the 12<sup>th</sup> place even in 2004. Regulation of the labour market, of rent and prices of energies are seen as a persisting problem and this may lead to further deterioration in the position of the Czech economy.

Indicators from three sources were selected as additional regulatory quality indicators – from the Global Competitiveness Report 2004–2005, from the data published in the World Competitiveness Yearbook 2004 and from regulation assessment by the Fraser Institute in Economic Freedom in the World 2005. The state regulation<sup>5</sup> and obstacles to business indexes are obtained from the first source, price control issues, labour market regulation and legal regulation are adopted from the second source. Data on credit market regulation, labour market regulation and commercial regula-

tion are adopted from the economic freedom index by FI. Table 10 presents data from the IMD.

Table 10: Additional regulatory quality indicators for 2004

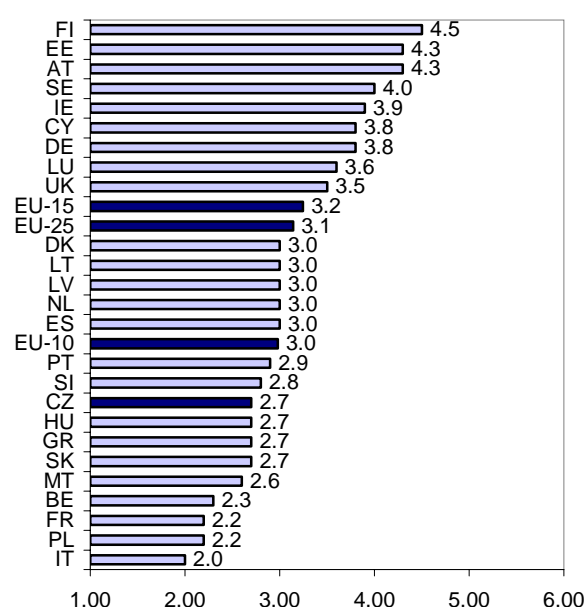
	Price control	Labour market regulation	Legal regulation of financial institutions
EU-25	7.07	4.32	6.86
EU-15	7.21	4.20	7.17
EU-10	6.75	4.63	6.09
CZ	7.65 (11)	4.05 (32)	6.25 (38)

Note: The data from IMD does not include results for Cyprus, Lithuania, Latvia and Malta and the averages are calculated without these countries. The figures stated in brackets express the CR's position in the group of 104 countries. Source: IMD (2004), own modification.

The data from the IMD show regulatory quality differing throughout various areas in the European Union. Prices are mainly deregulated and the Czech Republic is evaluated at a level not only above the EU-10 average, but also above the EU-15 average. What's more, the gap between the old and the new member states is not significant. The same applies to the labour market regulation, though at a very different level. The indexes show that the conditions on the labour markets throughout Europe are over-regulated and the difference of more than three and a half points for the Czech Republic in the price regulation and the labour market regulation assessment is a sad confirmation of this fact. Interestingly, the EU-10 countries have less regulated labour markets than the EU-15 states.

The situation in the financial sector regulation is satisfactory and the Czech Republic plays a progressive role within the EU-10 slightly lagging behind the EU-15. Nonetheless, the level of regulation in European financial markets is higher compared to financial markets worldwide and the Czech Republic's position in the sample of 60 countries confirms this fact. The CR is on the 11<sup>th</sup> place in price control, on the 32<sup>nd</sup> place in the labour market regulation and as far as the 38<sup>th</sup> place in the financial market regulation.

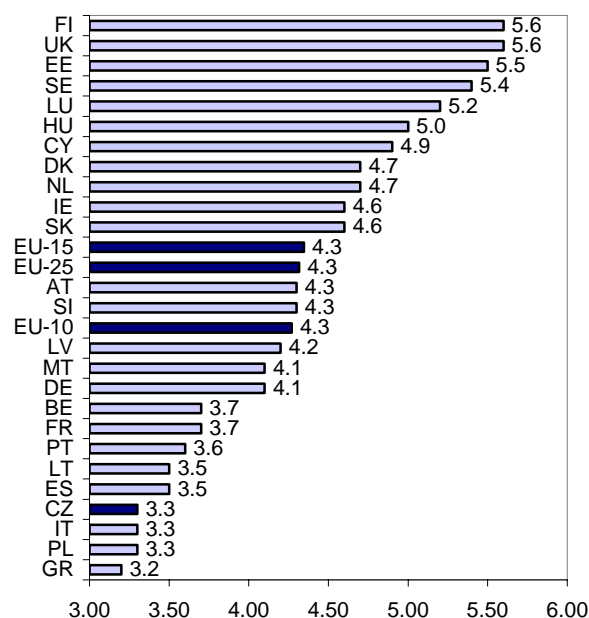
Figure 5: Adjustment to the state regulation (year 2004)



Source: WEF (2004), own modification.

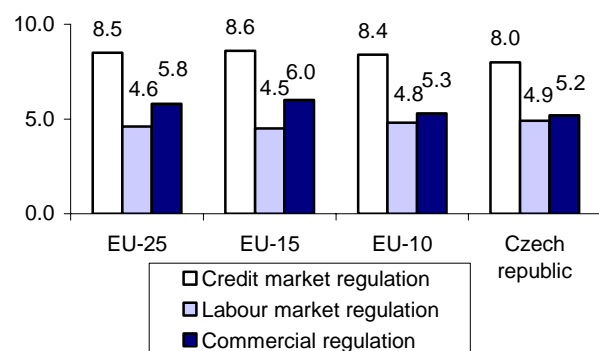
Figure 5 evaluates the ease of adjusting to the state regulation (higher values mean easier adjustment). The gap between the old and the new EU member states in this indicator is influenced by the situation in the Baltic states, i.e. the second place for Estonia with evaluation higher than the EU-15 average by more than one point. What's more, besides Poland, the group of countries with high regulation includes Belgium and France; Italy received the worst evaluation. Despite these circumstances, the gap between the EU-15 and EU-10 remains, even though it is not significant. The position of the Czech Republic is below the average for the new member states.

Figure 6: Obstacles to business (year 2004)



Source: WEF (2004), own modification.

Figure 7: Regulation restricting freedom according to the Fraser Institute (year 2004)



Source: Fraser Institute (2005), own modification.

Figure 6 assesses the difficulty of starting business. The EU-15 and EU-10 averages do not differ significantly but the index values divide the countries into three groups. Of the countries with transitional economies traditionally Estonia and surprisingly Hungary are included in the highest group with five or more points and the lowest group with less than four points includes the Czech Republic (3.30). Only Greece achieves worse results within the EU-25. Evaluation included in the economic freedom index completed by the Fraser Institute is

used as the last additional indicator. The FI assesses three components with regard to regulation restricting freedom: credit market regulation, labour market regulation and commercial regulation. Figure 7 compares these three components of regulation in aggregates for EU-25, EU-15, EU-10 and the Czech Republic. This comparison confirms the comments mentioned previously.

### Rule of law

Structure of the **rule of law** is one of the most important institutional characteristics of modern societies. Definition of the basic formal rules in the legal order creates boundaries for actions of economic entities. The legal order quality sub-index GM includes mainly the level of proprietary right protection and the ability to enforce contracts.

Indicators of institutional interactions in the EU-15 are considered unproblematic. Despite the deterioration during the last four years, the legal order quality indicator supports the theory that the developed countries have consolidated political and legal systems. This deterioration may be related to some antiterrorist legal measures. The EU-10 is reducing the large gap by improving the quality of legislation especially in accordance with the *aquis communautaire* associated with joining the EU. The initial difference of 1.33 decreased during the last year of the survey to 0.77 but it still represents a significant gap. The Czech Republic has maintained virtually constant index value, left its 17<sup>th</sup> place from the beginning of the period and now ranks just ahead of Cyprus and Poland. The legal order quality in the Czech Republic is evaluated on a long-term basis as one of the most serious institutional problems.

Table 11: Rule of law sub-index

	1996	1998	2000	2002	2004
EU-25	1.14	1.21	1.25	1.22	1.21
EU-15	1.67	1.66	1.67	1.56	1.52
EU-10	0.34	0.54	0.62	0.70	0.75
EU-8	0.35	0.48	0.55	0.65	0.68
CZ	0.64	0.62	0.59	0.69	0.69

Note: Unweighted averages of values for individual countries.  
Source: World Bank (2005), own modification.

Table 12: Compliance of legal order in transitional economies with the OECD legislative principles

Very high compliance	No countries
High compliance	Armenia, Kazakhstan, Lithuania, Latvia, Hungary, Macedonia, Moldavia, Poland and Russia
Medium compliance	Albania, Bulgaria, Czech Republic, Estonia, Croatia, Kyrgyz Republic, Serbia and Monte Negro, Slovakia, Slovenia and Uzbekistan
Low compliance	Bosnia and Herzegovina, Georgia, Romania and Turkmenistan
Very low compliance	Azerbaijan, Belarus, Tajikistan and Ukraine

Source: EBRD (2005).

Materials of the European Bank for Reconstruction and Development (EBRD) are the first additional resource for assessing the legal order quality. In 2005 EBRD published the Composite Country Law Index and rating of transitional economies reflecting the level of compliance of their

legal orders with the OECD legislative principles of corporate governance (see table 12). The Composite Country Law Index evaluates the overall level of commercial and financial law.

When commenting on this table, it is impossible not to state that the data confirm the previous statements on the (poor) quality of the Czech legal order. The fact that countries such as Russia, Armenia or Kazakhstan achieve greater compliance than the CR is alarming. The data listed in table 16 divide the EU-8 countries into two groups, with Lithuania, Latvia, Hungary and surprisingly also Poland included in the better group and on the other hand surprisingly Estonia together with the CR, Slovenia and Slovakia in the second group.

**Table 13: Overall level of commercial and financial law in transitional EU countries in 2005**

HU	EE	SI	LT
68	66	65	64
LV	CZ	SK	PL
62	61	60	58

Source: EBRD (2005).

Legal quality indicators selected from the IMD survey are used as yet another supplementary assessment. These indicators assess to what extent the current **legal framework** restricts or supports competition among companies and how this issue is addressed by **newly adopted** legislation (see table 14). This assessment shows the significant lagging in the legal quality of the new member states compared to the original EU-15 and the large gap between the Czech Republic and the EU-10, although the difference in new legislation is smaller than in the existing legislation. However, this slightly more optimistic evaluation is shown in a different light in view of the fact that the 46<sup>th</sup> place held by the CR in the group of 60 countries is only very slightly better than the 47<sup>th</sup> place.

**Table 14: Supplementary indicators of legal quality for 2004**

	Existing legal framework	New legislation
EU-25	4.93	5.24
EU-15	5.18	5.37
EU-10	4.32	4.93
CZ	3.55 (47)	4.70 (46)

Note: The data from IMD does not include results for Cyprus, Lithuania, Latvia and Malta and the averages are calculated without these countries. The figures stated in brackets express the CR's position in the group of 104 countries. Source: IMD (2004), own modification.

### Control of corruption

Unlike the previous institutional characteristics on functioning of formal institutions, the corruption indicator includes assessment of informal institutions and in actual fact assesses the state of morals and development in the society. The effort to measure corruption is a reflection rather than an indicator of institutional conditions. Corruption (defined as exercising public power for private gain) is reflected in the political process, as well as the judicial system but is also an economic phenomenon. Corruption in the economic sphere reflects especially the state's inability to implement the basic functions because it weakens the effectiveness of economic policies and as such is a symptom of weakness of economic structures and institutions. Corrupt environment decreases the coun-

try's credibility for foreign investors, reduces the efficiency of resource utilization and thus decreases the economic productivity. Corrupt environment and corrupt behaviour are supported by insufficiently clear division between the state and the market, the public and the private sphere and excessive and non-systemic regulation. The corruption control sub-index (see table 15) is based on the forms of corruption divided into major and minor corruption and supplemented by the so-called state control.

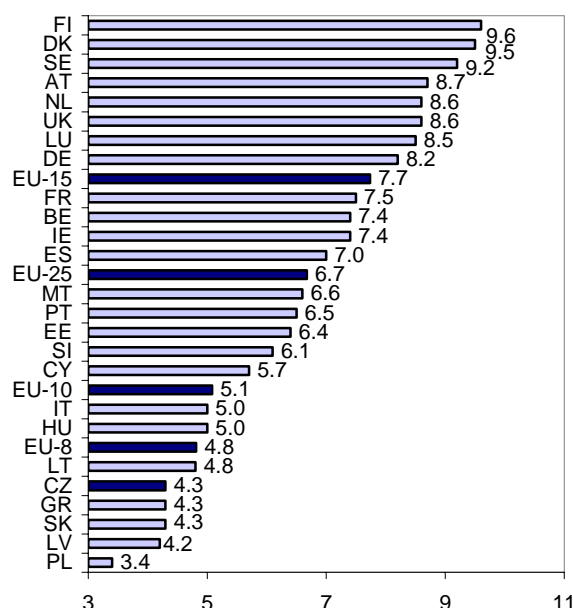
**Table 15: Corruption control sub-index**

	1996	1998	2000	2002	2004
EU-25	1.10	1.35	1.30	1.24	1.27
EU-15	1.54	1.93	1.80	1.71	1.73
EU-10	0.44	0.48	0.55	0.53	0.59
EU-8	0.31	0.34	0.52	0.45	0.49
CZ	0.55	0.35	0.38	0.38	0.30

Note: Unweighted averages of values for individual countries. Source: World Bank (2005), own modification.

Table 15 shows that corruption does not pose a serious problem in the EU member states. Although there are significant differences between individual states (the best Finland achieved the value of 2.53 and the worst Greece the value of 0.56), the EU-15 average is relatively high. The situation in the EU-10 countries is significantly worse. Not only does corruption control lack effectiveness, but the development also suggests the long-term character and strong roots of corruption in these countries. The corruption control indexes for the Czech Republic deteriorated during the entire monitored period. The CR is on the 23<sup>rd</sup> place and is ahead of Latvia and Poland only.

**Figure 8: Corruption perception index for 2005**



Source: Transparency International (2005).

Materials of **Transparency International**, a private non-government and non-profit organisation that has engaged in the fight against corruption on a long-term basis, are used as the first supplementary source. TI annually publishes the Corruption Perception Index (CPI) for an increasing circle of countries, allowing international comparison. Figure 16 states the current values for corrupt

environments in individual countries and table 19 shows development of CPI during 1999–2004.

Figure 8 arranges the EU-25 states in an order from the least to the most corrupt countries. Transparency International considers situations when the CPI value is less than five points cases with corruption out of control. The Figure shows that the average corruption index value for the EU increased by more than one point after the new member states joined the EU and that the average CPI value for the new member states is just above the critical threshold of five points (5.08) and when Cyprus and Malta are excluded, the average value for post-communist countries falls below this threshold (the EU-8 average is 4.81). Greece is the only one of the EU-15 states with the value below the critical threshold of five points and Italy achieved a borderline value. The group of countries with strong corruption includes the Czech Republic with the CPI value of 4.3.

**Table 16: Aggregate corruption indicator**

	1999	2000	2001	2002	2003	2004
EU-25	6.01	5.98	5.97	5.99	6.30	6.58
EU-15	7.58	7.57	7.55	7.56	7.71	7.69
EU-10	3.66	3.58	3.60	3.64	4.20	4.93
EU-8	4.58	4.48	4.50	4.55	4.49	4.64
CZ	4.60	4.30	3.90	3.70	3.90	4.20

Source: Transparency International (2005), own calculations.

The situation in the EU-25 states can be documented not only by the CPI value for 2005, but also on a long-term basis because the values of corruption perception for most European countries have been monitored for ten years. We can therefore examine the development of the CPI values over a longer period of time (see table 16). The table clearly shows the advantage of the EU-15 states over the new member states, especially in the EU-8 group, where no significant improving trend can be noted. Changes in the aggregate indicators over the last 5 years are very small. The Czech Republic did not exceed the critical threshold of five points even once during the entire monitored period. Although the improvement compared to 2002 is only minor, it is nonetheless commendable. The fact that only small changes occur in general confirms that informal institutions can be reformed only with great difficulties and through a long-term process.

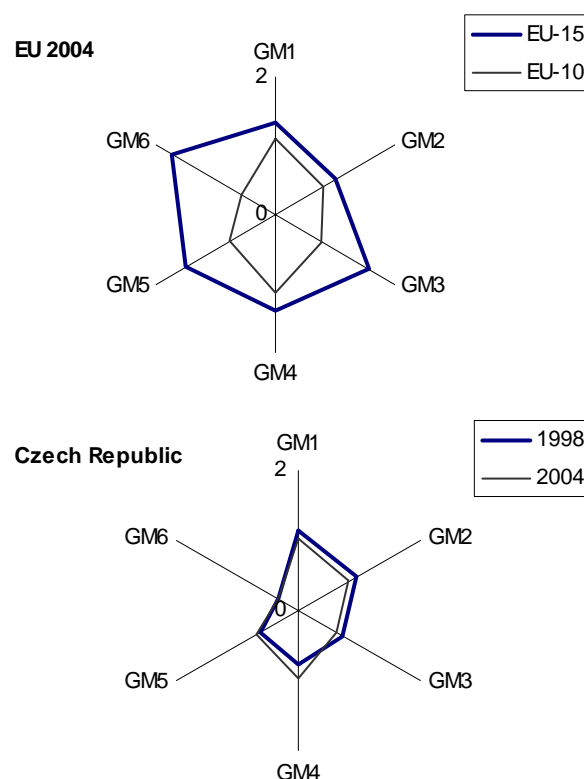
The CPI index compiled according to expert surveys is supplemented by the **Global Corruption Barometer** survey based on a public opinion poll. The purpose of this survey is to establish how people in individual countries perceive corruption, what experiences with corruption they have and what their expectations of the future development in corruption are. Transparency International carried out this survey for the first time in 2003 in 48 countries and extended the sample to 69 countries in 2005. This survey identified corruption as one of the most pressing problems the relevant countries need to solve, alongside with terrorism, unemployment and high inflation. Corruption in the Czech Republic was even placed immediately after unemployment, which is generally considered the greatest problem. Political parties with 4.0 evaluation on the five-point scale (1 – the lowest corruption. 5 – extreme corruption) are considered the most corrupt institutions, followed by the parliament with 3.7 points and the Police and judicature, both with 3.6 points. The Czech Republic differs significantly only in the opinion on the Police, which is considered

as the second most corrupt institution after political parties. With regard to the impact of corruption, people in general believe that corruption influences mainly the political life, rather than conditions for conducting business or personal life. However, compared to other countries people in the Czech Republic believe that corruption significantly influences also the conditions for conducting business. The general public remains mainly pessimistic regarding the development in corruption and expects corruption to grow slightly or maintain the same level. Interesting answers were obtained to questions regarding bribes. While ten percent from all respondents from the selected sample admitted to offering a bribe during the last year, this percentage for the Czech Republic was 21. This result further confirms the low CPI index value.

## 1.2 Dynamics of institutional changes

Overall evaluation of the dynamics of institutional changes (quality of governance) focuses on two major aspects. Firstly, the progress of the catching-up process (adjustment) in the EU-10 states in respect of the EU-15 countries, expressed by differences in assessment of individual institutional characteristics, is studied. These differences are summarised in table 17. The second aspect examines the change in the assessment of the Czech Republic between 1998 and 2004, which reflects the dynamics of institutional changes listed in Figure 9.

**Figure 9: Governance quality indicators GM1 – GM6**



Note: The values stated are unweighted averages.  
Source: World Bank (2005), own modification.

The table shows the rate of catching up and differences between indicators for the EU-10 and EU-15 states. The greatest differences appear especially in political stability, while smaller differences can be observed in democracy



and regulatory burden. The process of adjusting in these areas is progressing well, as the EU-10 states are democratic and politically stable. In the case of the regulatory burden the problem stems from the significantly higher regulation burden in the European Union compared to other economically developed countries (such as the USA or Japan), while the indicator assesses the quality rather than the extent of regulation. This means that the gap signals wasted opportunities for transformation processes for the EU-10 states. Significant differences, whether initial or final, can be observed in government effectiveness and legal order. The assumption of relatively fast adjustment of legal orders as a result of the necessary harmonisation or legal standards in the EU-10 states prior to joining the EU has proved wrong. Similarly to government effectiveness, the time frame<sup>5</sup> required for serious institutional changes is of a medium-term character. Corruption control is the indicator with the worst evaluation. Corruption control represents a very serious problem for the EU-10 states and its solution requires a permanent, long-term and most importantly systemic approach. The extent of the current problems is illustrated in Figure 9.

**Table 17: Differences in governance quality indicators between the EU-15 and the EU-10**

	1998	2000	2002	2004
Voice and accountability	- 0.38	- 0.28	- 0.39	- 0.23
Political instability and violence	- 0.34	- 0.50	- 0.13	- 0.18
Government effectiveness	- 1.15	- 0.98	- 0.95	- 0.78
Regulatory quality	- 0.48	- 0.62	- 0.55	- 0.28
Rule of law	- 1.12	- 1.06	- 0.86	- 0.77
Control of corruption	- 1.45	- 1.25	- 1.18	- 1.13

Source: World Bank (2005), own modification.

The progress of the catching-up process (adjustment) in the Czech Republic displays very low dynamics of institutional changes during the monitored period. On the one hand, this is caused by implementing the basic democratic and political changes before 1998. On the other hand, in the case of other characteristic this leads to the conclusion that the Czech Republic has not succeeded in adjusting promptly with regard to increasing the institutional quality.

### Analysis of the dynamics of institutional changes

The approach to examining the dynamics of institutional changes is based on the theoretical concept of the comparative institutional economy, especially on the classification of five types of a capitalistic society (see Amable, 2003): market economy of the Anglo-Saxon character, socially democratic economy, Asian capitalistic model, European continental capitalism and Southern European capitalism.<sup>6</sup>

<sup>5</sup> These relationships are explained in a greater detail in the work of Vymětal and Žák (2005a).

<sup>6</sup> The theoretical and methodological basis for the analysis of dynamics of institutional changes in the international comparison arise from the key concepts of the new institutional economy, differentiated by two divisions – historic and comparative institutionalism. When assessing the significance of institutions for the economic productivity, **historic institutionalism** starts from the traditional concept of the new institutional economy. **Comparative institutionalism** works with various models of a capitalistic economy as a description of the reality and as means for finding procedures for formulating economic policy objectives in institutional quality (the quality of institutions for performing administration), with regard to the necessity of changes (institutional reforms), urgency of changes and directions of adjustment. For a

The dynamics of institutional changes are expressed by the change in the aggregate institutional quality indicator between 1998 and 2004, and the change in the share of public expenses in the GDP during the same period. The share of public expenses in the GDP was used as an indicator describing the level of state intervention and the related institutional burden. The dynamics in the case of the EU-15 countries are minimal and the initial data allow classification according to the models listed above. In the case of the new EU member states, very different trends in the dynamics of institutional changes leading to movement (transfer) between individual capitalistic economy types can be observed from 1998 to 2004.

Figures 10 (for 1998) and 11 (for 2004) show the positions of individual countries according to the share of public expenses as a percentage of the gross domestic product, defined as an indicator reflecting the level of intervention by the state and state institutions in economic development, and according to the aggregate institutional quality indicator. Both Figures allow identification of individual groups of the EU-15 states according to different types of capitalism because their positions during 1998–2004 remain unchanged or change very insignificantly.

The following classification of the individual EU-15 states in four types (groups) of capitalism according to Amable (2003):

- Market economies (Anglo-Saxon model) – IR, LU, UK;
- Socially democratic economies – DK, FI, SE;
- European continental capitalism – BE, FR, DE, NE, AT;
- Southern European capitalism – IT, PT, GR, ES;

The EU-10 states are not classified in these groups because their positions with regard to the transition processes are considered temporary. Changes in these positions are institutional and can be described according to their direction and extent.

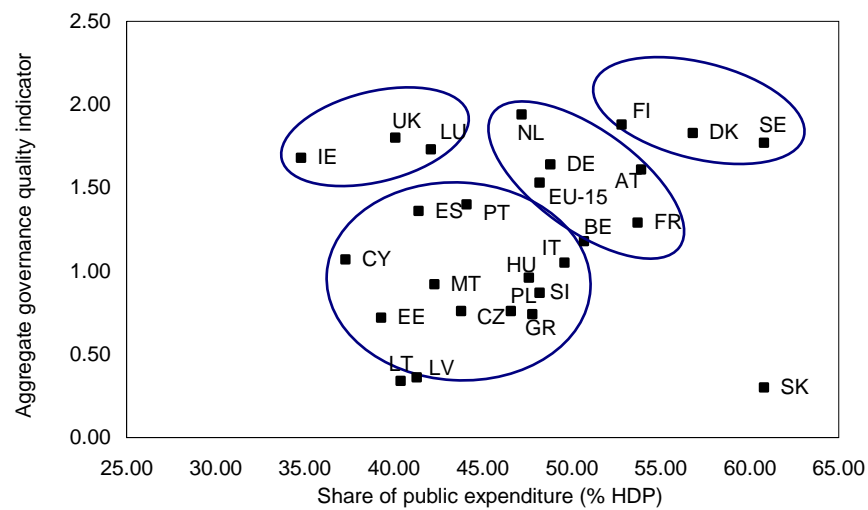
Figure 12 shows positions of the individual EU-10 states between 1998 and 2004. The arrows illustrate the direction and their size of the dynamics of institutional changes. The following trends can be identified based on assessment of the direction and extent of institutional changes that occurred in the EU-10 states during 1998–2004:

- Six of the new member states in total display strong dynamics of institutional changes as measured by the aggregate institutional quality indicator, i.e. the share of public expenses in GDP. This group includes especially Slovakia and Baltic states (see group A of the EU-8 states in Figure 13) with clear tendencies towards the Anglo-Saxon capitalism model. The group furthermore includes Cyprus, heading from the Anglo-Saxon type to the Central European type, and Malta with tendencies towards the socially democratic system of the Nordic character;
- The dynamics of institutional changes in the remaining four countries – the Czech Republic, Hungary, Poland and Slovenia (further referred to as group B) display minor, negligible movement towards the Mediterranean capitalism;
- The Czech Republic did not record any significant institutional changes in the monitored indicators during the relevant period.

detailed overview of the theoretical basis for the approaches referred to above see Žák, Vymětal (2006).

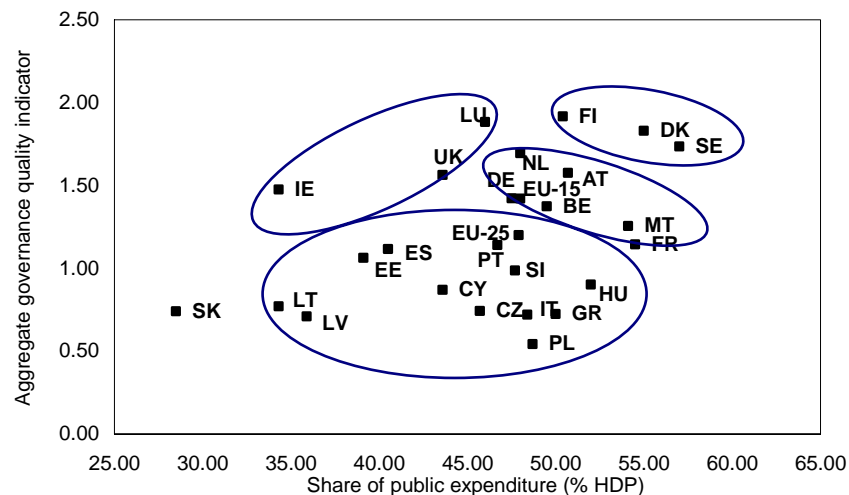


**Figure 10: Relationship between the institutional quality indicator and the share of public expenditure in GDP for 1998**



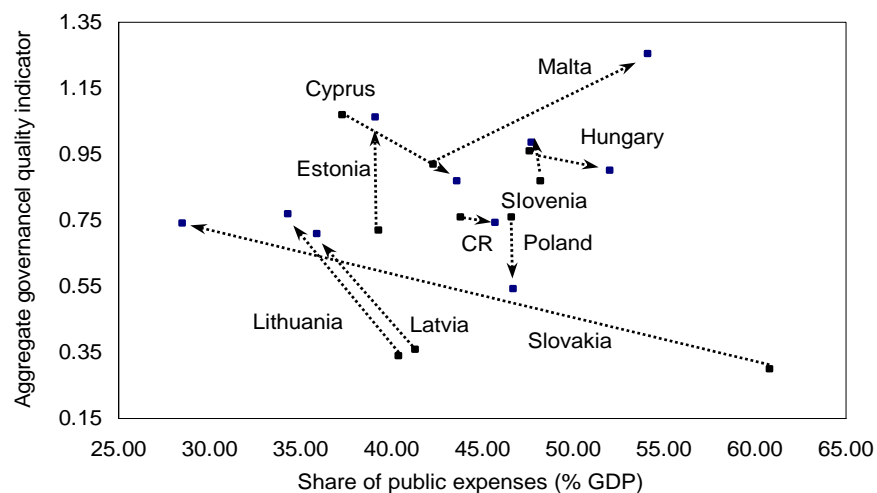
Source: World Bank (2005), the author's modification.

**Figure 11: Relationship between the institutional quality indicator and the share of public expenditure in GDP**



Source: World Bank (2005), own modification.

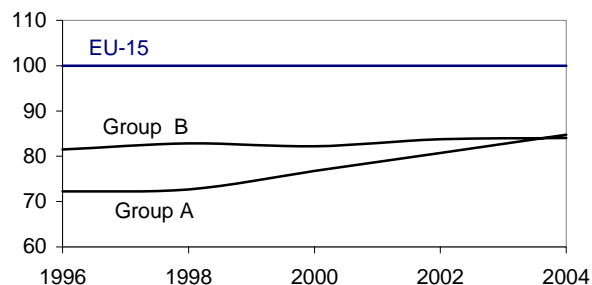
**Figure 12: Dynamics of institutional changes in the EU-10 during 1998–2004**



Note: Malta and Slovenia for 2000. Source: World Bank (2005), own modification.

Figure 13 illustrates gradual approach of the group A countries towards the EU-15 average, while the improvement in the group B countries is minimal or non-existent.

**Figure 13: Aggregate institutional quality indicator for the EU-8 compared to the EU-15**



Source: World Bank (2005), own modification.

### Dynamics of changes and competitiveness

The dynamics of institutional changes in the EU-8 states reflect their overall reforming efforts. The success of alternative models of capitalism is illustrated in the assessment according to the Growth Competitiveness Index (GCI) by the World Economic Forum. The data for individual countries for 2004 is stated in Figure 14.

**Table 18: Average GCI value in 2005 according to the types of capitalism**

	Average GCI for group of countries
Socially democratic economies	5.75
Market economies	4.96
European continental capitalism	4.93
Southern European capitalism	4.55

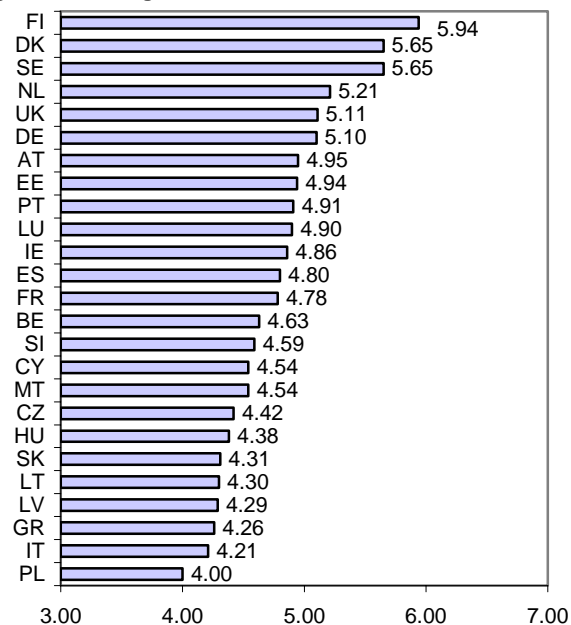
Source: WEF (2004), own modification.

Table 18 states the average values for the EU-15 states according to the four types of European capitalism listed above and arranges individual countries in an order accord-

ing to the competitiveness index values. The table shows a relatively significant advantage of the Nordic, socially democratic economies and a relatively significant negative difference in the countries with Mediterranean capitalism.

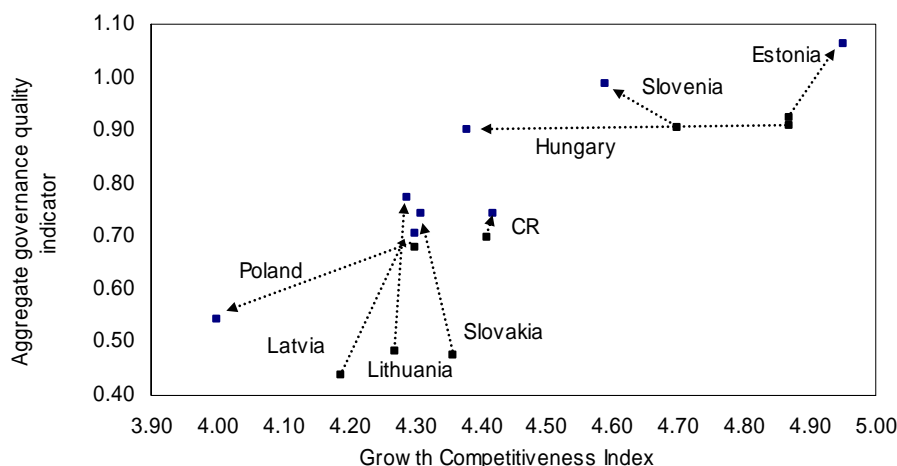
In the case of the EU-8 states. Figure 15 combines the dynamics of institutional changes during 1996–2004 with the dynamics of competitiveness between 2000 and 2004. In group A, Estonia, Latvia and Lithuania recorded a parallel increase in the institutional quality and competitiveness, while in group B the competitiveness decreased sharply. Slovakia is an exception in group A, while the Czech Republic is an exception in group B. The competitiveness of Slovakia deteriorated slightly, even though this deterioration is not significant compared to the fall in group B. The Czech Republic's position stagnates.

**Figure 14: Average GCI value in 2004**



Source: WEF (2004), own modification.

**Figure 15: Dynamics of institutional changes of EU-8 and competitiveness (2000–2004)**



Source: World Economic Forum (2005). World Bank (2005), own modification.

## 2. Doing Business

Conditions for doing business significantly and directly influence the execution and productivity of entrepreneurial activities and subsequently have impact on the overall economic productivity. Results of their quality assessment help to identify the impact of enterprise regulation on the economic and social characteristics of productivity and the related institutional characteristics (such as motivation to engage in corrupt practices). On the other hand, assessment of conditions for doing business helps in planning and implementing related (individual and comprehensive) reforms, which may contribute to increased competitiveness of a country through improving the quality of its institutional environment and boosting incentives to invest and employ. However, this does not mean that better evaluation of conditions for doing business is a reflection of no regulation. For example creating an adequate information system or ensuring enforceability of parties' rights often requires an advanced regulatory framework and significant expenses. Nonetheless, regulation in countries with favourable conditions for doing business represents a smaller administrative and financial burden for companies and makes their operation easier. Higher tax rates in these countries may be connected with a higher quality of public services, which apart from a minimal regulatory burden is also reflected for example in the quality of infrastructure, higher human development index values and a lower degree of corruption.

This chapter assesses the conditions for doing business (regulatory quality) in the Czech Republic within the European Union, using findings of the World Bank (WB) research for 2005 carried out within the *Doing Business* project (with data valid in January of the relevant year). Comments on the Czech regulatory practice and suggestions for their future use in an economic analysis are presented. The WB project assesses the conditions for doing business or the quality of regulation of entrepreneurial activities in 155 countries, including 22 European Union member states (excluding Luxembourg, Cyprus and Malta). Conditions for doing business are evaluated especially according to the characteristics and impact of the regulatory burden. The range of monitored indicators is gradually extended (ten indicators were monitored in 2005) and their methodology changes slightly, resulting in somewhat limited comparability of results in time (data for a period starting from 2003 available). The wide span of the project with regard to the number of countries allows extensive international comparisons for groups of countries at various levels of economic and institutional development. The study is structured to examine ten indicators of conditions for doing business, i.e. starting and closing business, granting licenses, enforcing contracts, protecting investors, registering property, getting credit, hiring and firing workers, trading across borders and paying taxes.

### 2.1 Theoretical and methodological basis for assessing regulatory quality

Leading modern **theoretical approaches** to regulation follow Pigou's concept of regulation as public interest, Coase's contractual solution theory and Stigler's theory of regulatory capture (see WB, 2003, p. 90–92). According to the public interest regulation theory, markets demonstrate frequent failures and governments striving for societal effectiveness are responsible for correcting these failures. Stiglitz draws attention to increased incidence of

market failures in less developed countries requiring more extensive regulation. This concept of the need for regulation is criticized from a number of aspects. Firstly, the expected extent of market failures and the inability of the competitive environment to solve the majority of alleged problems without regulatory intervention are considered excessive. Private arrangements are often capable of solving this problem even in the case of insufficient effectiveness of competitive forces. If this is not the case, impartial courts may serve this purpose, provided that they are able to effectively enforce adherence to proprietary rights and contractual provisions. Finally, the critics of regulation point out the assumption of competence and good intentions of the government as the regulator as erroneous. According to this concept, regulation is abused for the benefit of entities capable of influencing it. State intervention cannot increase the welfare of the society; on the contrary it contributes to its decrease. Regulation increases corruption in the environment and transaction costs.

Nonetheless, a certain level of regulation is necessary in the real world of market economies and this regulation increases the quality of life and the economic productivity. The enforcement theory (see Djankov et al., 2003) that compares two types of social costs – private damage costs and state intervention costs – represents an attempt to define the optimal extent of regulation. Private damage occurs as a result of private actors' ability to harm other entities, for example by theft, fraud, overcharging or creating external costs. State intervention is a manifestation of the public servants' ability to harm private entities through bureaucratic bullying or expropriation. As solutions progress from private arrangements within the market discipline to private judicial settlement, regulation and state ownership, the government's decision-making power increases, the authority of private actors decreases, social loss due to private damage reduces and social loss due to state intervention rises. Adequate forms of governmental intervention will depend on the type of activity and specific conditions in the relevant country, such as the productivity of the public administration and courts. Minimizing the cost of regulation triggered by its misuse for private gain requires a certain system for supervising regulators.

Two basic principles should apply in enterprise regulation – regulation is only necessary if private solutions cannot prevent harmful acts and feasible if it can be enforced effectively (i.e. when its misuse can be prevented). Countries achieving positive results in conditions for doing business typically simplify and deregulate competitive markets and thus increase their ability to generate private and social optimum without the need for external intervention. When regulation is considered necessary, maximum effort must be made to simplify it as much as possible. Strengthening property rights and ensuring their enforceability must be the key aspect of regulation. An efficient judicial system significantly reduces opportunities for breaching contractual obligations. Wider use of information and communication technologies increases the effectiveness and reduces the burden of administrative procedures, minimizes personal contact with public servants and thus reduces opportunities for demanding bribes, and improves the access to information for parties involved, thus decreasing their transaction costs.

### Box 1 - Quality of regulation (institutional environment) and economic performance

Analyses of the relationship between the regulatory quality and economic performance on the micro and macroeconomic levels are comprehensive, i.e. including various aspects of the regulatory quality, or focus on its individual aspects (such as the labour market, credit markets, etc.). **Eifert, Gelb and Ramachandran** (2005) use microeconomic data obtained from the investment climate research carried out within the World Bank project (World Bank, 2004) to demonstrate the impact of a low corporate environment quality on the overall factor productivity in African countries (in a wider international comparison). The related high regulation costs reduce the labour factor revenue and thus decrease the demand for labour and real wages. **Love and Mylenko** (2003) use the World Bank research data on the quality of corporate environment to assess the importance of public and private credit registers for reduction of financing restrictions and increase in the share of financing through external (bank) resources. This relationship is apparent in the case of private registers (the impact of public registers is insignificant mainly due to their lower information value) and reflects especially in the availability of financing for small and medium-size enterprises. **Arrunada, González-Díaz and Fernández** (2004) explain the differences between European and American forms of organisation (volume structures) and ownership in motor freight transport by institutional differences in labour regulation and taxation laws, which increase the cost of vertical integration in Europe compared to the USA. **Hoang Lan Ha** (2003) presents a (statistically significant) positive relationship between efficiency of judicial systems and development of credit markets in a wider international comparison. Judicial system efficiency is measured according to the speed and simplicity of the system. Countries with better contract enforcement systems exhibit more developed credit markets, greater banking sector volumes and higher shares of credit provided to the private sector. **Pierre and Scarpetta** (2004) demonstrate the perception of regulation on the part of employers and their response to situations when regulation is seen as restricting company operation. The company research results are compared to the actual labour legislation valid in the monitored countries. As a rule, stronger *de iure* regulation reflects in more intense perception of regulation as a limiting factor on the part of firms. However, there are significant differences between enterprises in adverse effects of this regulation – medium-size and innovative firms tend to feel the impact more intensely. Small firms address the regulatory pressure (which increases the cost of hiring and firing employees) through larger numbers of definite term contracts, while medium-size, large and innovative companies increase their investments into education at a workplace. **Pica and Mora** (2004) present the impact of similarity/difference in regulation between individual countries on their bilateral flow of foreign direct investment. This impact is significant and negative. Implementation of FDI is associated with additional fixed costs, which include the cost of managing different regulation. Similar levels of regulation support FDI, and increase wages, output and productivity. Higher productivity is a result of forcing out less efficient local entrepreneurs by foreign entities supported by more efficient allocation of resources. **Loayza, Oviedo and Servén** (2005) explore the impact of regulation on economic growth and relative volume of the informal sector. Regulation (especially on product and labour markets) influences macroeconomic and especially growth performance by stimulating transfer of resources to grey economy whenever it is excessively intense. The negative impact of the degree of regulation on economic growth is reduced or even eliminated by a high institutional quality. At the microeconomic level the authors focus on a mechanism through which dissimilar forms of regulating firms' input and output (negatively) influence growth of productivity. Interventions on the product and labour markets and fiscal regulation complicate input and output and thus negatively affect the Schumpeterian process of creative destruction as a condition for constructive corporate dynamics. **Bolaky and Freund** (2004) study the relationship between openness of economies, economic growth and regulation, concluding that greater openness of economies in countries with high regulation does not have a significant impact on economic growth, while a positive relationship between growth and openness of economies can be observed in countries with less intense regulation. In view of the effect of regulation, the relationship between openness and growth appears stronger compared to the previous studies.

Decreasing regulatory burden, especially the time demands and the cost of regulation, is significantly supported by limiting participation of courts in business matters to cases that cannot be solved by extrajudicial settlement or replacing judicial procedures with administrative procedures. Effective improvement in the quality of conditions depends on the consistency of reforming efforts. Many countries have recently introduced regulatory impact assessment for proposals of new regulatory measures. The requirement for analyzing the cost and benefit effectively helps to remove superfluous and burdening regulatory measures.

### 2.2 Factors and significance of regulatory quality

The regulatory quality is affected by a number of factors and it is a consequence of local choice or efforts to achieve higher regulatory efficiency to a limited extent only (WB 2003, p. 84-85). In a wider international comparison, countries with more developed economies on average regulate less and more consistently than less developed countries. Differences in regulation between developed countries are influenced by their history and these differences were previously also reflected in institutional structure of their former colonies. Anglo-American common law was typical for independent judges and juries, low weight of regulation and preference of private settlement of disputes. France developed a tradition of civil law based on the Roman law with state judges, emphasis on codes of law and procedures and preference of state regulation over private solution. Germany and Nordic countries developed their own versions of the civil law also based on the Roman law. Nordic countries and countries with Anglo-American legal systems exhibit the lowest regulation, while regulation is the most intense in countries with the French civil law system.<sup>1</sup> Levels of economic development and legal system heritage explain 60 % of differences in the degree of regulation between countries included in the World Bank survey in 2003 (WB 2003, p. 76). The impact of the remaining factors is less prominent and systemic. Political systems play a specific role. In countries with representative government systems, the aim of regulation is mainly to correct market failures, while the tendency towards exploiting regulation by narrow lobby groups is manifested in less democratic regimes. Regulation is less intense in countries with a greater degree of political freedom.

The general comparison according to the positions achieved in individual indicators of conditions for doing business based on the WB survey identifies weaknesses and strengths of EU member states within the entire sample (see Table 1). Baltic countries, especially Lithuania and Estonia were among the new EU member states achieving the best results, while Italy and especially Greece were among the old member states lagging behind the rest the most. In the overall comparison, nine EU member states, seven Nordic European states (including five EU member states plus Norway and Iceland) and eight non-European states were among the first twenty countries. Denmark as the best EU member state was surpassed by New Zealand, Singapore, United States, Canada, Norway, Australia and Hong Kong, i.e. except for Norway mainly by countries with Anglo-American common law heritage.

<sup>1</sup> Central and Eastern European countries in transition are seen as influenced by the German law to a great extent as a heritage of the Austrian-Hungarian Empire's impact. The German model includes Baltic economies, which in addition adopt certain qualities from economies of their wealthier Scandinavian neighbours.



As regards to the European Union, the results show that very significant differences between member states in conditions for doing business (regulatory quality) often remain. No significant harmonization among the original member states in this regard can be seen at this point. The position of EU states on average in the wider international comparison is clearly the worst in employment regulation (this indicator also shows the most significant differences between individual member states). High level of protection of European labour markets therefore undoubtedly contributes to their lower flexibility, especially with regard to (un)employment in more problematic groups. The second worst position of the EU countries of average is in conditions for paying taxes due to relatively high tax rates which in many cases are not matched by the quality of conditions for doing business. Low investor protection and registration of property remain a very significant weakness for the EU. On the other hand, the EU has achieved the best results in conditions for foreign trade and conditions for starting and closing business.

The following comparison shows relationships between the quality of conditions for doing business (as an alternative indicator of the institutional quality) and other economic and non-economic indicators. The EU countries are firstly distinguished according to the applicable tax burden (expressed according to an indicator from the WB survey) and the quality of conditions for doing business as a form of a public service. The following examination focuses on the relationship between the regulatory quality and the economic freedom index (published by *Heritage Foundation*) as an expression of intensity of regulation or the extent of state intervention and the relationship between the regulatory quality and the corruption perceptions index (published by *Transparency International*) as an approximation of the degree of abusing regulation.

The first relationship illustrates to what extent the level of redistribution matches the quality of conditions for doing business as a public service (Figure 1). The average values for both indicators for the EU-22 identify four groups of countries. The situation is the best in the case of a low tax burden accompanied by a high quality of conditions for doing business, which applies especially to Ireland, Denmark and Great Britain. The position of countries with a high tax burden, but also a high quality of conditions for doing business, such as in Sweden and Finland, can also be assessed as positive. What's more, a high level of institutional quality in combination with low intensity of state intervention (see below) has a positive impact on the effectiveness of public resource expenditure (if the society prefers a higher degree of redistribution). The third group of countries is characterized by a low tax burden in combination with a low regulatory quality, which can in fact bring additional costs for entrepreneurs, for example due to long waiting times, demanding procedures, high administration fees or corruption incentives. This group includes especially Slovenia, Portugal and also the Czech Republic. The results in these cases clearly show that reforms should focus especially on improving the institutional quality, rather than reducing the tax burden. However, a low regulatory quality in connection with a higher intensity of state intervention negatively influences the effectiveness of public resource expenditure and the degree of redistribution should therefore be as low as possible. The situation in the last group of countries is the worst because in these cases a high tax burden is combined with a low quality of conditions for doing business. This is the case for example in Italy, Greece, Hungary and Poland. A higher tax burden may also be connected with a better range of other public services rather than

a high regulatory quality. However, the question remains whether an ineffective regulatory system might make this range of public services costly.<sup>2</sup>

The third relationship demonstrates to what extent the quality of conditions for doing business reflects in the level of corruption in the relevant environment, in other words to what extent regulation is misused in the EU member states. Generally, we can assume that a lower quality of conditions for doing business is connected with a higher level of corruption (Figure 3). The relationship between the two indicators is again negative and very strong (the correlation coefficient is 0.73 and more than a half of differences between the member states in the level of corruption can be explained by differences in the regulatory quality). Similarly to the majority of the new member states, the Czech Republic is also included in the group of countries with a low regulatory quality and a high level of corruption. However, most of more developed EU member states with a comparably low quality of conditions for doing business demonstrate a lower level of corruption (Portugal, France, and Spain), while Estonia and Lithuania face greater corruption despite their higher regulatory quality. These specifics suggest differences in the efficiency of regulation enforcement or in the ability to prevent misuse of regulation in the form of corrupt practices. Although a low regulatory quality may present excessive burden for entrepreneurs, efficient control mechanisms are able to inhibit its corrupt effect.

The relationships described above show that improving the quality of conditions for doing business is a vital systemic condition for reducing the level of corruption in a particular environment and the extent of grey economy (and subsequently for increasing tax revenues). A higher regulatory quality also allows more effective use of available resources, significantly facilitates development of entrepreneurial and innovative activities, especially in the case of small and medium-size firms, and increases employment. The example of Baltic countries shows that even new EU member countries with a less developed economy and burdened by their socialistic past are capable of achieving significant success in this regard in a relatively short timeframe. It is necessary to focus first on areas where changes can be implemented relatively promptly and at lower costs and simultaneously prepare more in-depth and demanding systemic changes involving comprehensive legal regulation. The best way of reducing the time demands and the (indirect) costs of procedures related to enterprise is to minimize the participation of courts in cases regarding disputes that cannot be solved by private settlement.

<sup>2</sup> Nonetheless, it is necessary to point out that the importance of a better regulatory quality as a positive condition for doing business in countries with less developed economies may be reduced by their more significant lagging behind, for example in the quality of a physical infrastructure and services. This is why for example in the case of countries with similar degrees of regulation it is suitable to consider additional characteristics of the quality of public services, which can be demonstrated for example by the economic level (as an approximation of the infrastructure quality) or the mean life expectancy (as an approximation of the quality of life). These characteristics are elements of the human development index published by the UN (UNDP 2005). For example, Estonia and Lithuania with the best regulatory quality of conditions for doing business of the new member states may exceed the levels achieved by most of the original member states, but both lag behind these countries significantly in the two elements of the human development index referred to above. On the other hand, Italy, Greece, Spain and Portugal demonstrate regulatory quality at a (low) level similar to or even worse than the new member states but achieve better results in human development.



Figure 1: Relationship between the tax burden and the quality of conditions for doing business (in %)

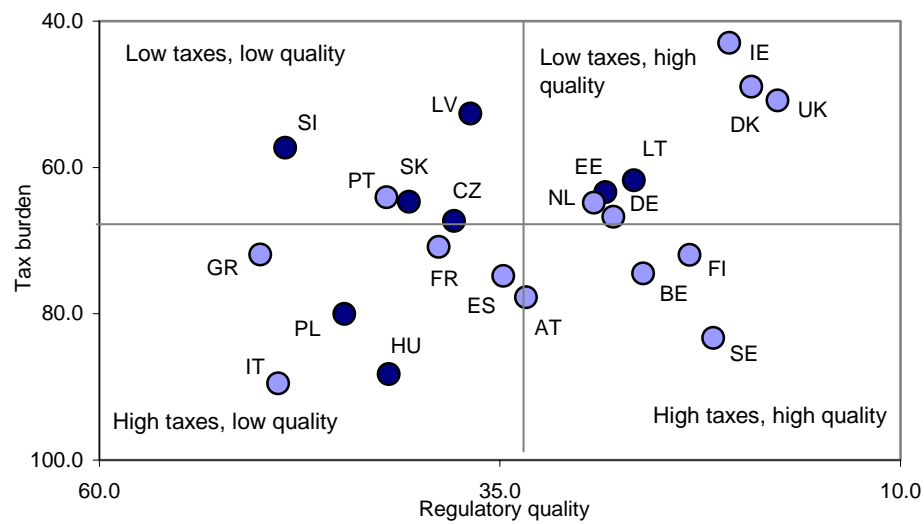


Figure 2: Relationship between the intensity of regulation and the quality of conditions for doing business

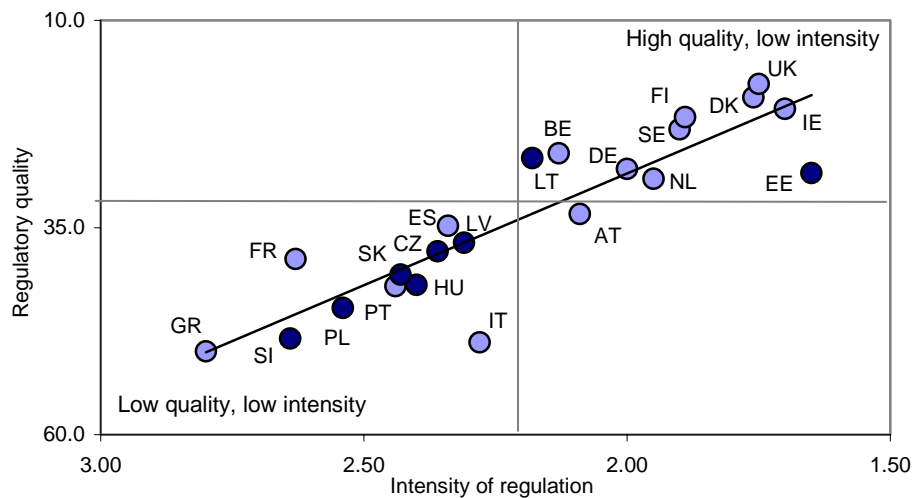
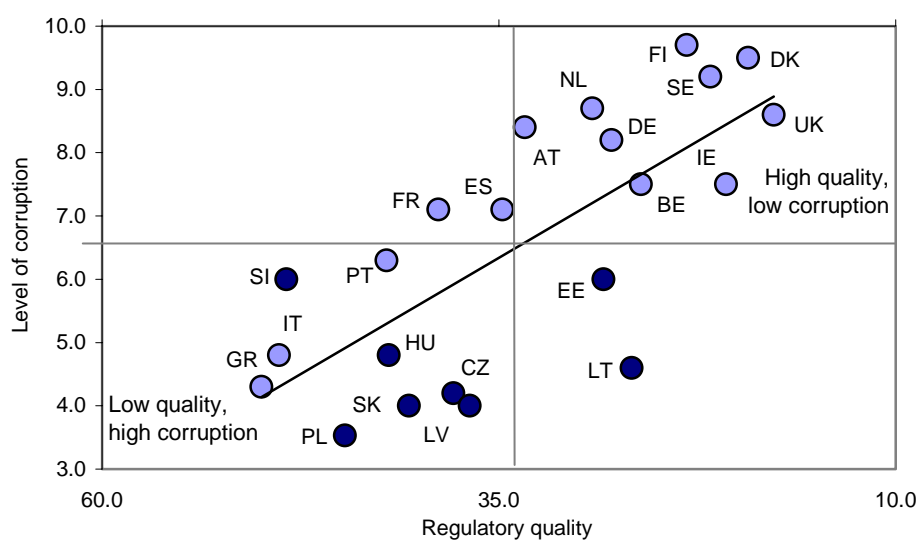


Figure 3: Relationship between the quality of conditions for doing business (%) and the level of corruption (CPI)



Source: WB (2005), TI (2005), Heritage Foundation (2005), own calculations.

**Table 1: Country ranking according to the business conditions indicators, 2005**

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Overall ranking	Starting business	Granting licences	Hiring/firing workers	Registering property	Obtaining credit	Protecting investors	Paying taxes	Trading across borders	Enforcing contracts	Closing business
Denmark	8	15	6	17	31	47	22	61	1	2	41
G. Britain	9	9	29	15	23	3	9	81	21	30	12
Ireland	11	13	14	59	69	7	10	21	18	32	13
Finland	13	18	19	84	16	39	46	67	4	23	6
Sweden	14	20	13	86	8	15	70	38	2	14	23
Lithuania	15	37	16	93	2	40	61	31	31	7	17
Estonia	16	43	9	111	29	61	34	18	14	18	43
Belgium	18	34	31	43	141	41	11	33	9	17	7
Germany	19	47	20	131	33	2	48	54	3	24	21
Netherlands	24	42	66	70	20	12	112	120	5	20	10
Latvia	26	26	47	103	88	48	43	83	62	15	9
Spain	30	86	50	150	37	14	79	25	10	25	22
Austria	32	59	41	110	28	18	118	72	8	35	31
Slovakia	37	48	40	74	6	46	115	69	60	81	93
Czech Rep.	41	77	87	60	57	13	58	70	24	21	121
Portugal	42	104	94	145	93	30	27	47	29	46	24
France	44	9	23	142	144	123	76	35	44	13	27
Hungary	52	72	119	85	96	43	62	98	38	31	42
Poland	54	92	120	64	75	82	25	106	34	102	40
Slovenia	63	77	48	133	89	51	50	77	63	85	79
Italy	70	45	93	138	48	33	96	102	90	76	47
Greece	80	121	42	148	130	91	131	67	64	8	29

Source: Own calculations using the WB data (2005).

### 2.3 Conditions for doing business in the Czech Republic

The overall assessment of individual conditions for doing business and their elements for the Czech Republic is supplemented with a comparison against the average figures for the EU-22, the best values among the member states, which are used for comparison when assessing the progress in fulfilling the Lisbon Strategy. In this regard we can conclude that the values for the EU-22 are favourable only in the number of procedures required for obtaining an approval. Doing business in the EU is therefore subject to a significantly greater administrative and financial burden, though often with major differences at the national level. The subsequent summarising ranking according to individual elements of the monitored indicators allows us to identify the weakest areas of conditions for doing business in the CR and focus greater and more consistent reformation effort on these areas.

When conditions for **starting business** are assessed, the administrative burden according to the number of procedures required and the estimated number of days necessary for their completion is determined. The financial cost of starting business after all related obligations have been fulfilled and the minimum capital investment has been ensured is also defined. A lower burden from the conditions for starting business has a positive impact on the dynamics of founding new companies and thus development of entrepreneurial activities in the formal sector. A significant administrative burden arising from the high number of procedures and days in combination with relatively high requirements for the minimum capital investment is one of the main problems in CR (77<sup>th</sup> place). The (direct) financial cost of starting business is relatively low. The administrative burden should be gradually

reduced by simplifying recording in the Commercial Register and establishing central registration facilities for entrepreneurs with the possibility of filling forms electronically. Connection to the information system of the public administration authorities will only allow one-off provision of information by entrepreneurs. A more significant systemic reduction in the administrative burden associated with starting business requires especially exclusion of courts and certification by a notary public from the process of registering companies. This does not involve mere formal and technical simplification of the procedures carried out in order to speed up the registration process, but requires transforming registration to a purely administrative process.

**Table 2: Starting business**

		EU-22	EU-14	EU-8	CZ
Procedures (number)	abs.	8	7	8	10
	perc.	28.7	27.6	30.7	50.6
Time (days)	abs.	28	24	34	40
	perc.	31.5	26.3	40.5	54.5
Cost (% income)	abs.	8.9	8.1	10.4	9.5
	perc.	22.7	21.3	25	24
Min. capital (% income)	abs.	46	34.6	65.9	39
	perc.	52.9	46.6	63.8	59.7

Source: The authors' own calculations using the WB data (2005).

In the case of conditions for **dealing with licenses**, all procedures required for obtaining the prescribed licences are recorded on the model example of civil engineering. The administrative burden arising from all related acts is determined according to the number of procedures and days and their financial cost. Low demands on the licensing proceed-

ings help to reduce the occurrence of illegal construction and lessen the opportunities and motivation to engage in corrupt behaviour. In the CR (87<sup>th</sup> place), the burden arising from the number of procedures combined with great demands on time is the worst, while the costs of licensing proceedings are among the lowest. However, the high administration burden in fact makes preparation for construction costly. Preparation of an application for a zoning and planning decision and construction permit with the requirement to obtain consent from all affected state administration bodies and all distribution network owners is the biggest problem. The new Administrative Procedure Code should provide some relief from 2006. However, more significant changes can only be expected from the new Construction Act, which from 2007 should allow combination of the zoning and planning proceedings with the construction permit proceedings to a greater degree, determine fixed deadlines for all types of proceedings and permit implementation of a wider range of buildings based on a notification only.

**Table 3: Dealing with licenses**

		EU-22	EU-14	EU-8	CZ
Procedures (number)	abs.	16	14	19	31
	perc.	36.7	28	52	95.9
Time (days)	abs.	191	180	211	245
	perc.	46.2	41.9	53.7	70.6
Cost (% income)	abs.	81.5	83.2	78.5	16.1
	perc.	26	28.2	22.2	2

Source: The authors' own calculations using the WB data (2005).

Conditions for **hiring/firing workers** are evaluated according to the employment rigidity index, which represents the average value for three sub-indexes – the index of difficulty in hiring employees, the index of working hours inflexibility and the index of difficulty in firing employees. Another two indicators of the conditions for hiring/firing workers measure the cost of hiring and firing employees. Lower employment regulation supports the flexibility of labour markets and the supply of employment opportunities especially for problematic groups. It also allows employers to optimize the demand for labour according to the development of external economic conditions.

**Table 4: Hiring/firing workers**

		EU-22	EU-14	EU-8	CZ
Difficulty of hiring index	abs.	36	38	33	33
	perc.	46	47.8	42.8	40.5
Rigidity of hours index	abs.	62	63	60	20
	perc.	50	51.4	47.6	8.4
Difficulty of firing index	abs.	37	36	40	20
	perc.	46.5	44.9	49.3	22.8
<b>Rig. employ- ment index</b>	abs.	45	46	44	24
	perc.	55.3	56.6	52.9	19.6
Hiring cost (% salary)	abs.	27.2	26.3	28.9	37
	perc.	75.2	70.4	83.7	97.4
Firing cost (weeks salary)	abs.	38.5	44.8	27.5	21.6
	perc.	44.9	51.1	34.1	27.2

Source: The authors' own calculations using the WB data (2005).

The burden associated with employment regulation in the CR (60<sup>th</sup> place) is among the lowest in the EU on average. However, the situation is very different with regard to the rigidity of regulation, which ranks among

the best even in the wider international comparison against the cost of employment. The rigidity of regulation is the strongest in the case of hiring employees, weaker in the case of firing employees and the weakest in rigidity of working hours. The cost of employment is very high in the case of hiring employees especially due to employers' payments towards social security, while the burden associated with the cost of firing employees is significantly lower. Despite strong reservations to the new version of the Labour Code on the part of employers, which were due to the continuing rigidity of regulation in favour of employee protection (especially in the case of restriction of terminating employment by a notice served for reasons on the part of the employer), the high cost of hiring employees continues to be the greatest problem in this regard and this problem significantly affects the demand for problematic groups on the labour market. In addition, the demotivating social benefit scheme has a negative impact on the offer of employment especially in low-income groups.

Conditions for **registering property** are assessed according to the number of procedures, number of days required for their completion and the relative cost of related payments. Lower administrative and financial demands on registering property facilitate disposing of assets and using assets in other types of transactions, and reinforce the institution of property rights. The conditions in the CR (57<sup>th</sup> place) are problematic especially in terms of the related time demands, while the number and the cost of procedures are relatively low. The great demands on time are caused mainly by long periods for entering registrations in the Land Registry. The fact that a record in the Land Registry alone does not prove the existence of ownership with certainty, despite the number of documents required for filling an application for registration also poses major problems. Ascertaining ownership of properties with certainty therefore often requires private investigation of the history of the real estate in question and additional contractual assurance of the transfer, which naturally results in higher costs. Further improvement in the technical and personnel resources at the Land Registry (even if this improvement were to be supported by higher administration fees) would undoubtedly contribute to reducing the time demands of registering property. Opportunities for simplifying required documentation and the subsequent reduction of periods for approving registration while problems caused by the low level of property registration prior to 1989 and partially also at the beginning of the 90s remain are the main issue in this regard.

**Table 5: Registering property**

		EU-22	EU-14	EU-8	CZ
Procedures (number)	abs.	5	5	5	4
	perc.	31.5	32.7	29.4	15.7
Time (day)	abs.	72	48	116	123
	perc.	44.5	35.9	59.7	83.5
Cost (% value)	abs.	4.8	6.1	2.6	3
	perc.	40.6	51.1	22.1	27.6

Source: The authors' own calculations using the WB data (2005).

Assessment of conditions for **getting credit** includes the issue of creditor and debtor rights and sharing credit information. The first set of indicators focuses on the effectiveness of the lien and bankruptcy laws for lending financial resources, while the second set of indicators

studies the market coverage, extent of information, and the quality and accessibility of credit information through private and public credit registers. High-quality conditions for obtaining credit increase the accessibility of external financial resources within the economy mainly due to the decreased creditor risk. The Czech Republic's position (13<sup>th</sup> place) is quite positive in the extent and quality of credit information, as well as the intensity of creditor protection. The situation in these areas has improved significantly compared to the 90s. The right of lien is one of the safest methods of securing receivables owing to high-quality legal regulation. The quality of credit information is high and the extent of covering the population and the range of information gradually grow. The newly introduced interconnection between the banking and the non-banking registers has also increased the information value.

**Table 6: Getting credit**

			EU-22	EU-14	EU-8	CZ
Strength of legal rights index		abs. perc.	6 31	6 30.8	6 31.3	6 20.2
Depth of information index	Public	abs. perc.	8.1 29.8	12 28.8	1.2 31.7	2.8 19.6
		Private	abs. perc.	32.6 24.6	42.5 21.1	15.3 30.7
	Index		abs. perc.	5 18.9	5 15.3	4 25.1

Source: The authors' own calculations using the WB data (2005).

The **investor protection** indicator assesses the power of protection of minority shareholders against abusing corporate assets on the part of the managers. The indicators distinguish between three key areas of investor protection: transparency of transactions, managers' responsibility for operations and options for suing managers by shareholders. Adequate investor protection supports mainly the extent of investment activities in the economy by preventing misuse of entrusted resources or allows recourse for potential misuse. The situation in the Czech Republic (58<sup>th</sup> place) is very uneven. Openness and transparency of transactions is assessed with the worst results, while managers' responsibility for their actions is evaluated with very good results and options for suing managers by shareholders demonstrate the best results. However, the importance and actual impact of a positive level of responsibility and opportunities for suing for misuse of entrusted resources for personal gain is significantly reduced by the low level of openness of information on carried out transactions.

The fact that although formal regulation of protecting creditor rights exists, this regulation is not up to the standard in a number of cases (for example – provisions on contracts on control, reports on associated persons, company mergers and divisions, transfer of assets, the right to purchase subscribed securities, etc., have been adopted incompletely and non-conceptually from the original usually German and Austrian legal regulation) poses a significant problem. The enforceability and effectiveness of investor protection is reduced by the overall unclear situation due to frequent amendments and unsanctioned breaches of information obligations, ineffectiveness of process instruments available to minority investors and non-existence of effective instruments for preventing misuse of economic power by majority owners.

**Table 7: Protecting investors**

			EU-22	EU-14	EU-8	CZ
Protect. investors index	disclosure	abs.	5	6	4	2
		perc.	44,8	37,7	56,2	82,6
	director liability	abs.	5	5	5	5
		perc.	41,1	43,6	42,7	29,8
	shareholder	abs.	6	6	7	8
		perc.	31,5	40	21,1	7,6
Strength investor protection index		abs.	5,3	5,7	5,3	5
		perc.	39,1	40,4	40	40

Source: The authors' own calculations using the WB data (2005).

In the case of conditions for **paying taxes** the number of tax procedures and their demands on time expressed as the number of hours per year required for preparing, filling and paying the three main types of taxes is assessed. The tax burden indicator measures all taxes payable by companies, except for the wage tax and social security payments. A lower burden associated with paying taxes has a positive impact on the fulfillment of tax obligations and therefore the amount of tax revenues, and supports the effectiveness of public expenses for tax administration. In the CR (70<sup>th</sup> place), the time demands represent the worst burden, the number of tax procedures is relatively low and the overall tax burden is one of the smaller tax burdens in the EU. Therefore, simplifying and clarifying the taxation system and improving the quality of the tax administrator work represent the greatest reforming challenge. Ideally, tax administration should represent a minimum burden for the tax payers and the comfort of fulfilling tax obligations should be improved. However, the procedure for simplifying the taxation system as such in order to achieve a significant reduction in the demands associated with paying taxes remains the key question. The issue of adequacy of the quality of public services provided for the collected taxes (which include the quality of conditions for doing business), i.e. the issue of effectiveness of public expenses or the extent of redistribution considered desirable or acceptable in the relevant society, is more relevant with regard to the tax burden.

**Table 8: Paying taxes**

		EU-22	EU-14	EU-8	CZ
Payments (number)	abs.	21	18	26	14
	perc.	27.1	22.2	35.8	15
Time (hours year)	abs.	260	216	326	930
	perc.	42.6	35.9	52.6	93.7
Tax payable (% profit)	abs.	48.6	50.7	44.9	40.1
	perc.	60.1	65.8	50.2	37.2

Source: The authors' own calculations using the WB data (2005).

Conditions for **trading across borders** are evaluated by recording all procedural requirements for export and import of a standardised shipment of goods. This indicator includes all official procedures from the agreement between the two contractual parties to delivery of the shipment. The demands on the number of signatures, documents and days required for the completion of all applicable procedures are assessed. A low administrative burden of commercial activities promotes the competitiveness of the production on foreign and local markets. The conditions in the CR (24<sup>th</sup> place) are more favourable in the case of export where only the time demands achieve worse results, while the number of documents and signatures is among the lowest even in the wider international comparison.



**Table 9: Trading across borders**

		EU-22	EU-14	EU-8	CZ
Export – doc.	abs.	6	5	7	5
(number)	perc.	18.7	12.8	33.9	4.8
Signatures	abs.	4	3	5	3
(number)	perc.	15.9	11.6	24.7	7.5
Time	abs.	15	13	17	20
(days)	perc.	16.2	15.3	21.4	25.5
Import – doc.	abs.	7	6	9	8
(number)	perc.	20.3	17.3	34.1	21.4
Signatures	abs.	5	4	7	4
(number)	perc.	15.9	11.7	26.6	13.6
Time	abs.	17	15	21	22
(days)	perc.	15.6	14.3	22.8	22.7

Source: The authors' own calculations using the WB data (2005).

The administrative burden in import is greater, though not dramatically. The worst results are again shown in the time demands and the number of documents and signatures follows. The conditions for trading across borders are affected to a certain extent by harmonisation with the EC laws. The differences in comparison with other member states are therefore caused mainly by other than legal circumstances, mainly the quality and promptness of the state administration and availability of assistance services.

Conditions for **enforcing contracts** are evaluated according to the number of procedures (requiring interaction between the parties to the proceedings), time demands of the entire proceedings from filling an action to enforcing a payment (including waiting times between individual stages of the proceedings) in the number of days and the cost of proceedings (including all related expenses). A high quality of conditions in enforceability of contracts positively influences the transaction costs of business activities and the level of risk associated with providing a loan. The conditions in the CR (21<sup>st</sup> place) are assessed as one of the best. The situation is the best in the cost of debt collection, the number of related procedures is also relatively low but the time demands continue to return less positive results. Arbitration proceedings before an independent arbitrator or a permanent arbitration court are increasingly used as an alternative solution to the slow judicial proceedings frequently of an inferior quality. The previously highly problematic execution of a legitimate decision has significantly increased as the new legislation allowing the involvement of private judicial executors motivated to achieve the highest possible return on the amount owed for the creditor was introduced.

**Table 10: Enforcing contracts**

		EU-22	EU-14	EU-8	CZ
Procedures	abs.	22	21	25	21
(number)	perc.	23.5	19.6	30.1	18.4
Time	abs.	338	274	450	290
(days)	perc.	32	22.6	48.5	31.8
Cost	abs.	11.8	12.4	10.8	9.1
(% of debt)	perc.	21.5	23.8	17.6	11.6

Source: The authors' own calculations using the WB data (2005).

Assessment of conditions for closing business is specified for the course of bankruptcy proceedings. The time demands are expressed as the average number of years and include all possible delays caused by obstructing parties to the proceedings. The financial demands of the proceedings are

expressed according to the cost of proceedings and the level of return on the resources the entitled parties may obtain from the insolvent company from the total amount of their receivables. Fast progress of closing business releases economic resources for their new use and thus promotes their effective allocation, and a high level of return on claimed finance positively influences development of investment activities. The conditions in the CR (121<sup>st</sup> place) are the worst in the overview of all monitored indicators of conditions for doing business.

**Table 11: Closing business**

		EU-22	EU-14	EU-8	CZ
Time	abs.	2.1	1.5	3.3	9.2
(years)	perc.	25.6	15.3	43.7	97.9
Cost	abs.	11	9	13	14
(% of estate)	perc.	32.2	28.0	39.6	46.1
Recovery	abs.	61.2	70.5	45.0	17.9
rate (%)	perc.	18.5	12.1	29.6	65.7

Source: The authors' own calculations using the WB data (2005).

Bankruptcy proceedings are relatively costly, provide a very low level of return and, most importantly, are excessively lengthy. The related legal regulation is complicated and subject to frequent amendments. Slow progress of the courts combined with obstructions by parties to the proceedings leads to significant delays and thus causes deterioration of the claimed resources. On the positive note, the reforming efforts focus on comprehensive transformation of the bankruptcy law with an emphasis on strengthening the role of creditors, allow acceleration of bankruptcy proceedings by determining binding periods for individual acts and introduce alternative insolvency solutions through bankruptcy proceedings with the aim to maintain a functioning company.

Using a more detailed structure allows classification of all individual elements of conditions for doing business in a descending order according to the Czech Republic's position in the wider international comparison with differences from the EU average included for each of the positions. The overview shows that major differences in the regulatory quality occur even within individual indicators. These differences are a reflection of the frequently occurring lack of a systemic character of individual regulatory conditions.

The CR achieves the worst results in conditions for closing business (especially in the time demands and the closely related level of return), conditions for granting licences (mainly in the number of procedures and the subsequent time demands), starting business (in most indicators) and paying taxes (in the time demands). These negative characteristics influence especially establishing business activities, releasing the existing resources for new and therefore more effective use, effectiveness of tax collection (and the subsequent higher tax revenues) and additional costs due to delays in licensing procedures or attempts to speed the proceedings up through illegal practices. With regard to individual elements of indicators of conditions for doing business, the level of information openness in protecting investors, time demands associated with registering property and the cost of hiring employees are also considered negative. These characteristics reflect in greater opportunities for exploiting entrusted resources for personal gain, slowing down transfer of property and thus increasing the transaction costs for the parties involved, and a lower level of employment especially in low-income and problematic workers.



On the other hand, the CR's position is the most favourable in conditions for obtaining credit, enforcing contracts and the administrative burden associated with trading across borders (especially in export). These characteristics positively influence the availability of external financial resources for business and the creditor risk associated with their repayment, penetration of foreign markets by local production, and development of foreign competition of local manufacturers. Regarding the types of conditions for doing business in the CR, the worst results are in most cases demonstrated in the time demands associated with the required regulatory procedures (rather than the cost-related burden). Decreasing the time demands would therefore bring significant improvement in the overall standard of regulation and in combination with a reduced number of procedures would weaken the motivation and opportunities for engaging in corrupt behaviour, which has been the Czech Republic's long term problem.<sup>3</sup>

The Czech government joined the efforts targeted at improving the conditions for doing business in the National Lisbon Program for 2005-2008 (see Government of the CR 2005). However, this area has received more extensive attention only recently, undoubtedly also due to its inclusion in the long-term economic growth strategy completed by Jahn's team (Government of the CR 2005a). The results of reforming efforts have so far been limited or have not involved any more extensive and in-depth changes to the systemic character, which has been a typical trait of the Czech economic policy on a long-term basis. Rather than focusing on major improvement in the regulatory quality, attention for example to discussion on tax cuts is paid in the media, despite the tax burden in the Czech Republic being one of the lowest in the EU (while social security payments at a level well above the average remain unchanged).

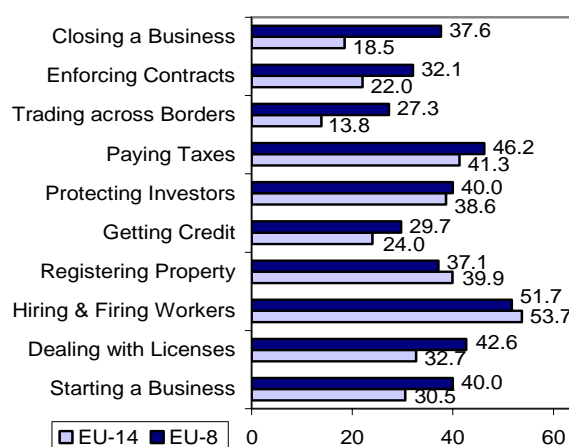
Czech entrepreneurs give the worst rating in surveys to the low quality in execution of the state's authority, in particular the executive and judicial functions and their impact on the business sector. Execution of the state's authority, especially in tax administration but also in administrative supervision and decision making, has been subject to continuous criticism. The other recurring criticism refers to the complicated enforceability of justified claims of entrepreneurs through legal proceedings, which is caused mainly by the slow progress of the courts. In the case of authorities and courts, entrepreneurs see the limited predictability of final decisions and the differences between individual regions in the CR as a serious problem. Any major improvement in the entrepreneurial environment in the Czech Republic will therefore require effective reforms of the state administration and judicature. On the other hand, entrepreneurs deliver significantly more positive evaluation of the accessibility of loans and information necessary for doing business, the work of state (EGAP, Czechtrade, Czechinvest) and other than state (professional chambers, associations) organisations providing assistance services than in the 90s. The effort of executive authorities to broaden the use of information and communication technologies in dealing with the state and public administration, and the standardisation of regular official procedures (forms, fixed periods, etc.) is also assessed positively.

The contents and formal legal quality of laws regulating enterprise in the CR continue to feel the negative effect of transformation from the totalitarian state rigorously controlling the economy to a modern liberal democracy regulating a market economy. Major legal codes (Civic Code, Labour Code and Penal Code) have been subjected to dozens of amendments but no significant modernising transformation. Judicature and interpretation have not been established in a number of cases. The so-called legislation rush, which was necessary at the end of the previous and the beginning of this century due to harmonisation of the local laws with the EC laws, has obviously sped up the reforming processes but at the same time at least temporarily reduced the clarity and stability of the legal environment. What's more, some of the provisions of laws (taxation, industrial, etc.) criticised by entrepreneurs are a natural consequence of the structure of political powers in the country, i.e. the fact that left centre has had the control of the government in the Czech Republic since 1998. On one hand, a left-wing government cooperates better with unions rather than entrepreneurial associations. On the other hand, the government needs to react adequately to changes in the integration of the Czech market in the single EU market and in the wider context to the globalisation processes, which bring increased competitive pressure on enterprises on the local and foreign markets.

#### 2.4 Comparison of the EU-8 and EU-14 countries

Figure 4 illustrates the conditions for doing business in the new EU-8 member states and the original EU-14 states according to their positions within the entire group of states. In the wider international comparison EU countries lag behind the most significantly in employment regulation, where the cost of hiring employees appears to be the worst indicator, and in conditions for paying taxes due to a relatively high tax burden. On the other hand, the area of trading across borders with the minimum number of administrative obstructions presents very favourable conditions for doing business. EU countries also achieve relatively good positions in conditions for enforcing contracts and obtaining credit.

Figure 4: Conditions for doing business in the EU-8 and EU-14 countries (percentiles)



Source: The authors' own calculations using the WB data (2005).

<sup>3</sup> When the demands of the conditions for doing business is assessed in the wider international comparison, the time demands in the CR with twice as negative results compared to the burden arising from the number of procedures (20.2) are reflected in the average position (48.3).

**Table 1A: Doing business in the EU, year 2005 (selected indicators)**

	Starting business	Closing business	Registering property	Enforcing contracts	Hiring/firing workers	Getting credit	Protecting investors	Dealing with licenses	Paying taxes	Trading across borders
	days	years	days	days	index	credit info	index	days	hours	days
AT	29	1,1	32	374	44	6	4	195	272	8
BE	34	0,9	132	112	20	4	7	184	160	7
CZ	40	9,2	123	290	24	5	5	245	930	20
DE	24	1,2	41	175	55	6	5	165	105	6
DK	5	3,3	42	83	20	4	6	70	135	5
EE	35	3,0	65	150	51	5	6	116	104	12
ES	47	1,0	25	169	66	6	5	277	56	9
FI	14	0,9	14	228	48	5	6	56	..	7
FR	8	1,9	183	75	66	2	5	185	72	22
GR	38	2,0	23	151	66	4	3	176	204	29
HU	38	2,0	78	365	37	5	5	213	304	23
IE	24	0,4	38	217	33	5	8	181	76	14
IT	13	1,2	27	1390	57	6	5	284	360	28
LT	26	1,2	3	154	44	6	5	151	162	6
LV	18	1,1	54	186	59	3	6	160	320	18
NL	11	1,7	2	48	49	5	4	184	700	7
PL	31	1,4	197	980	37	4	6	322	175	19
PT	54	2,0	83	320	58	4	6	327	328	18
SI	60	3,6	391	913	64	3	6	207	272	20
SK	25	4,8	17	565	39	2	4	272	344	20
ŠE	16	2,0	2	208	43	5	5	116	122	6
UK	18	1,0	21	288	14	6	8	115	..	16

Note: days/years/hours – number, hiring/firing index – rigidity (100 = the worst); getting credit index – legal support (10 = the best); protecting investors index – availability and quality of information (10 = the best); trading – export; EU-15, EU-25 unweighted averages. Source: World Bank – Doing Business, up to 1. 11. 2005.

**Table 2A: Quality of governance**

	1998				2004						
	Policy	Government	Institutions	Average	Democracy	Stability	Government	Regulation	Law order	Corruption	Average
BE	1,14	1,12	1,28	1,17	1,35	0,94	1,71	1,25	1,47	1,53	1,38
CZ	1,05	0,75	1,28	0,76	1,03	0,84	0,63	0,97	0,69	0,30	0,74
DK	1,45	1,77	1,32	1,83	1,59	1,21	2,15	1,76	1,11	2,38	1,70
EE	0,83	0,74	1,27	0,70	1,13	0,92	0,99	1,61	0,91	0,82	1,06
FI	1,56	1,77	1,31	1,88	1,50	1,65	2,06	1,79	1,97	2,53	1,92
FR	0,94	1,31	1,26	1,26	1,24	0,53	1,42	0,91	1,33	1,44	1,15
IE	1,43	1,63	1,24	1,68	1,30	1,22	1,48	1,63	1,62	1,61	1,48
IT	1,20	0,93	1,20	1,05	1,06	0,31	0,58	0,97	0,74	0,66	0,72
CY	0,78	1,24	1,21	1,05	0,97	0,85	0,70	1,16	0,60	0,36	0,77
LT	0,61	0,19	1,21	0,31	1,00	0,34	1,02	1,23	0,85	0,80	0,87
LV	0,62	0,45	1,29	0,35	0,96	0,95	0,60	1,02	0,98	0,23	0,79
LU	1,44	1,69	1,38	1,72	1,40	1,66	2,08	2,02	1,98	2,16	1,88
HU	1,21	0,97	1,33	0,97	1,16	0,85	0,68	1,22	0,85	0,65	0,90
MT	1,38	0,72	1,38	0,93	1,26	1,46	1,03	1,30	1,23	1,25	1,26
DE	1,39	1,49	1,44	1,64	1,38	0,92	1,38	1,29	1,66	1,90	1,42
NL	1,54	2,02	1,38	1,94	1,49	1,15	2,00	1,67	1,78	2,08	1,70
PL	0,93	0,85	1,29	0,77	1,13	0,35	0,47	0,64	0,51	0,16	0,54
PT	1,40	1,34	1,38	1,39	1,31	1,06	0,92	1,14	1,14	1,23	1,13
AT	1,37	1,38	1,37	1,60	1,25	1,18	1,76	1,41	1,76	2,10	1,58
GR	0,62	0,80	1,26	0,73	0,91	0,53	0,74	0,85	0,75	0,56	0,72
SK	0,66	0,18	1,36	0,29	1,10	0,65	0,67	1,15	0,49	0,39	0,74
SI	1,00	0,69	1,69	0,85	1,12	0,99	1,02	0,89	0,93	0,97	0,99
ES	1,00	1,60	1,97	1,36	1,17	0,54	1,29	1,13	1,12	1,45	1,12
SE	1,49	1,56	2,22	1,76	1,52	1,38	1,92	1,54	1,85	2,20	1,74
UK	1,19	2,04	2,19	1,80	1,37	0,77	1,85	1,62	1,71	2,06	1,56

Source: World Bank – Database Governance Matters.

### 3. Conclusion

The Czech Republic has been facing the problem of adverse characteristics of the local institutional quality compared to the rest of the EU-25 in the quality of governance, as well as conditions for doing business on long-term basis. Changes in the institutional quality are therefore urgently needed. However, to ensure that these changes are effective, they need to have a character of deeper system changes with a long-term perspective.

#### Quality of governance

An analysis of institutional quality in the European Union member states carried out mainly according to materials of the World Bank (Governance Matters) and comparison of various groups of member states (EU-15, EU-10, EU-8) with the Czech Republic show that although the **institutional environment** in the Czech Republic falls short of the average for the EU-15 countries, no significant tendency towards qualitative changes occurred during the monitored period. The group of monitored indicators shows that the CR does not have any significant problems with enforcing democracy or political stability. However, the assessment of government effectiveness and regulatory quality reveals some problems. Besides lagging behind, the process of institutional adjustment in the Czech Republic is stagnating and this clearly indicates the urgent need for institutional changes.

The **quality of legal environment** in the CR is an institutional characteristic where the worst results were achieved. Desired rectification in this aspect, which should mainly include greater independence of courts, increased quality of new legislation and improved law enforceability, should ensure significant improvement in the institutional environment. This also applies to the last examined topic – fight against corruption. The Czech Republic has been assessed on a long-term basis as a country with a high **degree of corruption**. What's more, the situation in the CR is described as corruption beyond control. The long-term existence of this problem affects significantly not only the economy, but indirectly also the overall social climate in the country. The most serious problems associated with the corruption environment are found in public funds and political decision making. Although the results of all completed studies predominantly have a character of soft data and need to be perceived as such, they clearly show the following: given the general consensus regarding the impact of the institutional environment on performance and competitiveness of the economy, the Czech Republic faces a major challenge in the urgent need to cultivate the local institutional environment.

Various types of capitalist societies can be identified from the perspective of **comparative institutional economics**. The following classification can be applied to the European Union member states: market economy of the Anglo-Saxon character, socially democratic economy, European continental capitalism, and Southern European capitalism. The completed analysis of the quality of governance in EU-25 countries confirms that this classification of different types of capitalism can also be applied in connection with institutional quality. The development of institutional characteristics in EU-15 countries, which can be described as relatively stable, matches individual countries on a long-term basis to

particular types. However, significant institutional changes can be observed in certain EU-10 countries, where the dynamics of institutional changes affect the classification of particular countries under the types listed above. Individual types of capitalism are characterised by different levels of competitiveness. The dynamics of institutional changes in EU-10 countries lead to the movement of most of these countries between individual types of capitalism and their subsequent transition to different conditions for competitiveness. The Czech Republic did not display any significant institutional changes during the monitored period. The CR can be classified under Southern European capitalism with regard to its institutional quality, i.e. a type of capitalism characterised by the lowest level of competitiveness.

#### Doing business

Improving the quality of conditions for doing business is a vital systemic condition for reducing the level of corruption and the extent of grey economy in the relevant environment (and thus increasing tax revenues). It also allows more effective use of the available private and public resources, significantly facilitates development of entrepreneurial and innovative activities especially in the case of small and medium-size enterprises and increases employment. In the Czech Republic, all of the areas referred to above are supported by a range of specific programs with significant financial resources. However, their effectiveness could be significantly increased firstly by improving the quality of conditions for doing business. The example of Baltic countries shows that even new EU member countries with a less developed economy and burdened by their socialistic past are capable of achieving significant success in this regard in a relatively short timeframe. It is necessary to focus first on areas where changes can be implemented relatively promptly and at lower costs and simultaneously prepare more in-depth and demanding systemic changes involving comprehensive legal regulation. The best way of reducing the time demands and the (indirect) costs of procedures related to enterprise is to minimise the participation of courts in cases regarding disputes that cannot be solved by private settlement.

Besides continuously updating the results according to newly available data, future research could focus on additional interesting topics, such as identifying the causes of often significant differences in indicators of conditions for doing business and their components at the national level or reasons for their persistence over time, and specifically in the case of the new member states distinguishing the quality of conditions for doing business according to the sources of the related legal standards and the time of their introduction (socialistic heritage with various levels of adjustment to the new conditions, completely new standards created at various stages of transformation under the influence of specific lobby groups, levels of expertise in submitting and approving entities or foreign models). This type of analysis would allow us to identify specifics, as well as more general trends in institutional reforms in the Czech Republic and the most problematic areas of their enforcement. Research should also evaluate differences in significance of the impact of a low quality in individual regulatory components on entrepreneurial activities (in addition to determining the country's position in the relevant indicator in the wider international comparison), ideally based on (regularly repeated) representative polls among entrepreneurs.

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## **Innovation performance**



## 1. Competitive Advantage

The chapter presents an analytical framework for comprehensive assessment and comparison of EU country positions. The framework comprises the competitive advantage matrix and diamond concepts which are based on differentiating between sources of competitiveness according to (qualitatively advanced) stages of development (driven by production factors, efficiency, or innovations). Economic success based on competitiveness at lower stages of development ultimately leads to the loss of competitiveness due to increasing prices of inputs, in particular wages. Achieving long-term sustainable growth therefore requires gradual advancement towards qualitatively higher sources of competitive advantage. This is particularly apparent within the enlarged EU in the case of new and some other less developed members.

### 1.1 Theoretical and methodological starting points

The key concept applied in evaluating the nature of competitive advantage is distinguishing between its **price/cost and qualitative** sources. This differentiation according to Porter (WEF 2003) reflects to a certain degree the economic level achieved and the conditions for its further improvement. Competitive advantage of more developed countries tends to be quality-based owing to their more advanced domestic knowledge base. On the other hand, cost-based competitiveness supported by low wages and undervalued currency is predominant in less developed countries. Positively perceived increase of such a competitiveness, e.g. as increasing export performance, therefore cannot be sufficient. The **growth of productivity** in production factors is vital for increasing economic level, i.e. the value of products and services per unit of input. The higher the prices of output and the more efficient use of input, the higher income is generated, leading to greater contribution to the growth of the total product and the living standard. In the case of less developed countries that succeed in maximising their cost-based competitiveness, **gradual transition** to quality-based competitive advantage is a condition for achieving sustainable long-term growth performance. Increasing economic standards and price levels followed by appreciation of the local currencies in these countries inevitably lead to the loss of their cost-based competitiveness.

Generation and development of quality-based competitive advantage requires improvement in **technology knowledge and innovation capacity**. This in turn requires long-term investment of adequate resources in the development of local knowledge base and efficient system for their use. Naturally, availability of resources depends on the economic level achieved, efficient use depends on institutional quality and history of knowledge-based activities (regarding the extent and quality of accumulated technology outputs), i.e. is path dependent. This is why the group of countries in positions of **technology leaders** (on the best practice frontier) includes, at the same time, the countries with the highest level of economic development whose long-term technology advantage is based mainly on their own innovation capacity. The higher quality of their knowledge base creates favourable conditions for its further improvement. On the other hand, the low quality of knowledge base in **less developed countries** represents the greatest barrier in its growth. Over time, the difference between the two groups of countries can

therefore increase. This problem is especially significant for new EU members, where the knowledge base is still underdeveloped and no major changes can be reasonably expected within a short time horizon.

Opportunities arising from **technology catch-up** based on adopting (standardised) technology from more advanced countries (technology transfer) are one of the advantages available to less developed economies. However, the catch-up is not automatic and depends to a great extent on an adequate level of the local knowledge base as one of the determinants of **absorption capacity**. Technology transfer occurs via various channels (especially through imports and foreign direct investment, as well as exports). A country position in the (multinational) **value chain** bears special significance for the effectiveness of technology transfer and for generation of conditions for creating quality-based competitive advantage. Value chain fragmentation means that its individual segments are moved to geographically separate locations. However, segments with high knowledge intensity are moved to host countries rather rarely and the role of technology transfer in less developed countries may therefore remain (very) limited.<sup>1</sup>

The subsequent analytical base concept of the **national innovation system**, introduced in the late 80's (see Freeman, 1988, Dosi et al., 1988) and elaborated on in the 90's (Lundvall, 1992, Nelson, 1993, Edquist, 1997), highlights interaction between the key agents in the development of quality-based competitive advantage. National innovation systems are defined as national institutions and their incentive structures and competences which determine the pace and focus of technology learning (or the extent and structure of activities driving changes) in the relevant economy. Although the range of agents in a national innovation system is very broad, a major role in its performance is played by innovative firms and their technology learning and accumulation processes.<sup>2</sup> As the world becomes increasingly global, the significance of technology competition as an effective incentive mechanism is strengthened. At the same time, the raising costs of innovation activities in leading technology segments promote opening national innovation systems and establishing strategic partnerships among multinational companies for research and development. For summary of current trends in NIS research see for example Balzat, Hanusch (2003). Applications of the innovation system concept are gradually

<sup>1</sup> Another problem relating to this issue concerns the persisting dual nature of the economic structure. In this case the qualitatively higher type of competitive advantage is limited to a selected technologically more sophisticated segment of the national economy (in less advanced countries typically connected with the presence of foreign capital), while the remaining, less advanced segments lag behind on a long-term basis in terms of the level of technology, productivity and export performance. As the inflow of financial and human capital tends to concentrate in already developed areas (on international and regional scale), the duality of national economy may become increasingly pronounced if the more developed segment remains relatively isolated from the rest of the economy.

<sup>2</sup> NIS includes educational institutions, research facilities, businesses investing in research and development, financial institutions involved in financing research and development (especially in the form of venture capital), joint ventures of businesses and research organizations, professional associations defining technical standards, patent organisations, data information centres, etc.

differentiated according to the analytical level as regional approach (for summary see Doloreux, Parto, 2004), industry approach (see e.g. Malerba, 2002) or technology approach (Carlsson et al., 2002).

### Competitive advantage matrix

Quality-based competitive advantage is a source of long-term sustainable growth and consequently also of economic prosperity. Achieving and developing this advantage is conditional on an adequate range of **quality intensive factors**, i.e. technology, human resources, adequate institutional environment, and comprehensive and sophisticated business operations and strategies allowing the efficient use of these factors. Positions of countries or enterprises in the multinational value chain become increasingly significant in globalized economy. These positions are characterised by the completeness of the value chain, i.e. whether it includes segments with higher qualitative intensity (research and development, internal marketing and distribution strategies, sales under own renowned brand) or whether it is limited to activities less intensive in terms of technology and skills (assembly operations using imported parts and components). The characteristics of competitiveness assessment referred to previously are presented for EU members - first in the form of a competitive advantage matrix which distinguishes between the quality and cost factors, and internal and external sources of technology knowledge.

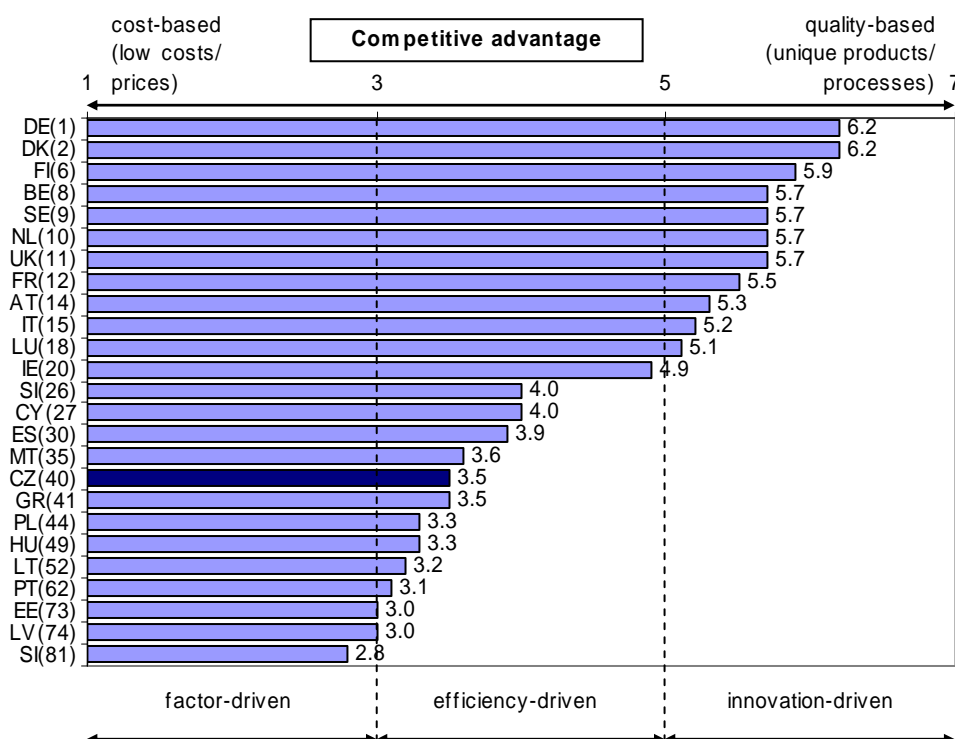
### Sources of competitive advantage

The key characteristics of competitive advantage are evaluated in the matrix according to its sources and the level of innovation capacity. This differentiation is based on the concept of global competitiveness index presented by Sala-i-Martin and Artadi (2004) with reference

to Porter (2003). This concept identifies qualitatively different sources of competitiveness that prevail in the three development stages. At the initial **factor-driven stage** companies compete mainly with price, i.e. exploit the advantage of cheap inputs using adopted technology. Success depends on meeting the basic conditions of macroeconomic stability, personal security, institutional quality, technical infrastructure and human capital. At the **efficiency-driven stage** a firm's productivity is determined particularly by the quality of products (no longer their price alone) and efficient production procedures. Technology capacity, i.e. access to the best technology available, even if adopted from abroad, is now the key qualitative characteristic of competitiveness. Other major efficiency enhancers include the effectiveness of individual markets (product, financial and labour), availability of developed human capital and external openness. At the **innovation-driven stage**, i.e. the qualitatively highest stage, innovation performance, i.e. ability to create new products and processes using the latest production and organisation procedures, is of key significance. Companies compete with their unique strategies based on sophisticated operations characterised increasingly by (qualitative) development of clusters (their internal and external linkages). Innovation performance is supported by specific institutions and incentives.

The initial assessment of the EU-25 members is based on an indicator distinguishing between two opposite **sources of competitive advantage** – on the one hand, low costs or local natural resources (sensitive to price-based competitiveness or price fluctuations), and, on the other hand, unique products and processes which are difficult to imitate.

Figure 1: Sources of competitive advantage, 2004



Note: Ranking within 104 countries. / – the best result, 1 – the worst result. Source: WEF (2004), modified.



Three development stages of sources of competitiveness can be identified on a scale from 1 (the worst result) to 7 (the best result): factor-driven (interval 1 - 3), efficiency-driven (interval 3 - 5) and innovation-driven (interval 5 - 7). Obviously, this identification is approximate and is used mainly as initial illustration of the applied qualitative segmentation.<sup>3</sup>

Positions of EU members are identified according to the results of expert survey undertaken by the World Economic Forum (WEF 2004), see figure 1. EU members are either at the efficiency-driven or innovation-driven stage. Two groups of countries can be clearly identified within the EU-25 accordingly. The first twelve (including borderline Ireland) can be described as countries with innovation-driven competitive advantage, while the remaining thirteen (including borderline Slovakia) as countries with efficiency-driven advantage. The competitive advantage in the first group can be classified as quality-based, while the advantage in the second group is more cost-based. Differences between EU members are significant not only in terms of the assigned values, but also as to the ranking within the entire group of 104 countries.

#### Sources of technology knowledge and level of innovation capacity

Sources of technology knowledge or the level of (internal) innovation capacity represent the other closely related criterion for assessing sources and development stages of competitive advantage. Again, two opposite positions are identified – acquiring knowledge mainly through licences and imitation of foreign technology as opposed to acquiring knowledge through own research activities leading to creation and introduction of new products and processes. Once again, certain intermediate stages reflecting the level of development in the domestic knowledge base can be identified between the two extremes. According to the basic structure, the individual

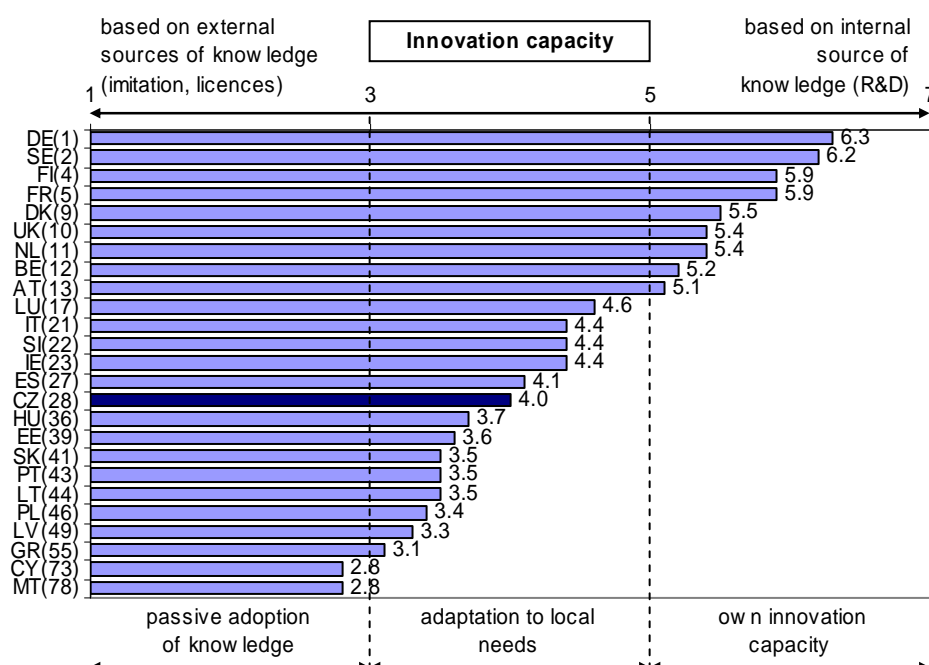
stages advance from passive adoption of external knowledge through the ability to adapt external knowledge to the local needs to prevalence of own innovation capacity.

**Technological openness** of domestic economic agents, i.e. their awareness of new technology and intensive interest in its acquiring and using, is the basic condition for successful technology transfer. The effectiveness of technology transfer is greatly influenced by the level of development in the domestic knowledge base. Naturally, this becomes more important with increasing significance of own innovation capacity. However, even passive adoption of foreign technology requires certain (minimum) level of knowledge.

The importance and standard of these conditions increase in the following development stage, allowing adaptation of transferred technology to local needs. Intensity of technology transfer through foreign direct investment depends on positions of affiliates in host countries within the multinational **value chain** and these positions are in turn influenced by the level of development in the domestic knowledge base. In addition, the position in the multinational value chain also influences the intensity of technology transfer via export and import. A position with greater qualitative intensity is associated with greater technology sophistication of imported production equipment and exported products and a broader range of performed activities (including international distribution and marketing), which allow closer contact with sophisticated demand and competition in technology more intensive product segments.

According to the international comparison within the EU-25 (figure 2), most members are at the stage of **adaptation** of external (adopted) knowledge to local needs and only few at the stage with prevailing own innovation capacity, i.e. with developed innovation capabilities based on internal source of knowledge.

Figure 2: Sources of technology knowledge and level of innovation capacity, 2004



Note: Ranking within 104 countries. 7 – the best result, 1 – the worst result. Source: WEF (2004), modified.

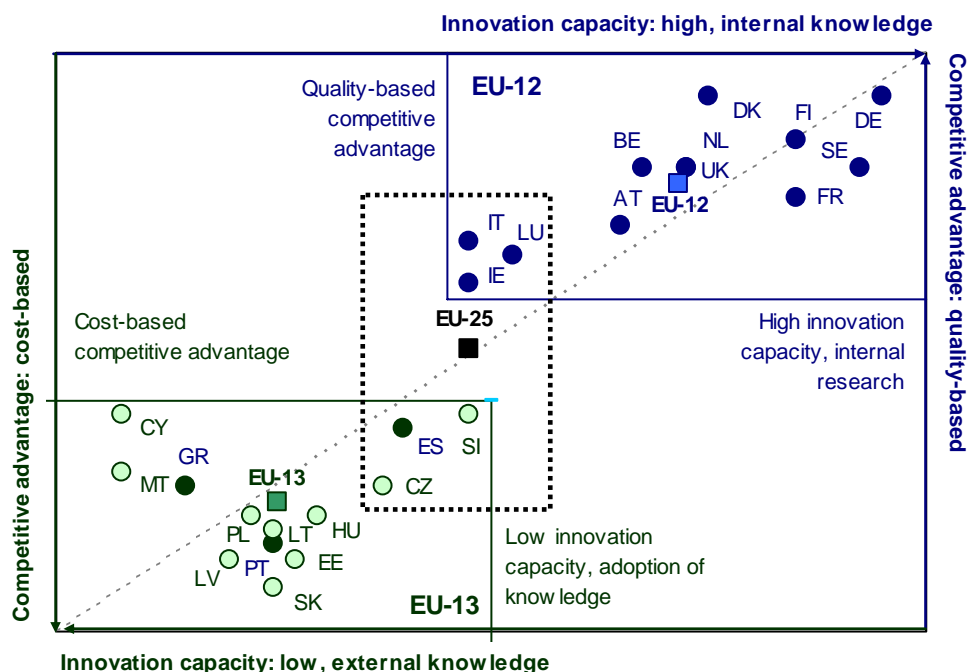
### Competitive advantage matrix

The indicators of sources of competitive advantage and of technology knowledge (level of innovation capacity) can be combined to show country positions in the **competitive advantage matrix** (see figure 3). The matrix identifies relatively clearly the lagging group of the new and less developed EU members (EU-13) compared to the more advanced members (EU-12). Greatly differing country positions in the competitiveness matrix often signal the necessity to specify analytical instruments for assessment and policy measures for related economic and political support at the national level. Lagging of the EU-13 is demonstrated in the prevailing **cost-based** competitive advantage, i.e. low importance of unique products and processes; competitiveness is more efficiency-driven. This lagging is also clearly shown in the persisting reliance on

**external sources** of technology knowledge, i.e. low importance of internal knowledge sources (research and development activities). Own innovation capacity is insufficiently developed, although most countries within this group demonstrate the ability to adapt external technology knowledge to local needs.

Although the two groups within the EU-25 are relatively clearly divided in terms of sources of competitive advantage (the average result of 5.6 in EU-12 compared to 3.4 in EU-13), lagging is (slightly) less pronounced in the level of innovation capacity (the average result of 5.4 compared to 3.5). The EU-12 countries score better on the competitive advantage quality at the given level of innovation capacity, while in the EU-13 the competitive advantage quality tends to lag behind their achieved level of innovation capacity.

Figure 3: Competitive advantage matrix



Source: WEF (2004), modified.

### Competitive advantage diamond

More detailed specification of competitive advantage characteristics is based on the initial definition of its qualitatively differentiated development stages. In this concept the **competitive advantage diamond** defines its four key aspects, each of which is assessed by four individual indicators differentiated according to their importance in transition of the economy to quality-based competitive advantage (or innovation-driven competitiveness stage). The structure of the diamond presented in this paper is the author's own design based on Porter's concept of importance of different factors in different competitiveness development

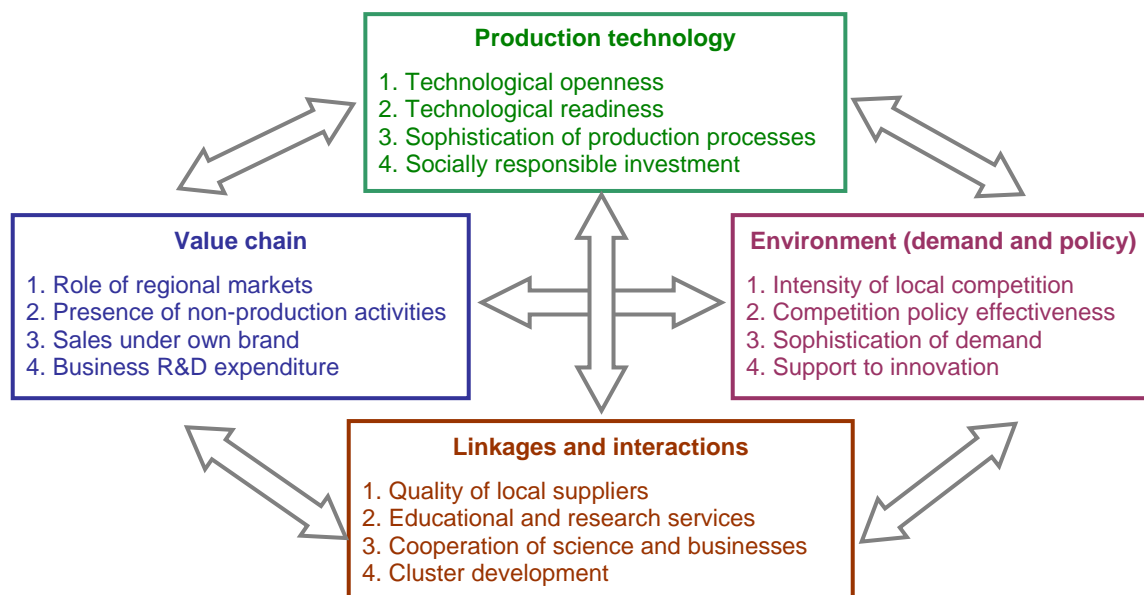
stages. Values of individual indicators are based on WEF survey (2004) and once again are stated on a scale from 7 (the best result) to 1 (the worst result). The structure of the competitive advantage diamond follows the findings from competitive advantage matrix, i.e. the selection of indicators reflects the specifics of **qualitative positions** of country groups within the EU-25. Therefore, on the one hand, certain factors that can be considered fundamental for long-term economic development were omitted (their presence is practically a condition for joining the European Union even for the less developed countries). On the other hand, specific importance of geographical and qualitative fragmentation of a value chain of multinational companies was considered, which is demonstrated in differences between qualitative intensity of domestic (with more developed knowledge) and host (with less advanced knowledge) EU economies.

<sup>3</sup> The concept applied by Sala-i-Martin and Artadi (2004) uses GDP per capita values to differentiate between qualitative stages of competitiveness (transition stages are also identified).

**The competitive advantage diamond** (figure 4) comprises (1) a production technology component evaluated according to qualitative characteristics of business operations and decision-making, including their social context, (2) a value chain component with a focus on the presence of individual segments with different qualitative intensity, (3) an environmental component including the aspect of demand sophistication (from intensity of competition to sophistication of buyers) and quality of political support (from the competitive environment to innovation activities), and (4) a linkages component which assesses the quality and intensity of interactions among the involved agents. Individual characteristics of each of the components are arranged in ascending order from one to four according to their

importance for quality-based competitive advantage (or its higher stage). Obviously, certain (sometimes even significant) structural differences between companies, industries or regions within the economy may appear in the qualitatively differentiated characteristics of the competitive advantage diamond. The overall assessment at the national level will therefore reflect the perception of prevailing qualitative evaluation of individual characteristics. In addition, there are differences in qualitative assessment between individual components of the diamond which enable identification of areas with significant lagging or advance. Ideally, the position (of a country, region or industry) should be at a similar level within the same tier of the diamond (1 to 4) across all components.

**Figure 4: Diamond model for competitive advantage**



Source: The author's structure using WEF indicators (2004).

## 1.2 Production technology

The first component of the competitive advantage diamond is the assessment of the qualitative level of the **production technology development**. The quality intensity is industry and company-specific and shows up in various importance of the generators and users of new technology within the economic structure. The production technology component assesses particularly the qualitative stages of company operations, while taking into consideration social context of corporate decision making at the highest stage. Technological standard is of key importance for increasing the efficiency of production activities, i.e. for efficient use of inputs.<sup>4</sup> Whether the technology used is developed by local companies or adopted from abroad is irrelevant in evaluation of this component (the source of knowledge gets on importance in the value

chain component). However, development of domestic knowledge base is an important condition as adoption of external technology requires adequate level of absorption capacity (especially internal or external availability of related qualitatively intensive inputs and density and intensity of linkages within the institutional infrastructure).<sup>5</sup>

### Production technology component in competitive advantage diamond

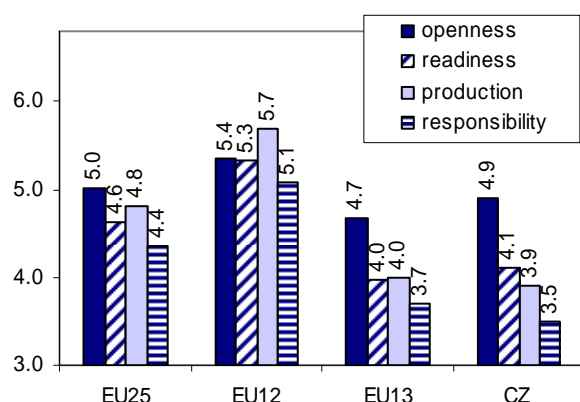
The first indicator in the **production technology** component within the diamond is (1) technological openness, i.e. whether companies are open to and active in absorption of new technology. Where technological openness is sufficient, effective use of new technology is further conditional on an adequate level of (2) technological readiness

<sup>4</sup> Smaller firms may be in a specific position, having the advantage of greater flexibility for implementing new technology, while being potentially limited by insufficient material and knowledge resources and a more difficult access to information on the latest technology.

<sup>5</sup> These inputs may include for example skilled human resources (including specific qualifications such as scientists or technicians) or specialised research, education or ICT services. However, assessment of available skilled human resources in less developed countries must be interpreted with great caution. Positive assessment may indicate low demand or its low quality intensity rather than high quality of supply (see sophistication of demand in the environment component).

or capacity, i.e. accessibility of new knowledge through alternative technology transfer channels. As a technological capacity increases, (3) sophistication of business operations and strategies increases to the point where the best and most efficient process technology available is used (i.e. the best practice frontier technology) as opposed to labour intensive production methods. As company operations and strategies reach their qualitatively highest stage, (4) socially responsible decision making and investment in production technology becomes increasingly important in company planning (beyond the scope of related legal requirements).

Figure 5: Indicators of the production technology component



Source: WEF (2004), own calculations.

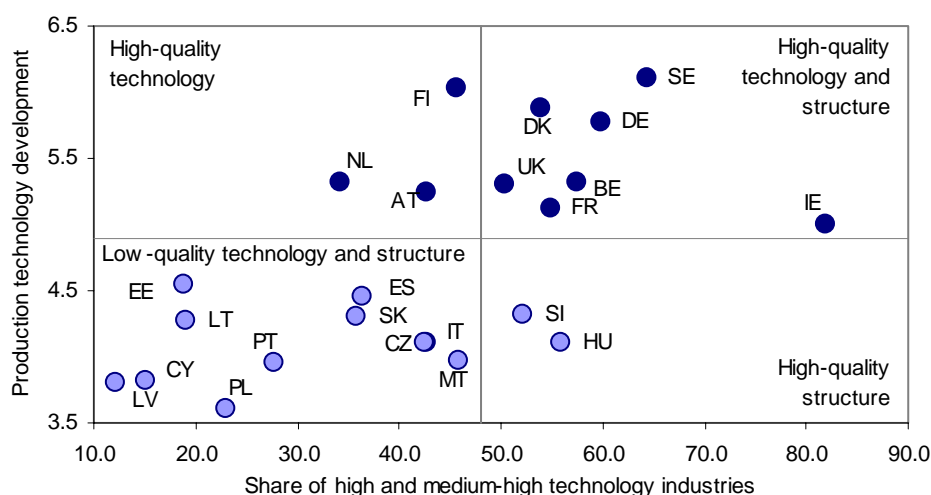
Positions of the Czech Republic and groups of the EU-25, EU-12 (developed members) and EU-13 (less developed members, i.e. new members plus Spain, Portugal and Greece) are shown in figure 5. Values of individual indicators in the production technology component in the Czech Re-

public are arranged in international comparison from the most positively perceived technological openness to the indicator with the worst evaluation – importance of socially responsible corporate decision making. The extent of the Czech Republic (and EU-13) lagging behind the EU-12 shows progressive tendency in the same order. On average, companies in less developed EU members are technologically open but lack adequate technological capacity and ability to use new technology efficiently. The most significant lagging behind more advanced member states is demonstrated or perceived in sophistication of production processes.

#### Quality of production technology and industry structure

In order to evaluate positions of EU members as to their **production technology** development, average values for this component were combined with the indicator of quality of economic structure (expressed as the share of industries with high and medium-high technology intensity). This comparison (figure 6) indicates various country groups within the EU. The country group with a low quality of production technology and an unfavourable qualitative structure holds the worst position. At the same time, these countries demonstrate a small share of industries with high technology intensity. Another group (including the Czech Republic) demonstrates a more favourable qualitative structure of economic activities, while maintaining a low quality of production technology. In this case, supporting adoption of more sophisticated technology or development of domestic research activities in industries with higher technology intensity (i.e. especially technology transfer through foreign direct investment) would be appropriate. The remaining EU members demonstrate a higher or high quality of production technology in combination with medium to high quality of economic structure (the lower quality of structure in some countries reflects specifics of their specialisation).

Figure 6: Quality of production technology and qualitative structure of economic activities



Note: Qualitative structure for 2002 expressed as a share of high and medium-high technology intensive industries in manufacturing value-added. 2001: Belgium, Cyprus, Lithuania, Malta, Great Britain, some industries undisclosed – Denmark, Estonia, Ireland, Lithuania, Luxembourg, Malta, Netherlands, Slovakia, France. Source: WEF (2004), OECD – STAN Database, up to 1.11.2005, EUROSTAT – New Cronos, Industry, Trade, Services, up to 1. 5. 2005, own calculations.

### 1.3 Value chain

The (multinational) **value chain** component specifically takes into account positions of EU members with less developed knowledge base and a significant role of the FDI sector. In these cases, assessment of competitive advantage needs to take into consideration consequences of the multinational value chain fragmentation, where various (qualitatively different) segments are located in various countries. Less developed countries tend to attract especially segments that make use of the advantage of cheaper inputs. Placement in countries at a similar or higher level of (knowledge) development is motivated more by access to specific assets (for example new technology).<sup>6</sup> The quality of factor endowment (factor intensity) related to the level of technology capabilities influences the depth and focus of trade specialisation and motivation of foreign investment flows as a (potentially) significant source of technology transfer.

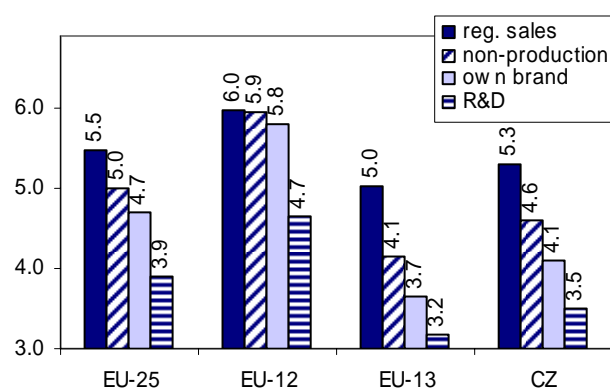
#### Value chain component in competitive advantage diamond

The first aspect of the value chain component includes the (1) intensity of exports to regional markets as a basic condition for asserting domestic production in foreign competition. Geographical proximity and intensity of economic and non-economic linkages facilitate penetration to markets in neighbouring countries. In the next stage of development assessment focuses on the (2) presence of non-production activities, i.e. to what extent companies develop activities of strategic importance besides manufacturing the input, such as product design, marketing, logistics or after-sales services. The more varied the value chain, the higher is the appreciation of production inputs. In the following stages the importance increases of qualitative intensity of the value chain segments. This is reflected first in the ability to export output (3) under own (renowned) brand. Assessment in the qualitatively highest stage turns to the (4) level of expenditure on research and development (compared to foreign competitors), which at the same

time defines the business innovation typology (or is one of its major aspects).

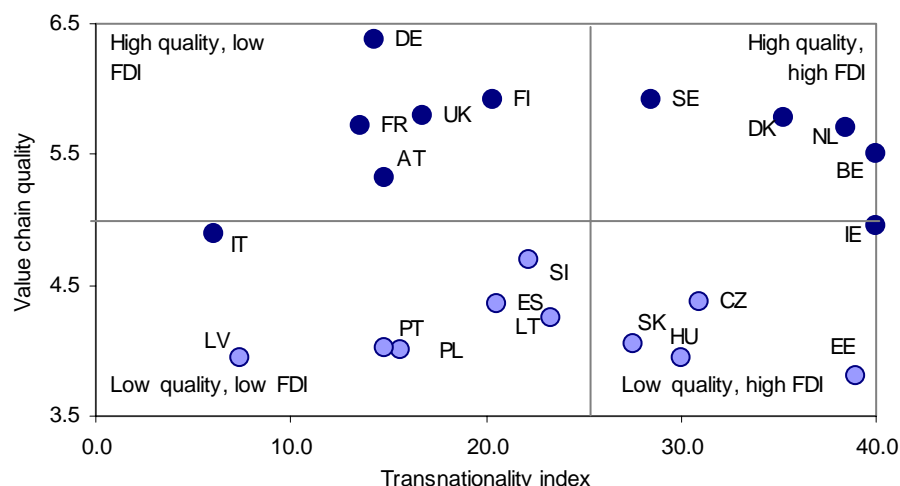
International comparison of the Czech Republic position with groups of EU in individual indicators of the value chain component is shown in figure 7. Once again, the figure shows lagging of the less developed country group in individual stages of the value chain component. Intensity of regional trade as a basic condition for and result of competitiveness in foreign markets receives the most positive evaluation. The worst evaluation on average is achieved in intensity of expenditure on business research and development (which applies also to the EU-12). The most significant lagging of the EU-13 behind the EU-12 is shown in sales under an own renowned brand. Generally, the value chain in the group of less developed members lacks qualitatively more intensive segments. The Czech Republic position in all indicators is on average only slightly more favourable than the EU-13 average and displays identical qualitative characteristics of value chain (in)completeness.

Figure 7: Indicators of the value chain component



Source: WEF (2004), own calculations.

Figure 8: Quality of value chain and intensity of foreign direct investment



Note: Transnationality index for 2002, Belgium – 77.1, Ireland – 69.3. Malta and Cyprus not available. Source: UNCTAD Database (2005), WEF (2004).



### Quality of value chain and importance of foreign investment

When positions of EU members in the level of **value chain** quality (or completeness) are evaluated, average values for this component are combined with the transnationality index indicator,<sup>7</sup> which describes the extent of internationalisation (figure 8).

In this comparison, the less developed EU members are included in the group with a low value chain quality even if the levels of FDI are comparable with some of the more developed members. The Czech Republic receives relatively positive evaluation in this group. However, the gap between the Czech Republic and more advanced members remains significant and indicates different motivation for investment decisions, i.e. cheaper inputs and medium skills of labour rather than specific assets (or importance of the domestic market). Changing these characteristics may be a long-term task, as positions of Spain or Portugal show in value chain quality among less developed EU members.

### 1.4 Environment (demand and policy)

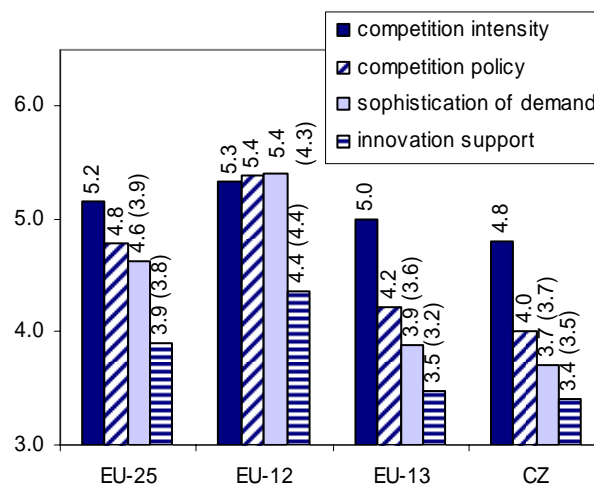
The third component of the diamond model of competitive advantage – qualitative intensity of the **external environment** is evaluated according to competition intensity, sophistication of the domestic demand and support for innovation activities. Support in the narrow sense includes specific measures encouraging innovation and focusing especially on various forms of financial (direct and indirect) instruments and instruments for (temporarily limited) protection of innovation results. Support eliminates or reduces the consequences of market failures, which under normal circumstances would weaken an incentive for investing in innovation and thus prevent companies from achieving a socially optimum outcome. In the broader sense, supporting innovation activities includes the quality of general conditions for economic decision-making. Innovation environment is influenced, for example, by quality of regulation and flexibility of product, labour and financial markets and within these by conditions for doing business, intensity of competition (including openness of the domestic market to foreign supply), labour mobility, and determinants of supply and demand for specific financial instruments (like venture capital).

### Environment component in competitive advantage diamond

The first indicator in the environment component – (1) intensity of domestic competition depends mainly on openness of the domestic market (to imports and inflow of foreign investment). The importance of (2) effective protection of competition, especially protection that respects its dynamic benefits, increases with growing importance of technology intensive activities and the subsequent market concentration. Growing qualitative intensity of economic

activities driven by intensity of domestic competition subsequently reflects in increasing (3) sophistication of the demand (i.e. preference of technology level and performance rather than price) from private, as well as public agents. In the last stage of development (4) sophisticated instruments for supporting innovation activities, specifically venture capital (by private agents) and government tax and subsidy allowances for companies are available.

Figure 9: Indicators of the environment component



Note: Data in brackets represent indicator values for the public sector. Source: WEF (2004).

Comparison of the Czech Republic position with groups of EU-25, EU-12 and EU-13 is shown in figure 9 with differentiation between private and public agents in the case of demand sophistication and support to innovation. The Czech Republic scores best in intensity of competition. The Czech Republic lags behind the EU-12 the most in sophistication of the demand within the private sector and effectiveness of the competition policy. The relatively intensive competition with weaker effectiveness of its protection is typical for the EU-13. Sophistication of the domestic private and public demand is low and availability of specific supporting instruments limited. Low technology level of the demand is therefore matched by low qualitative intensity of supply, i.e. the support from the external environment.

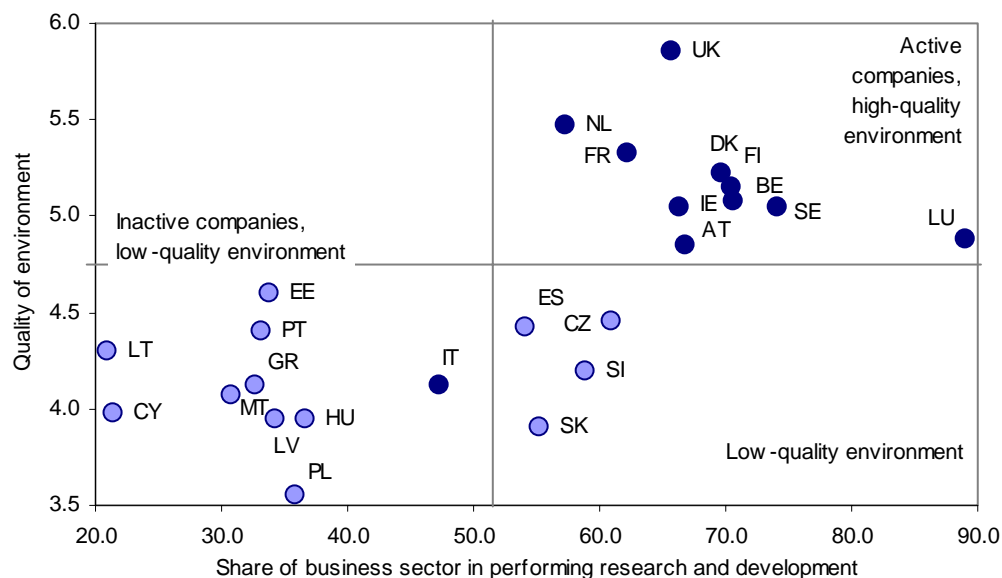
### Quality of environment and role of corporate research

Positions of EU members in the quality of **innovation environment** are evaluated in terms of average values for this component and values for the share of the business sector in performing research and development (figure 10). This comparison indicates countries (most of the EU-12) with high business activity, high-quality innovation environment and favourable conditions for doing business. The situation is quite the opposite in most countries of the EU-13. The research activity of businesses documented for the Czech Republic, Slovenia, Slovakia and Spain is above the EU-25 average, while the quality of their innovation environment is below the average. Improving the innovation environment can therefore be seen as an essential step for encouraging innovation activity in the business sector and can be potentially combined with more significant financial support. Although a relatively large part of public expenditure in the Czech Republic is dedicated to business R&D, the use of indirect financial support is only at its initial stages.

<sup>6</sup> Motivation of a company decision to expand activities abroad (i.e. questions how, where and when) is the subject of the international production theory. Reasons are divided according to the type of advantages pursued (in the so-called *OLI* paradigm) into the ownership of a unique asset (*ownership advantage*), opportunity to internalise benefits arising from undertaken transactions or making use of economies of scale (*internalisation advantage*) and making use of advantages of particular localisation (*localisation advantage*), see Dunning (1993).

<sup>7</sup> Transnationality index (TNI) is expressed as the average of shares of the FDI inflow in gross fixed capital formation, the FDI inflow in GDP, number of employees in foreign affiliates in the total employment, value added in foreign affiliates in the total value added.

Figure 10: Quality of environment and the role of business sector in R&D performance



Note: Data on business R&D for last available year. Source: WEF (2004), EUROSTAT – New Cronos, Science and Technology, up to 1.11.2005.

### 1.5 Linkages and interactions

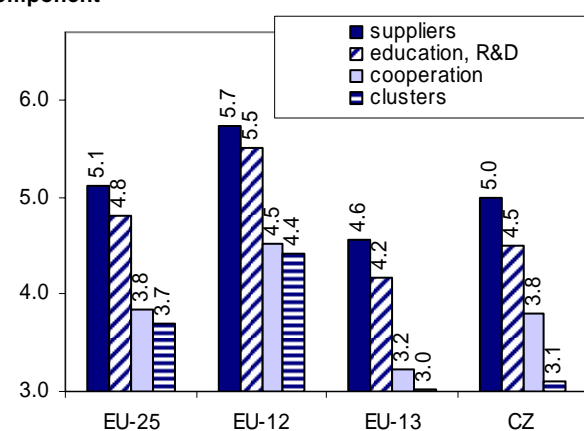
**Linkages and interactions** evaluated according to the characteristics of national innovation systems and the level of cluster development make the fourth component of the competitive advantage diamond. Interactions between agents involved in innovation in the form of competition, transactions and networking take on two key forms, representing pillars of knowledge distribution in the national system. The most important type of interactions is that between key players in the innovation process, i.e. between companies and knowledge institutions. Innovation performance is conditional on their willingness and ability to cooperate, i.e. share and exchange knowledge. The second form of interactions includes market and non-market mechanisms supporting cooperation (partnership) in research and development, or creation of clusters of economic activities. Increasing importance of processes involved in creation, dissemination and use of knowledge reinforces linkages between the NIS approach and development of knowledge-based economy, in particular when examining determinants of complex mechanisms involved in distribution of knowledge resources and benefits (institutional diversity, sector or industry innovation systems, economic and knowledge infrastructure, international linkages).

#### Linkages and interactions component in diamond competitive advantage

The first indicator in the linkages component is the (1) quality of domestic suppliers which defines availability and development of local supplier networks (of components, machinery and equipment) as opposed to dependence on their imports. Developed supplier networks interacting with customers positively influence innovation performance of producers. In the next stage of development, the intensity increases of knowledge activities in (2) availability of education and research services providing output adequate to specific user needs. This availabil-

ity is especially important for agents facing insufficient level of internal knowledge resources. Increasing quality and flexibility of knowledge service supply (together with increasing qualitative intensity of the demand) gradually reflects in development of (3) cooperation between academic science and the business sector. This cooperation requires adequate institutional openness in both types of agents and developed mechanisms for mutual knowledge transfer. At the highest stage of development numerous and intense linkages among a wide range of agents (creators and users of knowledge) form (4) innovation-based clusters.

Figure 11: Indicators of the linkages and interactions component



Source: WEF (2004).

Comparison of the Czech Republic position within the EU according to indicators of the linkages and interactions component is shown in figure 11. The EU-13 members lag behind the more developed EU-12 members in all indicators. This disadvantage is at a similar, even if slightly higher

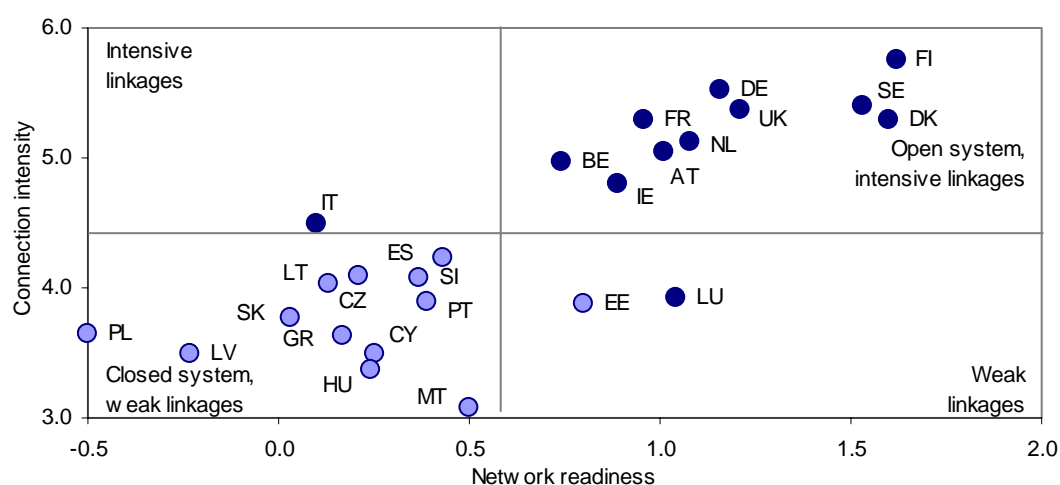
level in the case of cluster development. The Czech Republic position is more favourable than the EU-13 average. The Czech Republic lags behind the EU-12 the most in the level of cluster development, which is also significantly worse compared to the intensity of cooperation between academic science and the business sector. Linkages and interactions among agents in the national innovation system, or condition for developing innovation-based clusters, are typically insufficiently developed in the EU-13 countries with less developed knowledge base.

#### Quality of linkages and interactions and network readiness

The importance of **linkages and interactions** is assessed according to the network readiness index, which

defines the level of system openness (figure 12). This comparison shows reticence of information systems and weak and qualitatively undeveloped linkages and interactions within national innovation systems in the EU-13 members (with the exception of Estonia), while the situation is quite the opposite in most EU-12 countries. The Czech Republic achieved its worst evaluation in ICT environment, while the usage was evaluated significantly more positively with only slight lagging behind of the readiness subindex (however, the Czech Republic is still below the EU-25 average even in these indicators). Regarding the different groups of agents, individuals achieved the best evaluation closely followed by enterprises. The government position in readiness and especially in ICT usage is assessed as the worst.

Figure 12: Intensity of linkages and network readiness (system openness)



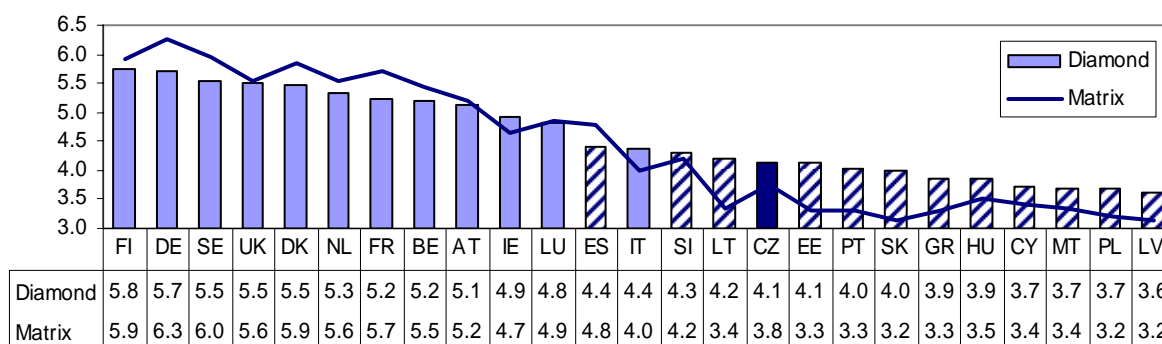
Note: WEF (2004, 2005), modified.

### 1.6 The Czech Republic and EU-13 competitive advantage within the EU-25

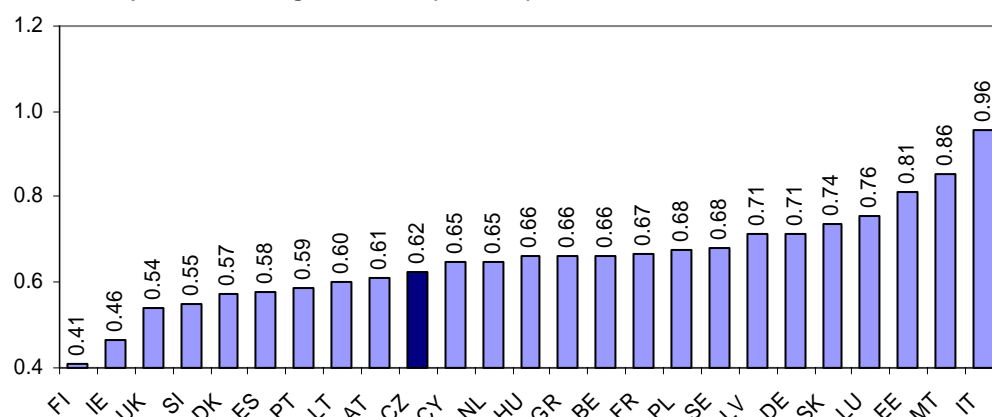
The overall evaluation of the competitive advantage quality firstly uses the average of all 16 indicators from the diamond and two indicators of the competitive advantage sources (figure 13). The leading positions in terms of diamond average belong to the EU-12 members, followed by the EU-13 group (with Italy as the only exception). The competitive advantage values are generally consistent with these results.

The second aspect of the overall evaluation focuses on the variation of values of the diamond indicators in individual countries (figure 14). The larger the variation, the more significant are the weaknesses of competitive advantage. Occurrence of indicators with values significantly below the average indicates desirable focus for supporting policy to increase efficiency of the national innovation system. On the other hand, low variation indicates evenly developed competitive advantage components, with the best result achieved by Finland.

Figure 13: Quality of competitive advantage (matrix and diamond)



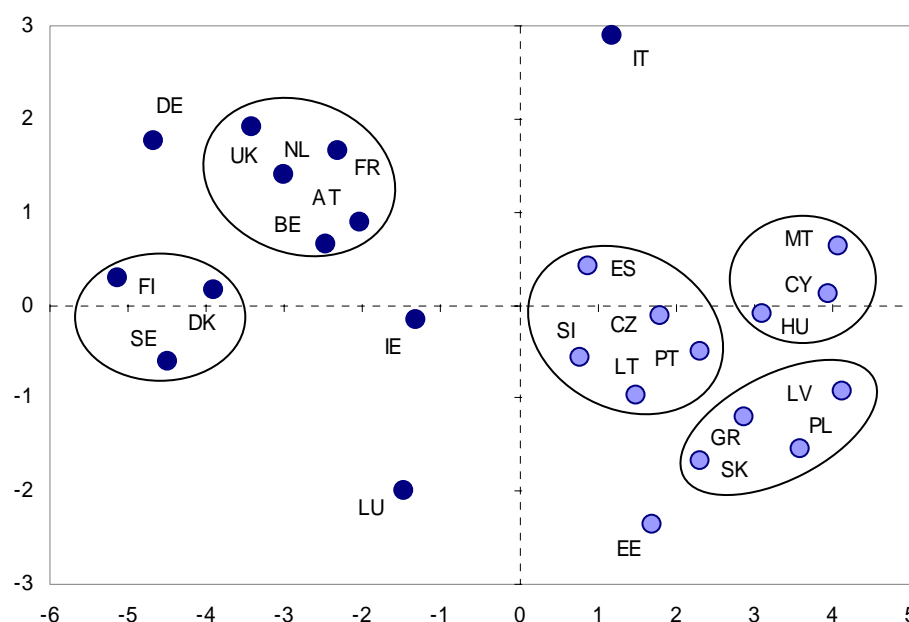
Note: Unweighted averages of individual indicators. Source: WEF (2004), own calculations.

**Figure 14: Variation of competitive advantage indicators (diamond)**


Note: Standard deviations in individual indicators. Source: WEF (2004), own calculations.

Cluster analysis is used to identify country groups within the EU-25 with similar performance or similar characteristics of strengths and weaknesses according to diamond values (figure 15). The analysis allows for improvement of the efficiency of policy support by using experiences of countries with higher performance based

on a similar structure of competitive advantage characteristics. This diagram shows less developed EU members divided into three groups with similar characteristics and Estonia as a country with a specific position (this also applies to Italy, Norway and Germany among the more developed countries).

**Figure 15: Cluster analysis of the competitive advantage quality**


Note: The multidimensional scaling method was used to convert the similarity values in two-dimensional chart. The chart axes bear no meaning. Distances between individual countries correspond as much as possible to the given similarity values. The use of this method was inspired by Arundel and Hollanders (2005). Source: WEF (2004), own calculations.

Table 1 shows three of the most similar partners for individual EU-25 countries for each component of the diamond model. Their similarity is determined according to the Euclidean distance (however, the extent of this similarity often differs greatly in individual groups). The Czech Republic position within the EU-25 in these comparisons is mainly below the average. The structure of its competitive advantage components is the most similar to that of Lithuania, Slovenia and Slovakia.

More detailed information on the similarity of the Czech Republic competitive advantage structure within the EU-25 is shown in table 2. Member countries are arranged in ascending order according to increasing differences compared to the Czech Republic. The distance increases (i.e. the similarity decreases) in countries with a higher average level of competitive advantage quality. Ireland is the closest country from the more advanced EU-12 members, while the differences against the Scandinavian countries and Germany are the largest.

**Table 1: Components of the competitive advantage quality and their similarity within the EU-25**

	Diamond		Technology		Value chain		Environment		Linkages	
Finland	DK,SE	5.8	DK,SE,DE	6.0	SE,DK,NL	5.9	FR,NL,UK	5.3	SE,UK,DK	5.8
Germany	(UK,NL,DK)	5.7	NL,BE,AT	5.8	SE,FI,DK	6.4	NL,FR,BE	5.2	UK,SE,NL	5.5
Sweden	DK,FI	5.5	FI,DK,DE	6.1	FI,DK,DE	5.9	AT,DK,BE	4.7	UK,DK,DE	5.4
Great Britain	NL,FR,BE	5.5	LU,BE,AT	5.3	FR,NL,DK	5.8	NL,FI,DE	5.5	DK,SE,DE	5.4
Denmark	SE,FI,UK	5.5	FI,SE,DE	5.9	UK,NL,FR	5.8	BE,AT,IE	5.0	UK,SE,AT	5.3
Netherlands	BE,UK,FR	5.3	BE,AT,LU	5.3	FR,UK,DK	5.7	FR,DE,UK	5.2	BE,AT,UK	5.1
France	BE,NL,AT	5.2	BE,IE,LU	5.1	NL,UK,DK	5.7	NL,DK,DE	5.2	AT,BE,IE	4.9
Belgium	AT,NL,FR	5.2	NL,UK,FR	5.3	AT,NL,FR	5.5	AT,DK,DE	4.9	NL,AT,FR	5.0
Austria	BE,NL,FR	5.1	LU,NL,UK	5.3	BE,NL,FR	5.3	BE,DK,SE	4.9	BE,NL,FR	5.1
Ireland	(AT,BE,FR)	4.9	FR,LU,UK	5.0	LU,SI,AT	5.0	DK,AT,BE	4.9	AT,FR,DK	4.8
Luxembourg	(IE,FR)	4.8	AT,UK,BE	5.2	IE,BE,AT	5.2	IE,SE,DK	4.9	PT,LT,ES	3.9
Italy	(ES,SI)	4.4	ES,PT,SI	4.1	AT,ES,IE	4.9	GR,CZ,CY	4.0	IE,LU,ES	4.5
Spain	SI,CZ,LT	4.4	SI,IT,EE	4.5	CZ,LT,HU	4.4	EE,AT,PT	4.6	LT,CZ,SI	4.2
Slovenia	CZ,LT,ES	4.3	ES,LT,PT	4.3	IE,CZ,LT	4.7	EE,GR,CZ	4.2	CZ,LT,EE	4.1
Lithuania	CZ,SK,SI	4.2	SK,SI,HU	4.3	CZ,ES,PL	4.3	PT,HU,GR	4.2	SI,CZ,ES	4.0
<b>Czech Rep.</b>	<b>LT,SI,SK</b>	<b>4.1</b>	<b>HU,MT,LT</b>	<b>4.1</b>	<b>LT,ES,SI</b>	<b>4.4</b>	<b>HU,GR,SK</b>	<b>4.0</b>	<b>SI,ES,LT</b>	<b>4.1</b>
Estonia	(SK,LT,PT)	4.1	SK,ES,CZ	4.6	SK,GR,PT	3.8	SI,CY,GR	4.3	SI,SK,CZ	3.9
Portugal	GR,LT,CZ	4.0	CY,LV,CZ	4.0	SK,GR,PL	4.0	LT,GR,HU	4.3	LT,LU,SK	3.9
Slovakia	CZ,LT,HU	4.0	HU,LT,EE	4.3	GR,PT,PL	4.1	CZ,HU,LV	3.8	PL,GR,LT	3.8
Greece	PT,SK,HU	3.9	CY,PT,LV	3.8	SK,PT,PL	4.0	HU,CZ,CY	4.1	SK,PL,HU	3.6
Hungary	SK,MT,GR	3.9	CZ,SK,LV	4.1	PL,LT,MT	4.0	CZ,GR,LT	4.0	LV,GR,PL	3.4
Cyprus	LV,HU,MT	3.7	LV,PT,CZ	3.8	LV,MT,HU	3.4	GR,EE,IT	4.2	LV,PL,HU	3.5
Poland	LV,GR	3.7	CY,PT,LV	3.6	PT,GR,SK	4.0	LV,SK,CZ	3.6	SK,GR,LV	3.7
Malta	HU,LV,CY	3.7	CZ,HU,CY	4.0	PL,PT,HU	3.7	LV,CY,SK	4.1	HU,GR,LV	3.1
Latvia	CY,PL,HU	3.6	CY,PT,CZ	3.8	CY,MT,HU	3.5	SK,PL,IT	3.8	HU,PL,CY	3.5

Note: The table shows two or three EU-25 countries with the greatest similarity of structure according to the Euclidean distance values. Countries in brackets show low similarity. Source: WEF (2004), own calculations.

**Table 2: Similarity of components of competitive advantage quality within the EU-25 vis-à-vis the CR**

Diamond		Technology		Value chain		Environment		Linkages	
LT	1.360	HU	0.245	LT	0.387	HU	0.300	SI	0.224
SI	1.400	MT	0.592	ES	0.458	GR	0.308	LT	0.412
SK	1.500	LV	0.648	SI	0.755	SK	0.436	ES	0.574
PT	1.604	PT	0.648	PL	0.843	IT	0.541	EE	0.592
ES	1.764	CY	0.656	PT	0.872	SI	0.592	SK	0.714
HU	1.814	SK	0.748	HU	0.954	LT	0.648	PT	0.917
GR	1.856	EE	0.959	SK	0.995	CY	0.702	GR	0.975
PL	2.122	SI	0.995	GR	1.072	PT	0.743	LU	1.025
EE	2.158	LT	1.054	IE	1.162	EE	0.771	PL	1.039
LV	2.585	ES	1.068	MT	1.404	LV	0.885	LV	1.407
MT	2.771	GR	1.118	EE	1.670	MT	0.943	HU	1.493
CY	2.809	PL	1.241	LU	1.703	PL	1.083	FR	1.655
IE	3.480	IT	1.349	LV	1.871	ES	1.197	CY	1.667
IT	3.530	IE	1.934	AT	2.045	SE	1.688	IE	1.679
LU	4.004	FR	2.352	CY	2.047	AT	1.806	BE	1.797
AT	4.229	LU	2.437	IT	2.243	BE	1.968	AT	1.924
BE	4.477	AT	2.596	BE	2.300	IE	2.050	NL	2.095
FR	4.771	UK	2.596	NL	2.766	DK	2.057	MT	2.114
NL	5.212	BE	2.766	FR	2.825	LU	2.478	IT	2.307
UK	5.711	NL	2.903	DK	2.963	FR	2.551	DK	2.478
DK	5.732	DE	3.585	UK	3.008	NL	2.588	UK	2.598
SE	6.164	DK	3.703	FI	3.247	DE	2.620	SE	2.657
DE	6.723	FI	4.001	SE	3.385	FI	2.918	DE	2.869
FI	6.853	SE	4.077	DE	4.155	UK	3.174	FI	3.450

Note: Higher values indicate greater differences in the component structure. Source: WEF (2004), own calculations.



## 2. Inputs and outputs of innovation performance

This section presents assessment of key aspects of a national innovation system (NIS) according to its inputs (including their structural characteristics), specific infrastructure conditions and outputs (innovation performance and quality of innovation environment). Presentation of the concept of a national innovation system draws on findings of economic and social studies of science, technology and innovations, and defines an appropriate framework for analysing innovation activities. A relatively reliable set of indicators and databases in this area allows determining not only the existing structural differences between individual national systems, but also certain trends in development of the sources of research and development. Results of this analysis are applied especially in identification of structural barriers that limit integration of domestic research and development into the innovation context and its use for the growth of innovation performance of domestic actors.

### 2.1 National innovation system concept and opportunities for its use in the situation of the CR

The national innovation system concept places emphasis on applying the national context in the approach to innovation and the fact that innovation is not influenced by a single factor or source but is a result of interaction of multiple sources and factors with a systemic character. Both of these aspects are currently a subject of critical studies – the national context is weakened by globalising effects, while the systemic concept, which requires a certain level of social consensus, tends to give way to the influence of conflictual approaches. However, the NIS concept remains the most productive approach to analysing innovation sources and innovation performance. It has been accepted as a framework for international studies on innovation (*Community Innovation Survey* – CIS) and is applied in the regulatory efforts of EU authorities and national governments dedicated to creating a European Innovation Area (EIA).

Interpretation framework for a national innovation system was influenced by two significant motives. The first motive draws on development of neo-Schumpeterian economics, which study changes in relationships between science and technology in developed countries. This angle of research was strongly supported by OECD and contributed to development of indicators of science and technology, analyses of this area and conceptual ideas, but also options for their practical application (at regular meetings of ministers for science and technology). A concept definition of a national research system was also created directly as a result of extensive empirical research carried out at the end of the 80's and beginning of the 90's and including 15 OECD member states. Although a great degree of diversity in the institutional structure and regulatory practices with regard to innovation was detected between monitored countries, some identical characteristics were also detected in both areas. This finding allowed defining **generally shared** (and therefore to a certain extent inevitable) conditions for the function of national innovation systems of modern societies and these were defined as follows (see Nelson, 1992):

- Comprehensive interconnection between science and technology characterised by a certain method for technical design and practices, and a system of in-

creasing scientific knowledge surrounding it; a national education system is an institutional basis of this scientific and technological complex and is structured according to this complex; this is why effective interaction between **universities and the companies** as a source of long-term economic growth occurs;

- Innovation activity of private enterprises or companies, which is seen as the ability to adjust to new circumstances (and therefore exceeds the technological and research capacity of the relevant companies); technological competence and **orientation of companies** is based on company's own laboratories, as well as its relations with suppliers and customers;
- **Activity of governments** directly supporting innovation activities or creating a constructive environment through monetary, fiscal and industrial policies and influence on the educational system.

The Czech Republic has all basic conditions for applying the national innovation concept as defined by the original model (see Nelson, 1992). There is long-term experience in development of academic science (university education combined with research), corporate science (research laboratories in companies) and public political support for research, including regulatory and administrative practices for its implementation.<sup>1</sup> The viability of this tradition was not lost even in situations of radical intervention in the institutional organisation of research (nationalisation of science in the 50's and its subsequent privatisation at the beginning of the 90's). The importance of research at universities is gradually restored and corporate research has also recovered from the shock of privatisation. This is why research could be relatively easily monitored according to standard indicators.<sup>2</sup> Standard forms of financing and implementing research – the so-called research sectors (business enterprise, academic, public, non-profit, and foreign) and accessible and comparable indicators of their sources and inputs have been established in addition to the above mentioned restoration of academic and industrial science.

Weaknesses of the national innovation system stem from the current transformation of the economic and social environment in general and from institutional organisation of research and development in particular: new trends are enforced under the influence of structural bonds with regard to distribution of resources and persistence of established practices in conduct and decision making. Yet another reason stems from the relatively demanding pressure on formal acceptance of the institutional framework of the EU and its qualitative requirements as defined in the Maastricht memorandum. As these requirements are applied, weaknesses of the national innovation system arising from its **insufficient interactive and systemic qualities** become clearly apparent. These weaknesses were especially obvious in the assessment of the status of

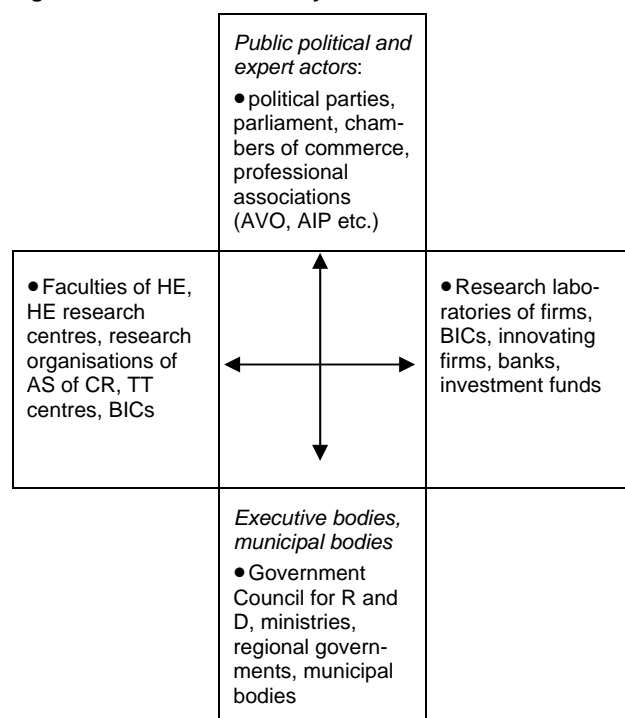
<sup>1</sup> This arrangement relates to the so-called German model of science organisation, which was developed during the Wilhelminian period, later adopted in North America and subsequently applied in general. Naturally, it strongly influenced the situation in the Czech territory (for more details see Müller, 2002).

<sup>2</sup> ČSÚ has been monitoring research and development according to the Frascati manual since mid 90's and has carried out two innovation studies according to the Oslo manual.

innovation policy in the Czech Republic carried out in connection with the accession to the EU (see EC, 2001).

The policy of the Czech government increasingly focuses on the topic of innovation and an extensive support for these activities is available from professional association and professional public. However, effective regulatory measures and institutional changes in this area have not been enforced. The importance of large domestic companies in research and innovation is declining (especially due to changes in ownership structures), although these companies continue to account for a relatively large portion of the overall research and innovation in business enterprise sector (BES). On the other hand, the influence of large foreign companies in this area increases. Medium sized and small companies were established as large companies fell apart with relatively limited finance options and often with insufficient demand and this created intolerable competitive pressure rather than systemic arrangement of creation of networks – this circumstance is important for creation of the infrastructure to support innovation in this entrepreneurial segment. The group of actors that influence the innovation process (including entities involved) structured according to research sectors is shown in Figure 1.

Figure 1: National innovation system /infrastructure in the CR



## 2.2 Inputs of research activities

Research and development is an important factor of innovation performance. However, there are some differences in the assessment of its role in relation to other innovation sources. The linear model, which currently influences actions of innovation players in the CR, sees the role of research and development as a key role. The interactive approach tends to place greater emphasis on qualitative connections between research and other actors within the NIS and sufficient development opportunities for all of its components.

A different context of assessment applied at the level of innovation companies evaluates the importance of research in relation to other innovation sources. Despite these differences, the volume of resources dedicated to research and development is currently seen as equally important as their orientation on innovation performance.

### Extent of financial and human resources in research and development

Table 1 characterises the position of the Czech Republic according to the indicator GERD in % of GDP (also referred to as intensity of GDP to research and development) over a longer period of time and in international comparison. Gradual restoration of the national research system after the radical decline in the extent of its resources in the first half of the 90's can be observed here. Research intensity of GDP improved slightly between 1995 and 2000 and subsequently stagnated.<sup>3</sup>

Table 1: Gross expenditures on research and development (GERD, in % GDP)

	EU-25	EU-15	CZ
1995	1.84 <sup>s</sup>	1.88 <sup>s</sup>	0.95 <sup>b</sup>
1996	1.82 <sup>s</sup>	1.87 <sup>s</sup>	0.98
1997	1.82 <sup>s</sup>	1.86 <sup>s</sup>	1.09
1998	1.82 <sup>s</sup>	1.86 <sup>s</sup>	1.16
1999	1.86 <sup>s</sup>	1.90 <sup>s</sup>	1.16
2000	1.88 <sup>s</sup>	1.93 <sup>s</sup>	1.23
2001	1.92 <sup>s</sup>	1.98 <sup>s</sup>	1.22
2002	1.93 <sup>s</sup>	1.99 <sup>s</sup>	1.22
2003	1.95 <sup>ps</sup>	2.00 <sup>ps</sup>	1.35

Notes: b – break in time series, s – estimate of EUROSTAT, p – preliminary value. Sources: EUROSTAT – New Cronos, Science and Technology, 1. 11. 2005.

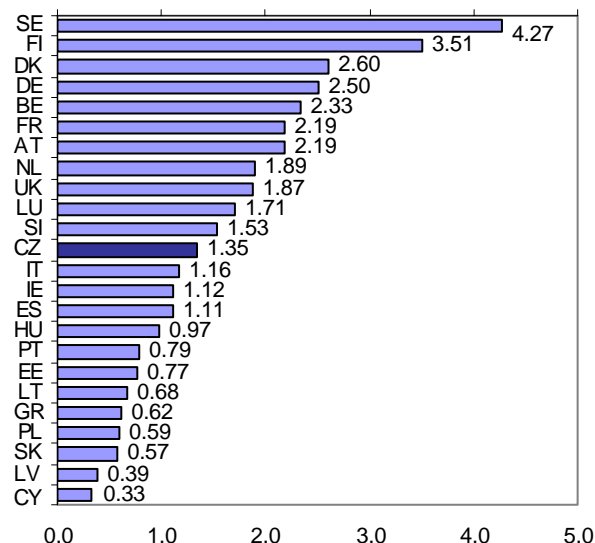
The CR is second after Slovenia in the group of new EU members (see Figure 2) according to the intensity and dynamics of this indicator. However, the extent of resources for research and development and dynamics of their growth appear as insufficient in view of the target level of 3 % of GDP. Differences between individual countries or groups in the EU-25 are considerable. Sweden and Finland hold the leading position with a significant advantage over all other countries. On the other hand, new member states record values significantly below the EU average.

Growth in the **number of employees in research and development** and its comparison against demographic indicators (population in their productive age, labour force, etc.) describe the intensity of research activities and its dynamics, as well as innovation performance. The extent of population carrying out research or involved in applying its results represents an important prerequisite for spreading and using innovations. However, this relationship is also intermediated by and conditional on a long-term cycle of changes in educational institutions and the impact of these changes on the society. Similarly to GERD, the number of employees in research and development as an indicator includes various functionally differentiated activi-

<sup>3</sup> The positive development in 2003 was caused by different growth rates of expenditure on R&D and GDP, when GDP grew slower than the total expenditure on R&D. Compared to 1998, the share of GERD in GDP in the CR in 2003 increased by 0.2 p.p. only.

ties and its information value depends on distribution of resources according to functional, professional, qualification and other aspects.

**Figure 2: Gross expenditures on research and development (GERD, in % GDP), 2003**



Note: year 2003 or last available year. Sources: EUROSTAT – New Cronos, Science and Technology, 1. 11. 2005.

Table 2 shows development of relative number of employees in research and development and researchers in relation to the level of employment. Both of these values for the Czech Republic grow gradually but remain significantly below the EU-25 average and are also lower than in some new member states. The CR lags behind in this aspect partially due to relatively low financial rewards for these professions, and partially owing to the radical decline in the number of employees in research and development during the initial stages of transformation.<sup>4</sup> This indicator in international comparison reflects the GERD values – Sweden and Finland achieve the highest share in the EU, with Denmark in the third place.

**Table 2: Employees in research and development and researchers (in % of total employment, HC)**

	Employees					
	1997	1998	1999	2000	2001	2002
EU-25	..	..	..	..	..	1.44 <sup>s</sup>
EU-15	1.41 <sup>s</sup>	1.43 <sup>s</sup>	1.45 <sup>s</sup>	1.48 <sup>s</sup>	1.50 <sup>s</sup>	1.54 <sup>s</sup>
CZ	0.96	0.95	1.00	1.03	1.04	1.13
	Researchers					
	1997	1998	1999	2000	2001	2002
EU-25	..	..	..	..	..	0.87 <sup>s</sup>
EU-15	0.80 <sup>s</sup>	0.81 <sup>s</sup>	0.83 <sup>s</sup>	0.86 <sup>s</sup>	0.88 <sup>s</sup>	0.92 <sup>s</sup>
CZ	0.49	0.48	0.53	0.56	0.57	0.65

Notes: s – estimate of EUROSTAT. Source: EUROSTAT – New Cronos, Science and Technology, 1. 11. 2005.

Comparison in Figure 3 presents an insight into structure of human resources in research and development – staff-

<sup>4</sup> Approximately 50 thousand people are currently employed in research and development in the CR; at the beginning of the 90's this indicator amounted to approximately 110 thousand.

ing of research with technical and administrative workforce. Differences reflect the share of research activities with high demands on technology and equipment, but also the extent of administration. The relatively large share of companies' research in the Czech Republic places the country in a group of states with slightly higher shares of non-research workforce; however, the value of this indicator does not deviate significantly from the average values for the EU-15 and the EU-25.

### Structure of research and development resources

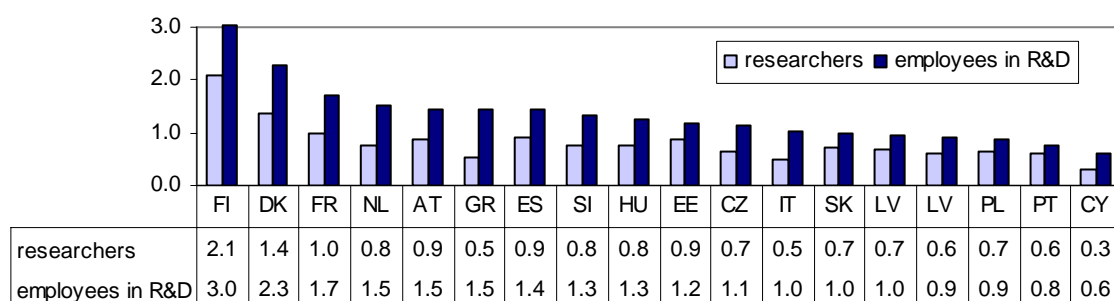
Distribution of research and development resources (GERD) and research and development workforce characterises their **structure** and thus creates a certain basis for analysing institutional forms of research activities. It reflects a power differential, which considerably influences the likelihood of institutional changes (for example excessive concentration of resources in a certain sector hinders institutional changes), and also allows monitoring the flow of resources between individual structural units and their intensity in turn can signal opportunities for institutional changes. An analysis of institutional changes is conditional on determining specific types of research and development arrangement (system).

Assessment of the structure of expenditure on research and development arises from their differentiation according to the institutional<sup>5</sup> and functional aspect. These forms of research and development organisation were accepted in the statistical practice as **research sectors**.

An analysis of research sectors is important for monitoring the process of restructuring national research and development systems in new EU member countries. The strong position of Academies of Science under the socialistic regime, which to some extent persists to this day, leads to a situation when these countries record the largest share of basic research in GERD in the EU-25 (Czech Republic 40 %, Poland 38 %, Hungary 29 %), while this share in similar EU members ranges between 10 % and 25 %. This example demonstrates not only the diversity of the institutional context, which needs to be taken into account when assessing research and development, but also the specific position of the institutional framework (institutional gap) of new EU member states. Specific indicators capable of monitoring crucial factors of related changes must be applied when assessing development of this framework. The share of special-purpose funding for research in the overall scope of GERD can be used as an example. Decreasing importance of institutional (subsidized) funding with an increasing weight of a competitive regime, which finances projects according to successful presentation of grants or projects, positively influences qualitative changes in research organisations owing to the emphasis on their productivity. The share of special-purpose funding in GERD increased significantly in the 90's and this type of funding currently accounts for approximately 40 %.

<sup>5</sup> Differentiation according to the institutional aspect is based on a long-term trend of science institutionalisation, initially in the form of the academic science (placement of science at universities with ties to education) and industrial science (placement of science in companies in the form of laboratories and with ties to company's needs), and subsequently also in the form of laboratories and research centres established for the purposes of the government and its regulatory tasks. The international character of scientific activities eventually led to a significant influence of foreign resources in financing national research and development and their institutionalisation.

Figure 3: Researchers and employees in research and development (in % of total employment, HC), 2002



Notes: Greece – researchers in 1997, R&D employees in 1999; Austria – researchers and R&D employees in 1998; Italy – researchers in 2000, R&D employees in 1999; Netherlands – researchers in 1999 and R&D employees in 2001; Portugal – researchers and R&D employees in 2001. Source: EUROSTAT – New Cronos, Science and Technology, 1. 11. 2005.

The **structure of research sectors** forms an important segment of the national innovation system. We focus our attention especially on the internal structure of the BES and academic sectors and their existing interactions. The analysis is based on binary monitoring of expenditure on research and development according to sources of funding and performance, which allows us to monitor the flow of finance between the sectors and assess the condition of their mutual connections (their openness or closure). Examination of the situation in the EU-25 reveals significant differences between individual countries in characteristics of research sectors from a large share of the business sector in funding and implementation of research and development or alternatively a significant share of the governmental sector to widely established systems with balanced shares of the BES, governmental and higher education (HE) sectors. From the structural point of view, the Lisbon strategy at the Barcelona Summit determined the target value for the share of the BES in financing research and development of at least 66 %. According to the latest available data this share in the EU-25 was as low as 55 % (67 % in the USA, 73 % in Japan) and the growth recorded compared to 1999 was very moderate. As shown in Table 3, the Czech Republic is characterised by a relatively low share of the HE sector and a high share of the governmental and BE sectors even in international comparison (see Figure 4).

Table 3: Distribution of BERD by sources of R&amp;D funds and sector of performance (in %)

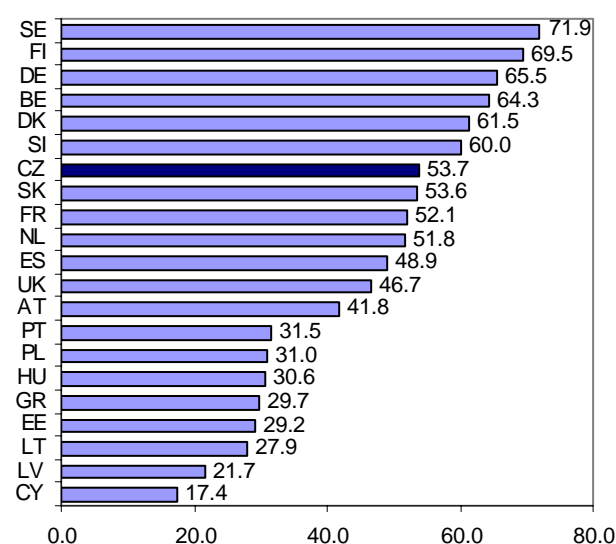
Sector of funding	Firms		Government		Foreign	
	1999	2001/2002	1999	2001/2002	1999	2001/2002
EU-25	55.2 <sup>e</sup>	55.4 <sup>e</sup>	35.4 <sup>e</sup>	34.7	7.2 <sup>e</sup>	7.6 <sup>e</sup>
EU-15	55.6 <sup>e</sup>	56.0	34.9	34.1	7.4 <sup>e</sup>	7.8 <sup>e</sup>
CZ	52.6	53.7	42.6	42.1	4.0	2.7

Sector of performance	Firms		Government		Higher education	
	1999	2002/2003	1999	2002/2003	1999	2002/2003
EU-25	64.9 <sup>s</sup>	64.7 <sup>s</sup>	14.0 <sup>s</sup>	12.9 <sup>s</sup>	20.3 <sup>s</sup>	21.6 <sup>s</sup>
EU-15	65.2 <sup>s</sup>	65.1 <sup>s</sup>	13.8 <sup>s</sup>	12.6 <sup>s</sup>	20.3 <sup>s</sup>	21.5 <sup>s</sup>
CZ	62.9	61.0	24.3	23.3	12.3	15.3

Note: s – estimate of EUROSTAT, e – estimated value. Source: EUROSTAT – New Cronos, Science and Technology, 1. 11. 2005, own calculations.

Figure 4: Share of BES in funding R&amp;D (CR, 2002, in %)



Source: EUROSTAT – New Cronos, Science and Technology, 1. 11. 2005.

Assessment of research sectors needs to take into account not only their relative shares in the national research and development system, but also the weight and dynamics of resources for **public and private funding**. The CR achieves values below the EU-15 and the EU-25 average in the share of government expenditure in GDP and the share of corporate expenditure (see Table 4), yet holds a very good position among the new member states (see Figure 5).

Table 4: Business enterprise expenditures on R&amp;D and sources of funding (in %)

	BERD in % of GDP							
	1995	1996	1998	1999	2000	2001	2002	2003
EU-25	1.16	1.15	1.16	1.21	1.23	1.26	1.24	1.23
EU-15	1.18	1.17	1.19	1.25	1.26	1.30	1.28	1.27
CZ	0.62	0.59	0.75	0.73	0.74	0.74	0.75	0.77

Note: EU-25, EU-15 – estimate of EUROSTAT. Sources: EUROSTAT – New Cronos, Science and Technology, 1. 11. 2005.

Binary monitoring of expenditure on research and development according to the source of funding and per-



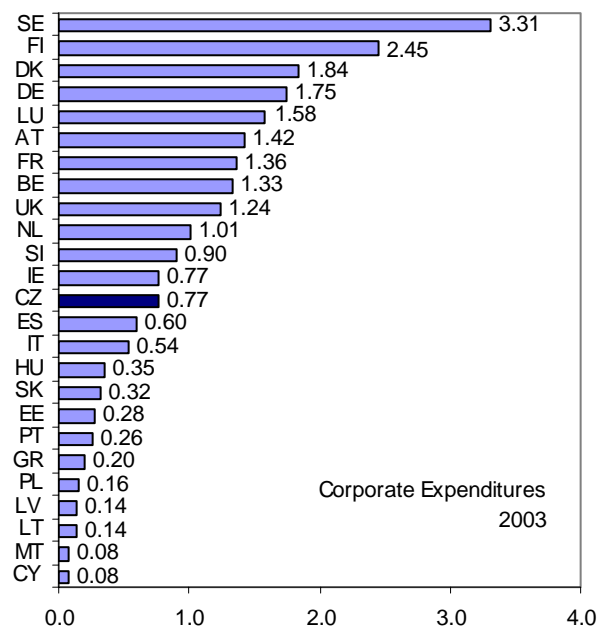
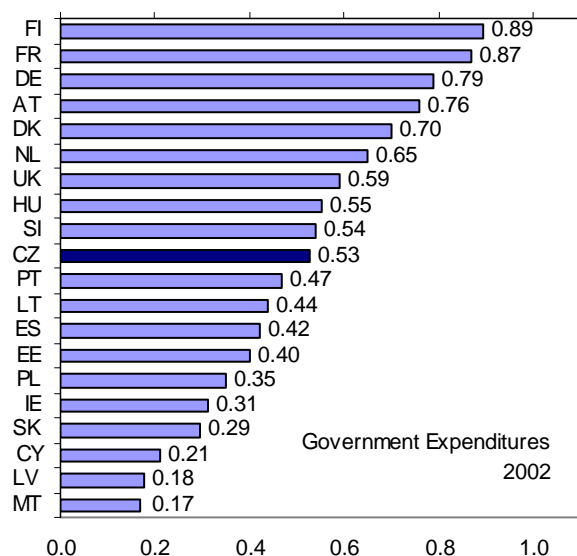
formance as shown in Table 5 allows us to detect the flow of finance between sectors and thus determine the extent of their interactions.

**Table 5: R&D funding by sectors of funding and performance (in %, 2003)**

	Funding		Performance	
	CZ	EU	CZ	EU
BES	51.4	54.3	61.0	63.9
Government	41.8	34.9	23.3	13.0
Higher education	1.2	0.7	15.3	21.8
PNP	1.0	1.6	0.4	..
Foreign and other	4.6	8.5	..	..

Source: EUROSTAT – New Cronos, Science and Technology, 1. 11. 2005.

**Figure 5: Gross R&D expenditures (in % of GDP)**



Sources: EUROSTAT – New Cronos, Science and Technology, OECD – Main Science and Technology Indicators, 1. 11. 2005.

Financial flows between sectors can reveal two situations – closure of sector or its openness. The situation in the Czech Republic can be assessed according to the matrix table, which records sources of funding for research and development on one axis, while the other axis indicates capacities of research and development performance (users of these resources - see Table 6). The governmental sector is characterised by the greatest degree of openness, which arises from its function of an administrator of public finance and its role in supporting research activities. The foreign sector presents a good example of openness – sources of finance are distributed throughout sectors and suggest competitiveness of domestic research (however, in many cases the low costs in domestic research rather than its uniqueness remain the decisive factor for attracting foreign funding). Table 6 also reveals how large part of its resources for research and development the BES consumes in its own research facilities and what portion is covered by contracted research with the HE, the governmental and non-profit sectors.

**Table 6: GERD by source of funding and sector of performance in the CR (2003, mil. of CZK)**

	BES	Gov-ern-ment	HE	PNP.	For-foreign	Total
BES	15928	2359	1	307	1073	19668
Gov-ern-ment	583	6471	233	5	233	7525
HE	48	4571	138	2	163	4922
PNP	30	88	2	8	3	132
Total	16589	13489	374	322	1472	32247

Note: The total sums need not be exact on the last two positions due to rounding. Source: ČSÚ (2004), p. 98.

The BES in the CR obtains 16 % of total sources of R&D funding for performance of its research from other sectors (12.2 % from government resources and the remaining part from the non-profit and foreign sectors). On the other hand, the research commissioned by BES in other sectors only accounts for 3 % of its total resources (mainly in the governmental sector, the academic sector only accounts for 0.2 %). The openness of the BES therefore is not reciprocal – the volume of resources for research and development received from other sectors is far greater than the volume of resources performed externally. Yet an active approach of the BES to the academic science and its share in funding for the HE sector is one of the crucial pillars of the national innovation system. The intensity of connections between the BE and HE sectors in the CR in international comparison is significantly lower than in other Central European countries and below the level in other EU states where the relevant data is available. The BES can receive academic research services from Academies of Science (especially in Poland and Hungary) or governmental laboratories (in other EU countries). However, cooperation with universities has a special role for two reasons: it facilitates transfer of experience from companies to universities and graduates in Ph.D. studies can provide transfer of knowledge from the academic science to companies.

#### Industrial structure of research and development

The analysis of research and development by the structure of the manufacturing industry and services holds special importance for the situation in the Czech Republic, where significant changes in the structure and research and devel-



opment facilities of the manufacturing industry occurred during the 90's. The significance of these changes was influenced by the relatively extensive size of industrial research and development in the socialistic economic regime

and excessively radical intervention of the economic reforms in this field. This resulted in a significant reduction of corporate research (for more details see Kubík, Müller, Neumajer, Obst, 1997).

**Table 7: R&D employees by branches of manufacturing industries and services in the CR (FTE, 1998–2003)**

	In number				Share in total (%)	
	1998	2000	2002	2003	1998	2003
15–22 Food products, textile, wood	239	312	326	336	3.1	2.8
23–24 Coke, fuel, nuclear fuel, chemicals	1262	1099	1156	1203	16.2	9.8
24 Chemicals, chemical products, pharmaceuticals	965	915	911	929	12.4	7.6
24–244 Manufacture of chemicals	708	685	585	569	9.1	4.6
244 Manufacture of pharmaceuticals	257	230	326	360	3.3	2.9
25 Manufacture of rubber and plastic products	290	174	238	269	3.7	2.2
26 Manufacture of other nonmetallic products	197	130	278	310	2.5	2.5
27 Manufacture of basic metals	337	216	147	155	4.3	1.3
28–35 Manufacture of metal products, machinery and transport equipment	5355	5014	5466	5614	68.9	45.8
29 Manufacture of machinery equipment	1774	1425	1427	1358	22.8	11.1
30 Manufacture of office equipment, computers	11	15	14	38	0.1	0.3
31 Manufacture of electric machinery.	489	419	507	523	6.3	4.3
32 Manufacture of radio, television, communication equipment	330	370	482	548	4.2	4.5
321 Manufacture of electronic components	55	77	83	106	0.7	0.9
322 Manufacture of TV, radio sets	275	293	399	443	3.5	3.6
33 Manufacture of medical, optical eq., wathes	238	322	320	422	3.1	3.4
34 Manufacture of motor vehicals	1685	1889	1840	1828	21.7	14.9
36 Manufacture of furniture	67	173	109	120	0.9	1.0
Manufacturing industry	7776	7284	11969	12258	100	100
50–52 Wholesale, retail, repair	43	157	295	273	1.3	4.9
55 Accomodation, restaurants	1	0	0	13	0.0	0.2
60–64 Transport, storage, communication	118	93	140	140	3.6	2.5
65–67 Financial services, banking	0	0	19	27	0.0	0.5
70–74 Real estate, R&D, industrial services	3065	3566	4097	4805	94.5	85.5
72 Computer and related services	193	402	771	1345	6.0	23.9
73 R&D	2682	2891	2954	2856	82.7	50.8
75–99 Community, defense, social services	16	211	334	365	0.5	6.5
Services	3243	4027	4886	5622	100	100

Source: ČSÚ (2005), s. 76–77, own calculations.

Engineering, chemical and electrical industries accounted for three quarters of corporate research at the beginning of the 90's and represented significant concentration of resources. The number of employees in this area was reduced dramatically (from 64 to 8 thousand) during the 90's but inter-industrial proportions changed very little: mechanical engineering maintained its leading position and chemical and electrical industries retained less significant shares of research and development.

Distribution of research and development employment by manufacturing industries shows that the process of restructuring continues to this day. However, some structural trends can now be identified. While the 90's were characterised by a significant decrease in research activities in high-tech industries, less pronounced decline in industries with medium technological demands and an increase in low-tech industries, the latest period by contrast saw an increasing importance of more research intensive industries. This applies especially to production of pharmaceuticals, electrical machines (mainly components and optical devices), other non-metal mineral pro

ducts and motor vehicles. In the case of services, the importance of research and development in business services declined.

#### Other structural aspects of research and development

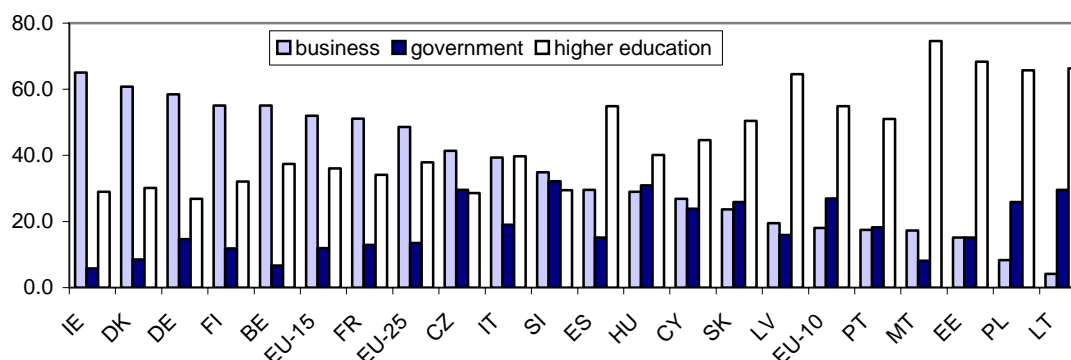
Specialisation, qualification and functional aspects are applied in an analysis of the structure of research and development in addition to the structure by manufacturing branches. The structure according to **research sectors** is shown in Table 8. Sectors with considerable influence of globalisation effects are characterised by a more significant role of the specialisation profile (especially in the BES). The extent of resources plays a major role in the remaining sectors as research is required to cover a whole spectrum of specialisations (this is especially obvious in university education and research). The extent of resources in the HE sector in particular is considerably lower in the Czech Republic than in most EU countries (see Figure 6).

The analysis of the structure of R&D employment by **scientific disciplines** is also associated with the indicator of the

share of female employment (see Table 9). This indicator closely characterises the focus of national university institu-

tions on covering all scientific disciplines and consequently also educational traditions and structures of economies.

Figure 6: Researchers by sectors of research and development (2002, FTE, in %)



Sources: EUROSTAT – New Cronos, Science and Technology, 1. 11. 2005.

Table 8: Researchers by sectors (2002, FTE, in %)

	Business	Government	Higher education (HE)
EU-25	48.6	13.5	37.9
EU-15	51.9	12.0	36.1
CZ	41.3	29.6	28.6

Sources: EUROSTAT – New Cronos, Science and Technology, 1. 11. 2005, own calculation.

Table 9: Researchers by scientific disciplines (CR, 2002, FTE, in %)

	Total	%	Females	%
Natural sciences	4267	28	1160	30
Engineering	6743	45	971	25
Medical sciences	1095	7	546	14
Agricultural sc.	972	6	446	11
Social sciences	1059	7	458	12
Humanities	838	6	336	9
Total	14974	100	3917	100

Source: ČSÚ (2002), p. 98.

However, comparison of the share of female employment in research human resources has a higher information value, despite being introduced in the European statistical practice relatively recently. The focus on increasing the **share of female employment** in research plays an important role in strategies for development of research and development in EU countries. The reasons are generally associated with emancipation. However, they are also a reaction to a limited inflow of new human resources in this area. Female population with university education is expected to provide a crucial resource for the growth of new human resources for research and development.

The situation of the Czech Republic with regards to the above-mentioned emancipation strategy is very poor in relation to other new EU members – the share of women in the overall numbers of employees in research is the lowest (see Table 10). The opportunity for increasing the share of women in research and development is clearly guaranteed by the balanced numbers of men and women in university studies, which have been

generally asserted in all countries. However, participation of women in research will be influenced by embedded cultural traditions that shape the perception of gender differences. This issue is also undoubtedly influenced by the standard of the infrastructure of services, which would allow women to combine their motherhood with their professional roles.

Table 10: Share of females in total number of employees in R&D and researchers (FTE, in %)

	Year	Employees	Researchers
Hungary	2002	45.6	33.7
Slovakia	2002	45.2	40.8
Slovenia	2002	37.8	34.6
Denmark	2002	36.7	26.7
Spain	2002	36.0	35.7
CZ	2002	32.6	26.1
Belgium	2001	27.8	25.6
Germany	1997	23.6	18.1
Austria	1998	22.2	14.0

Source: EUROSTAT – New Cronos, Science and Technology, 1. 11. 2005, own calculations.

Illustrating the level of **regionalisation of research and development** in international comparison is very difficult.<sup>7</sup> However, data for the CR recorded in Table 11 is available. This data shows that the positions of individual regions change irregularly. Nonetheless, the position of the Central Bohemian agglomeration is gradually weakening and many other regions demonstrate increasing dynamics.

<sup>7</sup> Analytical documentation prepared by the European Commission integrates the regional aspect in the R&D analyses. Indicators for research sectors with the least influence of concentration in capital cities of countries, such as the corporate or academic sector, appear to be ideal for this type of analysis. These indicators allow us to determine the positions of individual regions according to the intensity of regional research (for more details see EC, 2003, p. 111).

**Table 11: Employees in R&D by regions – NUTS 3 (FTE, in %)**

	2000	2001	2002	2003
Praha	45.1	41.4	42.0	42.3
Středočeský	12.3	10.9	12.2	13.0
Jihočeský	3.8	3.9	3.9	3.9
Plzeňský	3.5	3.4	3.4	2.5
Karlovarský	0.2	0.4	0.3	0.4
Ústecký	1.4	2.0	1.5	1.3
Liberecký	2.7	2.5	2.7	2.4
Královéhradecký	1.9	2.6	2.8	2.9
Pardubický	3.9	4.4	4.4	3.9
Vysočina	1.4	1.2	1.6	1.6
Jihomoravský	10.9	14.4	12.5	13.1
Olomoucký	4.0	3.5	3.6	3.6
Zlínský	2.6	3.0	3.4	3.0
Moravskoslezský	6.3	6.3	5.7	6.0

Source: ČSÚ (2001, 2003).

### 2.3 Specific conditions for innovation performance

The following analysis uses findings on the importance of individual segments or institutions of the infrastructure for supporting innovation. The emphasis is on characteristics for which analytical and internationally comparable data is available: the importance of qualification for research and development, the influence of the academic and corporate research, the financial sector and regulatory measures and self-regulatory organisations in establishing the infrastructure for supporting innovation.

#### Qualification for research and development

The supply of R&D human resources is influenced by the number of **graduates in Ph.D. programs** in natural and technical sciences. The data on Ph.D. graduates in natural and technical disciplines is recorded in Table 12. Comparison with the USA shows that the value of this indicator for population aged 25–34 years in 2002 is significantly lower in EU countries (0.5 % compared to 1.2 %). Sweden and Finland are the only two countries with values higher than the USA. However, these countries also record a lower share of Ph.D. graduates in natural and technical sciences in the total number of graduates (for example in Finland this share is 40 % and

in the USA 36 %). Comparison of both of these indicators suggests that countries with a higher share of Ph.D. graduates in the population tend to have a lower share of natural and technical sciences – besides Finland, this is for example also the case in Austria and Germany (see Figure 7).

**Table 12: Graduates of PhD studies in natural sciences and engineering**

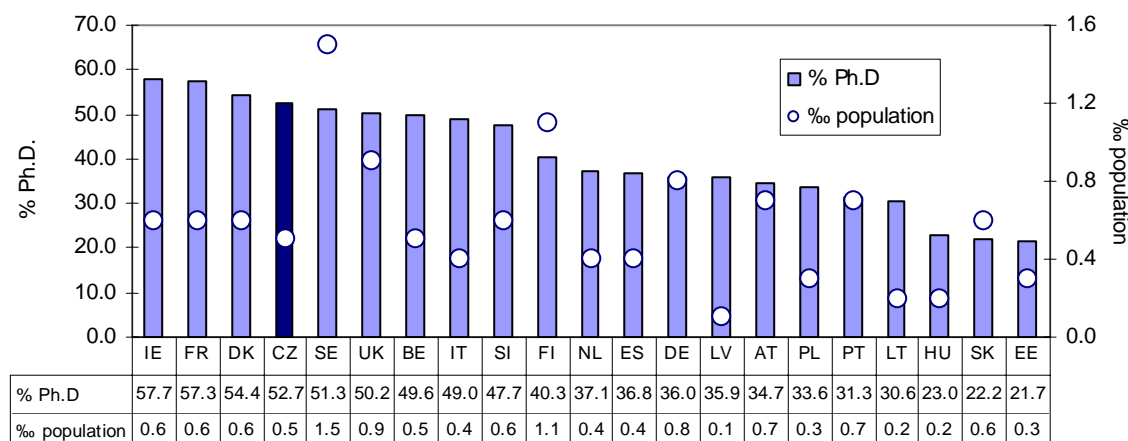
	Share in total of PhD graduates (in %)				
	1998	1999	2000	2001	2002
EU-25	44.3	43.9	44.1 <sup>s</sup>	43.1 <sup>s</sup>	43.1 <sup>s</sup>
EU-15	44.8	44.6 <sup>s</sup>	44.1 <sup>s</sup>	43.9 <sup>s</sup>	43.9 <sup>s</sup>
CZ	56.0	57.2	57.0	52.2	50.6
	Share in population 25–34 years of age (in %)				
	1998	1999	2000	2001	2002
EU-25	..	0.5	0.5	0.5	0.5
EU-15	0.5	0.5 <sup>s</sup>	0.6 <sup>s</sup>	0.6	0.6
CZ	0.3	0.3	0.3	0.4	0.4

Note: s – estimate of EUROSTAT, Source: EUROSTAT – New Cronos, Education and Training, 1. 11. 2005.

The share of Ph.D. graduates in natural and technical sciences in the population aged 25–34 years in the CR is comparable to the EU-25 level in the total amount, as well as in both genders (0.7 % for men and 0.3 % for women). This share has been increasing slightly since 1998. The share of graduates in natural and technical sciences in the total number of graduates remains above the 50 % mark but gradually decreases. Nonetheless, in 2003 the CR still recorded a value well above the EU-25 average.

#### Companies and academic science

Indicators reflecting the intensity of mutual connections between companies and the HE science follow **WEF** and **IMD studies**. **Corporate innovation studies** (CIS), which monitor answers to questions relating to types of cooperating entities in innovation activities, can also be used for this purpose. Considering the specific position of the governmental sector in new EU members, which includes research institutions of academies of science, the inter-sectoral analysis can be extended to relations between the BES on one side and the HE and governmental sectors on the other side. The situation in the

**Figure 7: Graduates of PhD studies in natural sciences and engineering (2003)**


Source: EUROSTAT – New Cronos, Education and Training, 1. 11. 2005.

CR in this area has been discussed above (see Table 6 and the relating text). According to available international studies companies in the EU participate in implementation of research and development in the governmental sector the most in Poland and this share also exceeds 10% in Latvia, Lithuania, Finland, Slovakia, Slovenia and Great Britain. Besides the leading Latvia, Hungary and Germany also record the highest share of companies in research and development carried out at universities. Transfer of BES sources of funding from the governmental sector to the academic sector can be observed in Hungary, while the share of BES source of funding in the governmental sector in Germany is traditionally very low. This comparison places the Czech Republic among countries with a relatively low share of companies in implementation of research and development in the governmental sector but also a negligible share of companies in implementation of research at universities.

The data by WEF is used for wider comparison (based on an expert survey) of **cooperation** between companies and universities in implementation of research and development (see Table 13, Figure 8). Finland, Sweden, Netherlands, Belgium and Germany show the best long-term positions on average according to this comparison (Austria and Great Britain also hold strong positions). The Czech Republic shows gradual improvement: it held the 11<sup>th</sup> place in the EU-25 in 2004 and the best position among new member states. This assessment is in strong contrast with the above-mentioned negative evaluation of the share of the BES in funding research and development in the HE sector. The situation in Slovenia did not change compared to 2001, while Hungary recorded the greatest deterioration.

**Table 13: Co-operation between firms and local institutions of higher education**

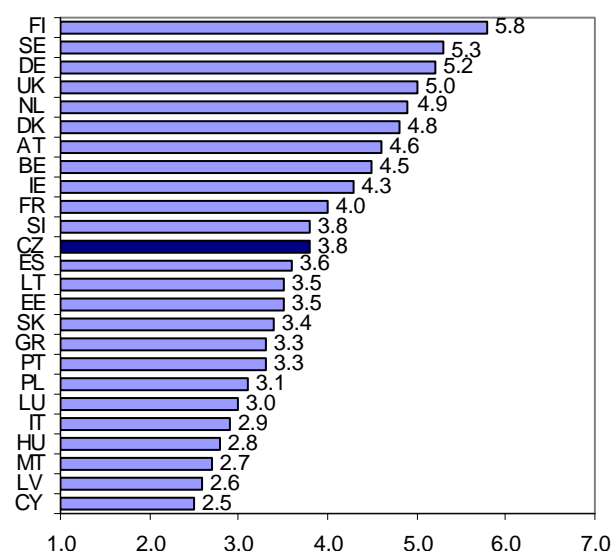
	EU-25	EU-15	CZ
1998	4.28	4.46	3.55
1999	4.36	4.51	3.69
2000	4.26	4.38	3.30
2001	4.59	4.91	4.10
2002	4.21	4.56	4.10
2003	3.99	4.34	3.70
2004	3.85	4.30	3.80

Note: 7 – best evaluation, 1 – worst evaluation. EU-25 a EU-15 – non-weighted averages. Sources: WEF – Global Competitiveness Report 1998–2004, own corrections.

The data listed above shows that traditional Central European countries (Germany, Austria) and Scandinavian countries have the best situation in relationships between companies and the HE sector (see Figure 8). Most of the new member states also report a good quality of these relationships, especially when the governmental sector is included in the assessment. The detected situation is influenced by traditionally established forms of institutionalisation of research and development.<sup>8</sup> The socialist past state's intervention in the

institutional framework of academic science in the Czech Republic significantly strengthened centralist tendencies and weakened especially the position of research and development at universities (unlike Poland and Hungary, where universities maintained their role in research).

**Figure 8: Co-operation between firms and local institutions of higher education (2004)**



Note: 7 – best evaluation, 1 – worst evaluation. EU-25 a EU-15 – non-weighted averages. Sources: WEF – Global Competitiveness Report 1998–2004, own corrections.

### Government support for research and development

International comparison shows (see Table 14 and Figure 9) that the EU-25 is experiencing a slight growth in the share of **GBAORD in GDP**. However, the recorded value still lags behind the USA figure (1.14 %). The structure of expenditure in the EU differs significantly to the benefit of civil research and development (however, it is necessary to point out that the civil expenditure in the USA is strongly underestimated due to a different methodology of recording GBAORD). Great Britain, Spain, France and Sweden record the highest share of defence research in GBAORD in the EU. General research at universities and undirected research represent the most significant items in the EU with regard to **socioeconomic objectives**, although individual countries differ greatly in their shares of both items. The data on GBAORD in a longer time series for the Czech Republic is not available. In the basic structure, 96.7 % of expenditure accounts for civil research and the remaining part for defence research. General research at universities (28 %) and undirected research (26 %) represented the largest items with regard to socioeconomic objectives, while 10 % of expenditure accounted for production and technologies.

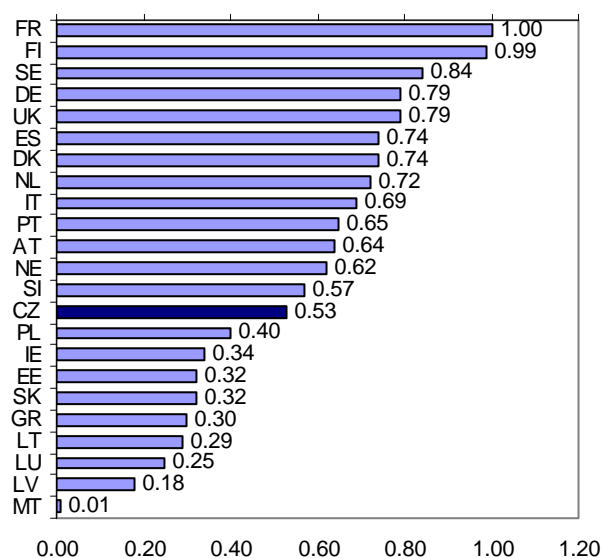
<sup>8</sup> This image reflects the traditional decentralised model of science organisation, which expanded from Central Europe (the so-called German model) to the Anglo-Saxon area and later found widespread application. Combination of research and teaching and openness to

the needs of corporate science was one of the main features of this model (for more details see Müller, 2002). The adoption of this approach in Scandinavian countries is supported by the focus on the emancipating role of education and the importance of universities in these societies.

**Table 14: Outlays of government budget to R&D (in %)**

	Total (% of GDP)			
	2000	2001	2002	2003
EU-25	0.73 <sup>s</sup>	0.74 <sup>s</sup>	0.77 <sup>s</sup>	0.77 <sup>s</sup>
EU-15	0.75 <sup>s</sup>	0.76 <sup>s</sup>	0.79 <sup>s</sup>	0.79 <sup>s</sup>
CZ	..	..	0.51	0.53
	Civil R&D (% GDP)			
	2000	2001	2002	2003
EU-25	0.62 <sup>s</sup>	0.64 <sup>s</sup>	0.65 <sup>s</sup>	0.67 <sup>s</sup>
EU-15	0.64 <sup>s</sup>	0.65 <sup>s</sup>	0.65 <sup>s</sup>	0.66 <sup>s</sup>
CZ	..	..	0.49	..
	% Government expenditures			
	2000	2001	2002	2003
EU-25	..	..	..	..
EU-15	1.62 <sup>s</sup>	1.62 <sup>s</sup>	1.64 <sup>s</sup>	..
CZ	..	..	1.10	1.00

Note: s – estimate of EUROSTAT. Source: EUROSTAT – New Cronos, Science and Technology, 1. 11. 2005.

**Figure 9: Outlays of government budget to R&D (2003, in % of GDP)**


Source: EUROSTAT – New Cronos, Science and Technology, 1. 11. 2005.

### Venture capital

EUROSTAT presents the data on venture capital as a part of structural indicators expressing its relative share (in % of GDP) and structuration by **investment stages** (see Table 15 and Figure 10). The concept of venture capital according to the definition by EUROSTAT excludes purchase by internal or external management or purchase of quoted shares. EVCA (*European Private Equity and Venture Capital Association*) provide data on venture and equity capital for European countries which are gathered by European Private Equity surveys.

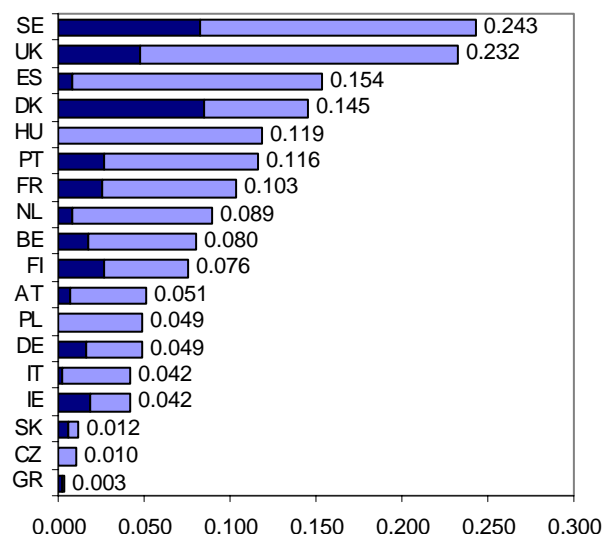
When the international context of creation and application of venture capital is taken into account, we can conclude that the importance of expenditure on **venture capital** remains on average very low in the EU compared to the USA (half of the USA level in 2003). On average just under one fifth of the total venture capital in the EU is intended for the initial stages of company development. This share is higher than 40% in Denmark, Sweden and Portugal only. Finland, Ireland, Switzerland and Austria are the most attractive countries for foreign venture capital

as they received higher volumes of venture capital from abroad than from domestic resources. Banking institutions in Sweden, Great Britain and Netherlands were able to create larger sources of venture capital than the volume of these resources obtained by domestic companies from abroad (see OECD, 2005f, p. 42).

**Table 15: Expenditures on venture capital by stages of business development (in % GDP)**

	Early and starting stage					
	1999	2000	2001	2002	2003	2004
EU-15	0.038	0.075	0.045	0.029	0.021	0.023
CZ	0.001	0.026	0.010	0.001	0.001	0.000
	Expansion stage and transfer of ownership					
	1999	2000	2001	2002	2003	2004
EU-15	0.103	0.154	0.099	0.081	0.088	0.085
CZ	0.047	0.175	0.029	0.037	0.002	0.010

Source: EUROSTAT – Structural Indicators, Research and Innovation, 1. 11. 2005.

**Figure 10: Expenditures on venture capital by stages of business development (2004, in % of GDP)**


Source: EUROSTAT – Structural Indicators, Research and Innovation, 1. 11. 2005.

The Czech Republic holds one of the lowest positions in the EU-25 with regard to the importance of investment in venture capital. The share of venture capital in the initial stage of company development is approximately one third. In terms of technological orientation, the largest share of capital in high-tech industries is intended for communication technologies and the importance of other industrial groups is low. Adverse data on the use of venture capital is supported by evaluation of this indicator in surveys by WEF and IMD, according to which the CR was on the 20<sup>th</sup> place in the EU-25 or on the 18<sup>th</sup> place in the EU-21 in 2004.

### Scientific and technical publications, patent statistics

The hub of scientific production was transferred from Europe to the USA after the World War II. The EU surpassed the USA in mid 90's as the largest **producer of scientific literature** in absolute and relative representation (in the share in the scientific output worldwide). The situation has been changing since the beginning of the new century and the position of the EU has been deteriorating.



rating in relation to the USA. Scandinavian countries and the Netherlands hold the best position in the number of scientific and technical publications per capita on a long-term basis (see Figure 11). The range of specialisations in the EU is very diverse and typically focuses on a limited number of fields, reflecting partially the size of the relevant country and partially the country's technological profile. The Czech Republic is among the countries with below-average scientific and technical publication and quotation productivity in the EU-25 (see Table 16). Moderate but long-term improvement in this productivity can be seen as positive. With regard to scientific disciplines, the situation in the Czech Republic is the best in mathematics, engineering and clinical medicine. Scientific output in the CR specializes in technical sciences, in particular chemistry.

The **patent statistics** study the second aspect of scientific and technical performance. Table 17 describes the position of the EU-25 according to the **number of patent applications** at EPO per capita. However, there are considerable differences between countries or their groups (see Figure 11). Sweden holds the leading position on a long-term basis, other leaders include Finland, Germany and the Netherlands, where the patent performance has grown significantly compared to 1998. All new member states and Spain, Portugal and Greece significantly lag behind the average, with Slovenia holding the best position in 2002. Finland, the Netherlands and Sweden are the leaders in advanced technologies and the patent performance of less developed countries is negligible.

**Table 16: Number of scientific and engineering publications per 1000 population**

	EU-25	EU-15	CZ
1995	0.567	0.637	0.305
1996	0.652	0.734	0.363
1997	0.666	0.748	0.365
1998	0.724	0.812	0.387
1999	0.734	0.822	0.392
2000	0.735	0.820	0.408
2001	0.758	0.843	0.440
2002	0.745	0.825	0.457
2003	0.822	0.909	0.512
2004	0.789	0.869	0.505

Source: ISI Web of Science (publications), 1. 11. 2005; World Bank – World Development Indicators (population), own calculations.

**Table 17: Patent applications in European Patent Office (per million of population)**

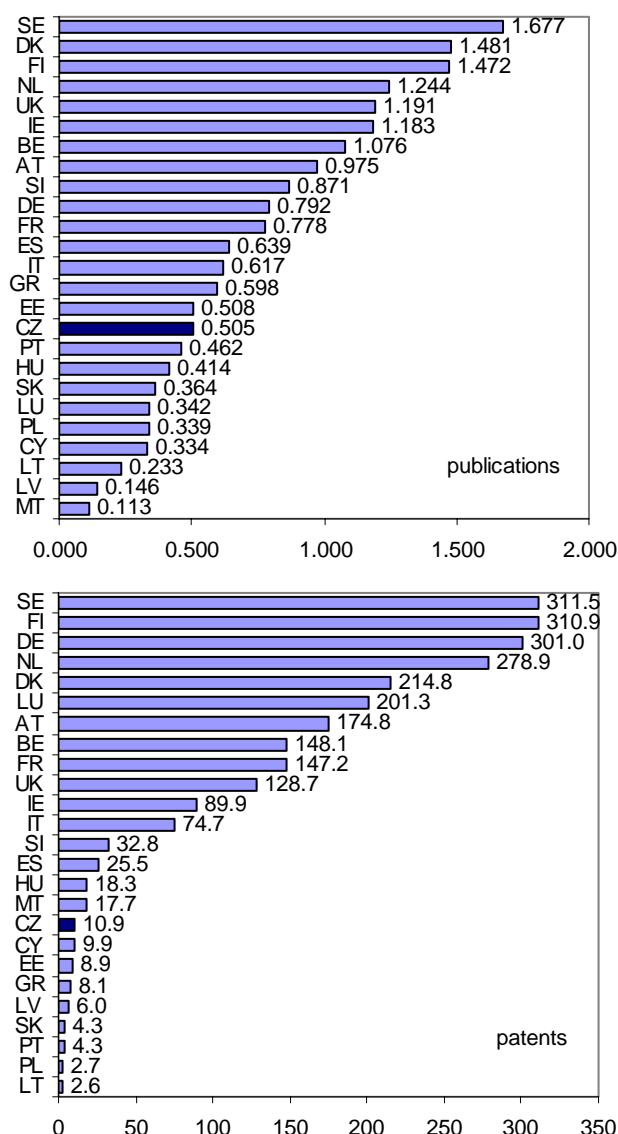
	Patent in total				
	1998	1999	2000	2001	2002
EU-25	109.2	118.3	133.6	142.0 <sup>s</sup>	133.6 <sup>ps</sup>
EU-15	130.0	141.0	158.7	168.3 <sup>s</sup>	158.5 <sup>ps</sup>
CZ	9.7	9.8	13.5	11.4	10.9 <sup>ep</sup>
	High-tech patents				
	1998	1999	2000	2001	2002
EU-25	16.3	19.5	24.6	28.4 <sup>s</sup>	26.0 <sup>ps</sup>
EU-15	19.5	23.2	29.4	33.7 <sup>s</sup>	30.9 <sup>ps</sup>
CZ	0.7	0.6	0.8	0.8	0.5 <sup>ep</sup>

Note: s – estimate of EUROSTAT, p – preliminary value, e – estimated value. Source: EUROSTAT – New Cronos/European and US Patenting System.

The Czech Republic is one of the EU-25 countries with low patent performance. The number of patent applications per

million of residents was 11 in 2002, which means a decline compared to 2000 and a result lower than one third of the level of Slovenia in 2002. High-tech patent applications did not even reach one during the entire period.

**Figure 11: Number of scientific and engineering publications per 1000 population (2004) and a number of patent applications in EPO per million of population (2002)**



Source: ISI Web of Science (publications), 1. 11. 2005; EUROSTAT – New Cronos/European and US Patenting System, 1. 11. 2005.

## 2.4 Innovation performance of companies and quality of environment

Results of innovation surveys (*Community Innovation Survey – CIS*) are the main source of data on innovating domestic companies. Czech Statistical office participated in the last two rounds of CIS (1999–2001, 2002–2003), which means that this data can be used to analyse the innovation potential of the BES in the CR. The data describes the level and structure of innovation sources and factors influencing this level and structure. Findings from two individual surveys of innovation sources and performance carried out in the Czech Republic are also mentioned.

### Innovating companies and innovation in the CR

The following analysis is based on CIS data for the period 1999–2001, while the data from the latest survey (2002–2003) is used in addition for closer interpretation. The share of **innovating companies** represents the first approximate indicator of innovation activity in the relevant country. Table 18 describes this indicator and states types of innovation (including possible combinations) and the data is structured by branches of the manufacturing industries and services. The data shows that innovating companies account for less than 29 % of all companies. This indicator is slightly higher in the manufacturing industry and lower in services. The data from CIS 2002–2003 for the CR is slightly lower but with similar proportions between branches (manufacturing industry 28.4 % and services 22.8 %).

**Table 18: Innovating firms by type of innovation (share in total number of firms, in %, 1998–2000, 2001–2002)**

	Total			
	Product or process	Product	Process	Product and process
EU-25	36.2	12.3	8.4	14.3
EU-15	39.0	13.5	9.4	15.8
CZ	28.5	11.9	5.2	11.5
Manufacturing				
EU-25	39.1	12.6	9.5	16.7
EU-15	42.1	13.4	10.5	17.8
CZ	30.2	11.7	5.1	13.4
Services				
EU-25	32.6	12.5	7.0	11.9
EU-15	35.0	13.8	7.8	13.3
CZ	26.2	12.6	4.9	8.7

Source: EUROSTAT – New Cronos, Community Innovation Survey – CIS3, 1. 5. 2005, own calculations.

CIS data allows us to detect the relationship between the **size of companies** and their innovation activity. Table 19 shows that larger innovating companies are more frequent (around 60 % of all companies with 250 or more employees). The following group of medium-sized enterprises includes almost 40 % of companies with innovation oriented production or services, while the remaining group of small companies focuses on innovation to a limited extent (around 20 %). The data on **types of innovation activities** provide additional characteristics of innovation companies. The expended costs suggest the relative weights of individual operations in innovation activity of a company. The extent of expenditure on innovation in innovating companies remains limited – amounts to 2 % of their total revenues. As shown in Table 20, expenditure for purchasing machines and technical equipment is dominant in all sizes of companies. Smaller companies are characterised by lower expenditure on research and development (including external research) and higher expenditure on obtaining the required knowledge and launching innovations on the market.

**Table 22: Most important market for innovating firms by their size (CR, 1999–2001, share of firms in %)**

	Regional	National	Foreign
Small	14.0	44.5	41.5
Medium	4.2	30.2	65.6
Large	5.1	17.7	77.2

Source: ČSÚ (2003a).

**Table 19: Share of innovating firms in total number of firms in the given size group (by number of employees, in %)**

	Small (0–49)	
	1999–2001	2002–2003
Total	23.4	22.0
Manufacturing	23.0	23.5
Services	24.3	22.0
Medium (50–249)		
Total	38.4	36.0
Manufacturing	35.6	38.8
Services	39.5	31.0
Large (250 +)		
Total	64.2	57.0
Manufacturing	65.7	63.3
Services	49.6	40.0

Source: ČSÚ (2003, 2005).

**Table 20: Expenditures on innovation by type of expenditure and size of firm (CR, 1999–2001, in %)**

	Small	Medium	Large	Total
Intramural R&D	14.4	33.5	20.1	22.0
Acquisition of R&D	3.5	8.6	9.1	8.1
Acquisition of machinery and equipment	41.2	38.4	47.8	44.8
Acquisition of other external knowledge	12.5	5.0	9.9	9.3
Training	3.9	1.1	2.8	2.6
Market introduction	22.0	11	7.7	10.7
Design	2.5	2.3	2.6	2.5

Source: ČSÚ (2003).

**Table 21: Expenditures on innovation by type (CR, CIS, in %)**

	1999–2001	2002–2003
Intramural R&D	22	24
Acquisition of R&D	8	9
Acquisition of machinery and equipment	45	33
Acquisition of other external knowledge	9	10
Training	3	2
Market introduction	11	18
Design	2	4

Source: ČSÚ (2003a, 2005b).

### Business environment of innovating companies

CIS detects characteristics of the business environment of innovating companies from quantitative data (for example according to the share of markets of various sizes in receipts from innovated products) and from evaluation made by innovation actors (for example on the importance of obstacles in innovation activities). From the perspective of conditions for the **application of innovation outputs**, Table 22 shows that entry at global markets is an important factor influencing innovation performance of companies. Although this effect is clearly dominant in large companies, it also influences small and medium-sized enterprises.

Companies also evaluate the significance of individual motivating factors for introducing **new products or services**. The largest portion of respondents (around 30 %) states that the range of products or services and the quality of production play an important role, the following factors

include expansion of markets and production (15–20 %), opportunities for savings in production (10–15 %), regulatory measures especially with regard to the environment (10 %) and material saving (less than 10 %). The importance of market-oriented motivation therefore prevails in the focus of innovation activities. International comparison in this regard has a limited information value because the monitored factors represent symptoms of nationally specific cultural background. The only conclusion that can be drawn from this data is the fact that the fulfilment of regulatory measures and standards plays a more important role in motivation of innovating companies in the EU-15 than in new member states.

Evaluation by respondents focused on the availability of (internal and external) **innovation resources** and the impact of various factors of the business environment provides a broader outlook. The survey results suggest that unavailability of financial capital connected with high costs of innovation is the most important limiting factor (approximately 30 % of companies consider this factor significant and 60 % of companies consider it moderately significant). The following factors include excessive venture (significant for 20 % and moderately significant for 50 %) and a lack of qualified labour force and low demand for innovation (significant for 10–15 % and moderately significant for 30–40 %). The impact of other factors associated with availability of information of flexibility of organisation is evaluated as less significant or insignificant (70–85 % respondents).

Table 23 lists data on selected indicators describing the position of domestic innovating companies in **international comparison**. The innovation intensity is described in the indicator of expenditure on innovation (in % of revenues), which includes expenditure on related activities. The level of participation of innovating companies in cooperative networks is reflected in the indicator of the share of companies that concluded agreements on cooperation in innovation activities with other companies or institutions during the monitored period. Cooperation in this context means active participation in research, development and other innovation oriented projects with other organisations.

**Expenditure on innovating activities** in the EU-25 range from 2.7 % in Belgium to 0.5 % of revenues in Denmark. The average relative expenditure on innovating activities in the manufacturing industry is more than three times as high as in services. Smaller new member states (Hungary, Cyprus, Latvia, Lithuania) and Finland have the largest shares of cooperating innovators (more than 40 % of innovating companies). Companies operating in services cooperate less frequently than companies in the processing industry. From the perspective of **economic effects** expressed as a share of revenues from innovated products in total reve-

nues, Germany records the highest values in products that are new for the company and Finland has the highest values in products that are new for the market (see Figure 12). The economic effects of innovations in the manufacturing industry are on average higher than in services.

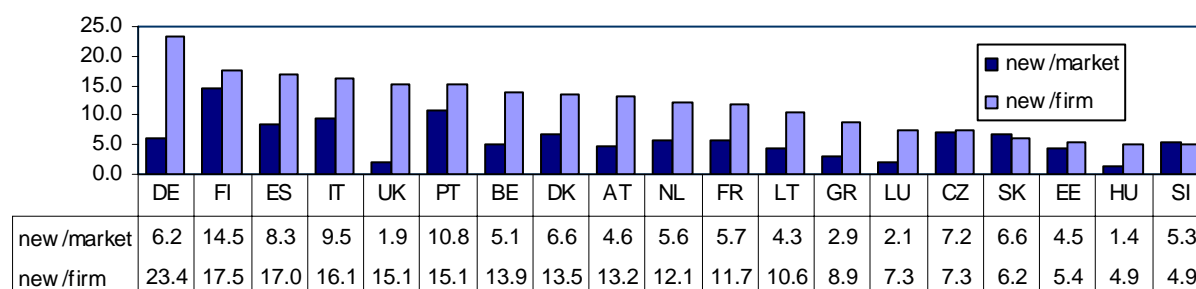
**Table 23: Overview of activities in the innovating firms (CR, in %, 1998–2001)**

	Total			
	expendi- tures	coopera- tion	new/ market	new/ firm
EU-25	2.1	..	5.9	16.8
EU-15	2.2	..	5.9	17.1
CZ	1.1	24.0	7.2	7.3
Manufacturing				
EU-25	3.5	..	7.8	20.9
EU-15	3.5	..	7.8	21.2
CZ	1.5	24.8	10.8	10.7
Services				
EU-25	1.1	..	4.4	14.5
EU-15	1.1	..	4.3	14.8
CZ	0.7	22.3	4.6	4.7

Note: expenditures – expenditures on innovation activities in % of sales, cooperation – % of firms cooperating in innovation activities, new/market, new/firm – share of sales of products, which are new for market/ firm in total sales. Source: EUROSTAT – New Cronos, Community Innovation Survey – CIS3, 1. 5. 2005, European Commission – European Innovation Scoreboard Database 2004.

Compared to the EU-25, Czech companies expend the second lowest share of their revenues on innovation activities, cooperate less with other organisations in implementation of innovation activities and record lower effects of products that are new for the company with regard to their share in total revenues, while the effects from products that are new for the market are slightly higher than the average figure in the EU-25 (higher in the manufacturing industry). In inter-sectoral comparison the Czech Republic lags behind the EU-25 less in services than in the manufacturing industry. In terms of other than technological changes, the highest number of companies with innovation activity introduced significant aesthetic changes (49 %), which are followed by changes in strategies (39 %) and changes in organisational structures (38 %). The share of companies with other than technological changes places the Czech Republic on average on the 12<sup>th</sup> place in the EU. The share of companies that protect their innovations through formal or informal means is low in the CR. The majority opts for protection through trademarks (23 %), while patents account for the smallest portion (8 %).

**Figure 12: Sales from product innovations (in % of total sales, 1998–2000)**



Source: EUROSTAT – New Cronos, Community Innovation Survey – CIS3, 1. 11. 2005; European Commission – European Innovation Scoreboard Database

### 3. Information society and ICT

This section identifies the innovation potential and effects of information and communication technologies (ICT) influencing the quality and competitiveness of economic entities and the society as a whole. It also analyses problems and constraints in achieving these effects. It covers four topics – analysis of overall characteristics of the information society development, analysis of demand for ICT, analysis of supply on the ICT market, and analysis of utilisation of ICT at the corporate level. The analysis is based on examination of opportunities and problems associated with three basic elements of any information system, i.e.: ICT applications (application software and its deployment in national or corporate information systems, whether of a standard or specific character), technological infrastructure of ICT (especially technical equipment, computer networks and security facilities) and ICT services (activities provided to users incl. their content, organisational, personnel and economic resources).

#### 3.1 Information society

The term **information society** refers to widespread deployment of information and communication technologies in all types of economic and other human activities. However, this new and rapidly developing area is naturally characterised by significant inconsistency in defining the basic terms and this makes any comparison complicated. The increasing importance of the information society development is reflected in initiatives of the European Union, which created a long-term program called **e-Europe**. This a strategy for achieving competitiveness of the EU in relation to the USA and Asian countries. Basic cross-sectional indicators in international comparison for the EU-25 (or OECD) countries are used to initially analyse assessment of the information society development and the position held by the Czech Republic in this regard. However, the persisting limited information value and insufficient availability of indicators for individual countries or over time are among the major problems occurring in this context.

#### Information society and development in ICT utilisation

Development of the information society (and the information industry) is based on gradual harmonisation of information technologies, communication technologies and information content (information services). ICT industries are significantly influenced by **competitiveness of individual countries** – their specific character arises from the fact that while these industries as such bring economic effects, they are also a source of growth in other industries. Based on the e-Europe initiative ICT therefore became one of the basic elements of the Lisbon Strategy.

The importance of ICT industries is demonstrated by their share in GDP of the EU, which increased from the initial 4 % at the beginning of the 90's to 8 % in 2000, their share in employment (6 %) and research and development expenditure (18 %). During 1996–2000 labour productivity in ICT industries recorded the average annual increase of 9 %. Furthermore, ICT have a significant impact on increasing productivity in other industries (during 1995–2000 this influence was estimated at 40 %) (see EC, 2002).

Information and communication technologies are becoming an **integral part** of a wide spectrum of products and

services, increasing their useful value (for example in cars, design, banking and other services). They enhance the effectiveness of state administration processes and services provided to individuals and economic entities. Moreover, ICT provide access to information, knowledge and education to the general public and thus increase the quality of life.

#### Information society development in international comparison

ICT applications have spread very rapidly over the last few years and become essential for most economic and social activities. However, their heterogeneity and the cost of their operation and maintenance have increased at the same time. Table 1 presents comparison of the key application areas in individual development stages and the focus of the main monitored indicators of ICT utilisation.

**Table 1: Development stages of ICT implementations and performance metrics**

	Implementation fields	Metrics of use
70–80's	Automation of product design, production planning support	Production increase
90's	Internal integration solutions, support of sale	The better quality and sales development
Present	External integration support, the flexible business processes, products innovations, e-Business methods	The better quality and increase of key performance indicators
Future	e-Health e-Learning e-Security .....	The better quality and increase of key performance indicators, the complex innovations

Source: Own calculations.

While development of the information society is assessed from a wide range of aspects, this text will focus mainly on the following: level and basic structure of expenditure on ICT, development of communications, extent of internet use, broadband internet use, utilisation of internet services for personal and commercial purposes, internet use in various types of enterprises, development of electronic business and comprehensive assessment of networked readiness.

Therefore, the main focus is in harmony with worldwide statistics and analysis of the development of a global information environment (especially the internet), the extent and structure of its use or the use of its services in individuals and households, as well as companies and public administration.

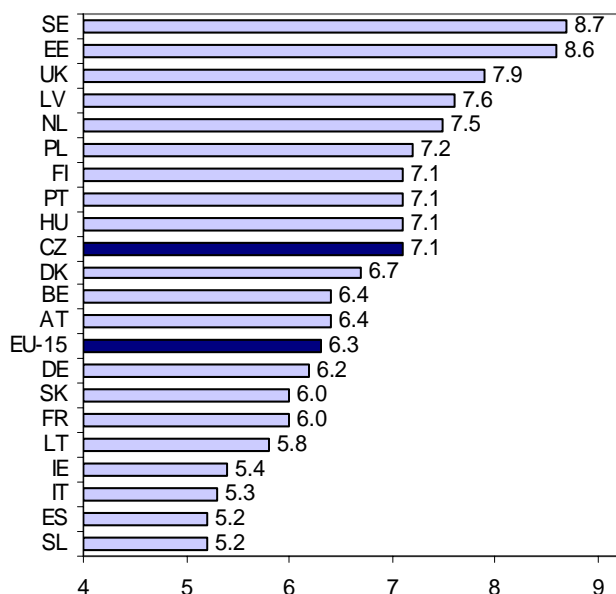
#### Expenditure on ICT and communications development

**ICT expenditure** reached a high level at the end of the 90's and culminated in 2000 in connection with investments in solving problems associated with the transition of information systems to the new millennium. Two years of significant decline followed, partially as a result of the weak economic growth achieved by developed countries. Since 2002, ICT investments have been rising (on the global scale). The EU-25 as a whole falls behind the



USA and Japan in their share of ICT expenditure in GDP (6.4 % compared to 7.8 % in the USA and 8.0 % in Japan). There are significant differences between individual EU countries regarding the level of this share, as well as its structure (see figure 1).

**Figure 1: Share of information and communications technologies expenditure as a percentage of GDP (2004)**



Source: EUROSTAT – New Cronos, Information Society Statistics, to 6. 1. 2005.

The average levels of expenditure on both elements of ICT are virtually equal in the EU-15. The new member states (data for Cyprus and Malta is not available) are characterised by higher expenditure on communication technologies compared to information technologies. This in most cases considerable difference indicates a combination of high investment in the creation and development of a modern telecommunication infrastructure and (potential) underestimation of expenditure on information products and services.

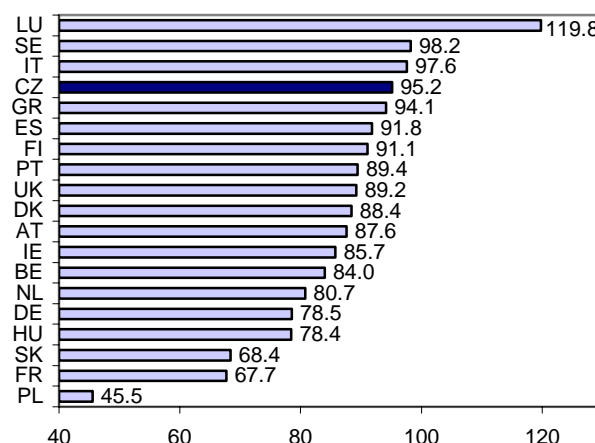
The quality and development of **telecommunication networks** is currently one of the key factors influencing the economic level and the ability to enter into international business relationships. This includes fixed, as well as mobile communication means. The number of fixed telephone lines is gradually decreasing as they are being replaced by mobile networks. Connection to the digital ISDN network is also giving way to combinations of DSL (Digital Subscribe Line) technologies, mobile services and cable TV modems.

Figure 2 shows the number of mobile phones per 100 residents. Except for the specific case of Luxembourg, most developed countries are within the range from 80 to 95 mobile phones per 100 residents.

The results for the Czech Republic are very positive in this regard, as 95.2 mobile phones per 100 residents places the country among the leading EU states (unlike in the numbers of land lines). The combined year-on-year growth between 1998 and 2003 achieved in the CR is the highest in the EU (24.3 %). However, this growth is influenced by the very low initial level of mobile

phone ownership and similarly high growth was therefore recorded also in Hungary, Slovakia and Poland. The positive results in mobile phones in the Czech Republic are influenced by a range of factors (intense competition among mobile operators, a massive marketing campaign and the population's flexibility in relation to these technologies).

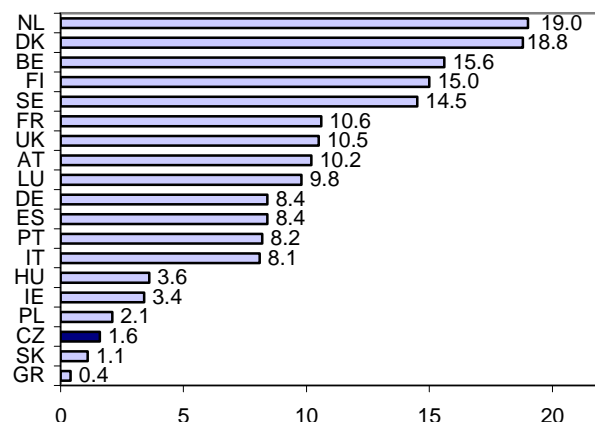
**Figure 2: Mobile phones per 100 inhabitants (2004)**



Source: OECD – Telecommunications Database 2005, to 6. 1. 2005.

Not only dissemination of mobile technologies is a basis for increasing the economic performance through improved speed and quality of communication processes, but it also creates a significant potential for development of various types of mobile trading. The situation regarding the use of the **broadband internet** in the CR compared to other countries is not as positive.

**Figure 3: Number of broadband users per 100 inhabitants (2004)**



Source: OECD (2005c).

Figure 3 shows that the utilisation of broadband internet technologies in the CR is currently relatively limited (1.6 users per 100 residents). However, more detailed data on the development in 2004 reveal that in the third quarter the CR recorded the fourth strongest increase out of all monitored countries. It is necessary to point out that wider dissemination of these technologies is not purely a source of internet entertainment (as it generally appears) but also a prerequisite for deployment of business applications, inter-company coopera-



tion, educational programs, management and implementation of research and other initiatives with high demands on information and especially graphics.

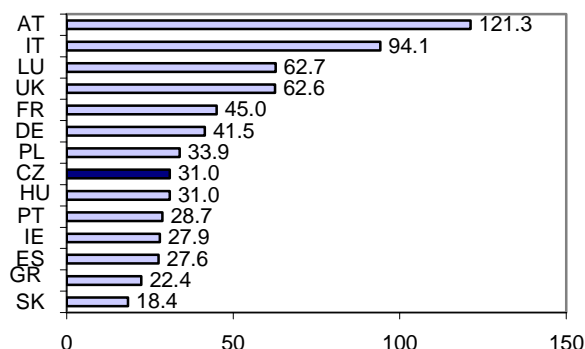
The deployment of these types of applications is subject to the level of ICT equipment in households, in particular the use of high-speed internet connections, which is currently influenced by the economic rather than technological factors. This is also the reason behind the current relatively low use of electronic trading applications, i.e. e-Business executing relationships between suppliers and end consumers.

#### Internet infrastructure and use

**Internet infrastructure** and its quality are becoming an increasingly important basis for economic and other human activities, thus influencing the development of the economy and the society as a whole. The internet infrastructure is determined by the extent and number of operated computer connected to the internet (hosts) and the structure of administered domains.

The total of 233 million hosts worldwide was connected to the internet at the beginning of 2004 (compared to 30 million in 1998). There were more than 150 million generic domains registered for various organisations (generic top level domain – gTLD), of which 100 million accounted for the .net domain and 49 million for the .com domain. The number of connected hosts per 1,000 residents in 2004 is shown in figure 4.

Figure 4: Internet hosts per 1000 inhabitants (2004)



Source: OECD (2005b).

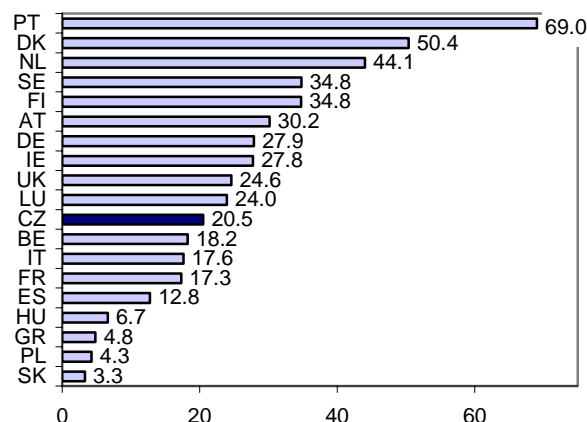
Measuring **real internet use** is naturally very difficult. Numbers of internet users - individual users, as well as households - are used as the basis for these figures. The numbers of internet users in the EU countries per 100 residents in 2004 are shown in figure 5.

The Czech Republic (with 4.5 % households with broadband internet) is among the last countries in the EU, falling even behind Poland (8.3 %) and Hungary (5.8 %). This undesirable position caused by the current pricing policy in the CR and a lack of preparedness in the population will subsequently mean a relatively slow growth of more demanding e-Business applications and other applications based on these technologies.

The internet infrastructure offers a range of **services and applications** and the level of their utilisation nowadays influences the performance of individuals, as well as entire organisations. These services in-

clude especially electronic mail, internet telephony, business activity oriented information services provided by www applications, communication between residents or enterprises and the state administration, etc. For example, the e-mail service was used in the CR in 2004 on average by 27 % of the adult population. Rapid increase can therefore be reasonably expected in this regard.

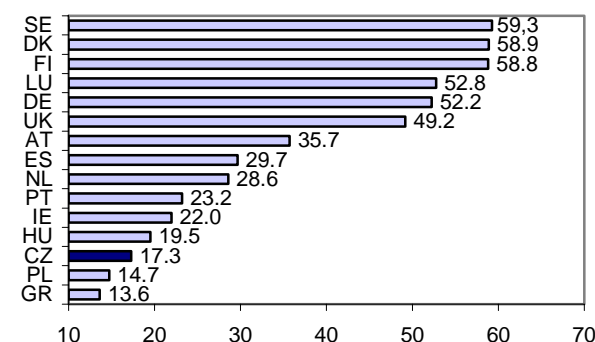
Figure 5: Number of internet users per 100 inhabitants (2004)



Source: OECD – Telecommunications Database 2005, to 6. 1. 2005.

Searching for information on products and services offered is clearly the most frequently used business oriented internet service for residents (see figure 6). This service is widely used by the adult population especially in Scandinavian countries and Germany. In addition, the internet banking services are also in high demand in these countries.

Figure 6: Commercial use of the internet as a percentage of adults (2004)



Source: EUROSTAT (2005b).

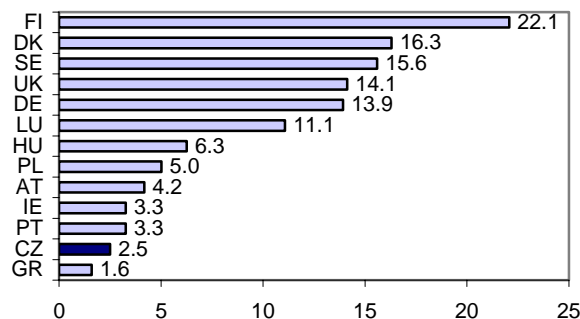
Table 2 documents significant differences between the CR and other developed countries in various forms of internet use. This is not due to a lack of business applications on the Czech market, but mainly due to the prevailing doubts in the population regarding the security of these applications, insufficient qualification of the general public and the previously presented differences in the presence of high-quality broadband connection mainly in households.

**Table 2: The use of internet as a percentage of adults (2004)**

	Products information	Purchases/orders	Banking services
Czech Republic	17.3	5.2	4.9
Finland	58.8	26.0	50.3
Germany	52.2	31.9	26.4
Poland	14.7	3.8	4.0
Austria	35.7	13.4	18.3
Sweden	59.3	26.6	40.3
Great Britain	49.2	30.5	22.4

Source: EUROSTAT (2005b).

Internet job searching is among highly sought-after services in many EU countries. The use of this service is documented in figure 7. Although the use of this service in the CR is currently at a very low level, common practice suggests that a rapid increase in the use of this service can be expected owing to the high quality of www servers in this area.

**Figure 7: The use of internet in the job seeking as a percentage of adults (2004)**


Source: EUROSTAT (2005b).

The use of the internet and internet services at the **corporate level** takes various forms – from the basic types of services (electronic mail and use of a range of information sources) to e-business applications (electronic shop, electronic supply, etc.). While the level of readiness in Czech companies is relatively high, the main problem lies in the insufficient readiness on the consumer site.

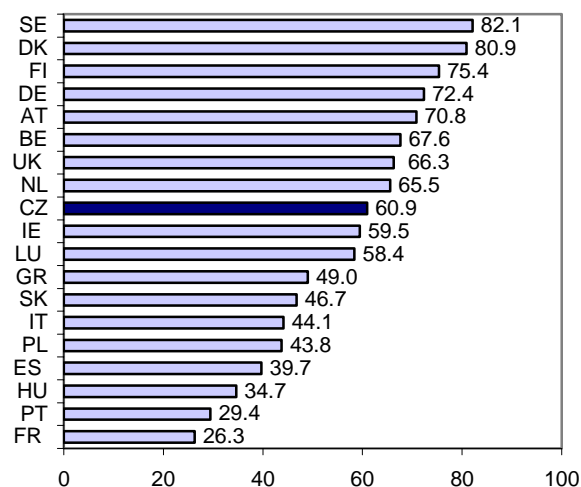
Distribution of web servers, regardless of whether they are users' own www servers or whether they are provided through web hosting, is an especially important factor in assessing the expected development of e-business applications. Scandinavian countries are once again ahead of all other countries with over 70 % equipped firms with more than 10 employees. The Czech Republic achieved a result equal to the EU average - 61 % (see figure 8).

The use of internet services at the industry level is relatively balanced. The banking and insurance industries traditionally hold the strongest position in this regard, which is in correspondence with their usual extent of clientele. On the other hand, these services are used less in retail and production industries. Excluding retail (82.4 %), the Czech Republic records the internet use in more than 90 % firms with 10 or more employees in all industries.

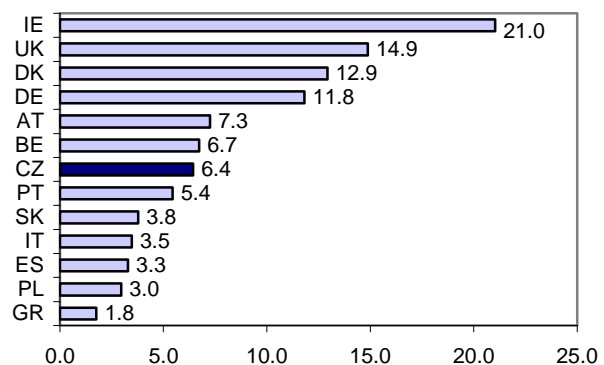
The level of **electronic business** is an essential factor for competitiveness of most companies. These applications are currently a necessity rather than an advantage. They include solutions for corporate business applications in

relation to end consumers (B2C – Business-to-Consumer), and especially electronically executed business relations between two economic entities (B2B – Business-to-Business).

The share of electronic transactions in the overall turnover of companies in most European countries is rising. The share of internet sales in the overall turnover of companies ranges in individual countries between 0.4 and 13 %. Common problems associated with internet sales not only in the CR include unsuitability of certain products for this type of sales (for example food, clothing, etc.), logistic problems and consequent delayed delivery of goods, and consumer doubts regarding the security of business operations. On the other hand, positive aspects include not only the availability of information and opportunity to compare a range of offers, but also generally lower prices provided by internet shops compared to conventional shops.

**Figure 8: Companies with own websites (% , 2004)**


Source: EUROSTAT (2005b).

**Figure 9: Share of e-business in the total companies revenues (% , 2004)**


Source: EUROSTAT (2005b).

Figure 9 documents the share of electronic trade in the overall turnover of companies in selected European countries. The figure shows the relatively good position held by the Czech Republic and especially the potential for further rapid growth in these applications arising from the technological infrastructure development.

Significant differences in internet purchases and sales between individual industries are clearly noticeable. The construction industry records a relatively low share of

internet sales in most countries (however, this is due to the generally lower dissemination of ICT in this industry).

### Networked readiness

Dissemination and use of information and communication technologies is conditional on a range of mutually interconnected qualitative and quantitative prerequisites, which range from the institutional and technical infrastructure to the input and output of innovation activities. The Networked Readiness Index applies a comprehensive approach to assessing positions of countries in the development of information and communication technologies. The index is determined and published with the aim to highlight the complexity and diversity of factors influencing the development of ICT in individual countries and thus support qualified decision making at the macro and microeconomic level in the dissemination and use of ICT, including implementation of effective supporting policies. The Networked Readiness Index sees information and communication technologies as a key factor in development of countries as they facilitate fast and effective communication at all levels and simultaneously create an infrastructure for commercial transactions and competent and effective public services. Government policies and development concepts support an increase in the ICT penetration and reduction of digital division; customs barriers are being eliminated and competition strengthens and this stimulates private investment in ICT.

**The Networked Readiness Index** is published in the annual publication of the World Economic Forum dedicated to information technologies (Global Information Technology Report). The index is defined as the level of preparedness of a country or a region for participating in or deriving benefits from the development of information and communication technologies. The index is based on a combination of soft and hard data obtained from a wider spectrum of sources (including the WEF annual publication on competitiveness), and includes three basic pillars (components) or networked readiness – an **environment** for development of information and communication technologies, networked **readiness** of the three key groups of entities (individuals, companies and the government) and the actual **utilisation** of ICT by these entities.

The structure of the index is based on three premises: firstly on differentiation between three groups of entities concerned in the development and use of ICT, secondly on the importance of the general macroeconomic and regulatory framework, in which individual types of entities play their specific roles, and finally on the relationship between the level or utilisation (and consequently also effects) of ICT in individual types of entities and the level of their readiness for using ICT and their ability to attain related effects of this utilisation. In 2004, the index summarised the networked readiness in 104 countries. The total of 51 variables is monitored and divided into nine sub-indexes. Aggregate values are expressed as unweighted averages and results for individual countries are compared against the overall assessment of their competitiveness and the achieved level of economic development (in GDP per capita). The regional aspect of the networked readiness index is also differentiated according to groups of countries.

The **environment** component assesses the support provided by the country for the development and utilisation of ICT from three individual aspects – the market environment (availability of human resources and corporate ser-

vices for the development of knowledge-based economy, quality of the institutional environment, external openness and overall macro-performance), the political/regulatory environment (quality and impact of policies, laws and regulation on the ICT development and utilisation) and the infrastructure environment (availability and quality of infrastructure for access to ICT).

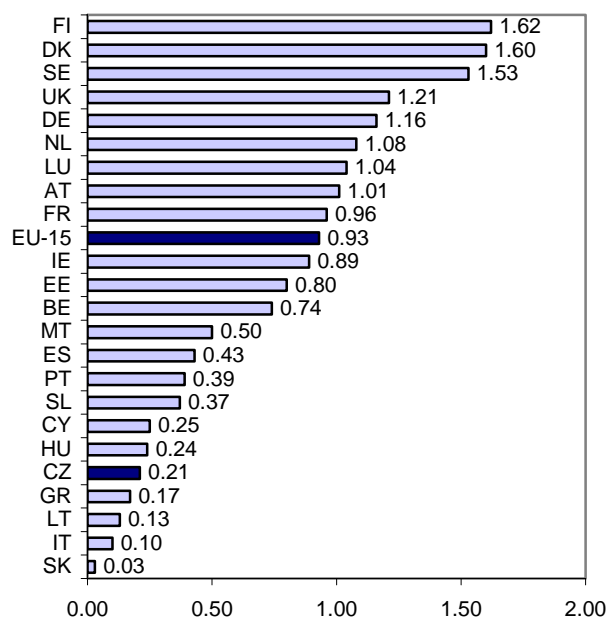
The **readiness** component measures preparedness of the key players for making use of the potential of ICT. This ability reflects a combination of many factors including individual skills vital for ICT utilisation (level of literacy, type and location of internet access, degree of individual connectivity), availability of and access to ICT for companies (ICT utilisation efforts and investment in employees' ICT skills) and the use of ICT in services and processes implemented in the public sector (creation of policies, internal decision-making processes, online availability).

The **ICT utilisation** component again assesses its level according to the three key entities. When the availability of data describing a specific impact of ICT on these entities is limited, changes in behaviour or lifestyle and other economic and non-economic benefits of ICT utilisation are monitored. Internet use for various types of activities and availability of telephone lines are among the major indicators monitored in individuals. In the case of companies, attention is paid to ICT interconnection between individual companies and between companies and their customers, ICT use for corporate activities and the extent of online transactions. The success of ICT support and the availability and use of online public services are assessed in the governmental sector.

The best results in the overall assessment of **networked readiness** (see figure 10) in the EU-25 were achieved by the three Scandinavian countries. The group of new member states lags behind the EU-15 average (0.18 compared to 0.93) quite significantly. Estonia holds the best position out of the new member states. Assessment of the three basic networked readiness indexes in the EU-25 is the best on average in the use of ICT, followed by the environment for ICT, and the readiness for ICT comes last, significantly lagging behind the previous two indicators. While the environment for ICT in the new member states receives the worst assessment (mainly due to the negative assessment of the institutional quality characteristics), the EU-15 achieves the best results in this aspect. The poorer results in the readiness compared to the use of ICT in the EU-25 suggest insufficient skills and capacity for adjusting to the future demands in this area. While the government's readiness for ICT and the level of ICT use in the governmental sector are the weakest points of the EU-25 in the individual sub-indexes, the use of ICT at the individual and corporate levels receives the best assessment.

The **Czech Republic's** position in the EU-25 is not very positive; the average results place the country in the 19<sup>th</sup> place. Similarly to the EU-25, the CR achieved the worst results in the use of and readiness for ICT in the governmental sector and in the standard of the market environment. On the other hand, the best results were achieved in the ICT used by individuals and companies. With the exception of the ICT use in companies, the CR lags behind the EU-25 average in all monitored indicators and the assessment in four of these indicators even falls short of the EU-10 average.

Figure 10: Network readiness index (2004)



Source: WEF (2004).

### 3.2 Demand for ICT

The analysis of development in the demand on the ICT market studies the situation in the Czech Republic in greater detail, including the context of demand in Central and Eastern European countries. The demand for ICT in this region has experienced some positive changes in the last few years and these changes can be used as the basis for expectations for the future development over the next approximately five years. Materials produced by the analytical company IDC, which can be currently considered the most up-to-date and comprehensive data, are used as the basis for assessing the demand.

#### General status of demand for ICT

Over the last few years, ICT expenditures in the CR and other new member states have been rising very dynamically and the year-on-year growth in 2004 reached 21 %. This positive development was influenced especially by the following factors:

The current economic growth and the high level of direct investment reflect in investments in **production of information technology components** (computers and communication and controlling elements). This growth is linked with the development in financial services and various insurance services and in electronic and mobile services in banking. Liberalisation and privatisation of telecommunications stimulate especially projects focused on the development of services provided by telecommunication operators, including services supporting the expansion of mobile business.

The **small and medium size enterprise** sector is experiencing a significant growth in expenditure on ICT. Projects of this segment represent the main item in the demand for infrastructure and software.

Investment in technical facilities in the CR and other Central European countries has increased significantly (the total increase by 25 % compared to 2003, the sales of personal computers have increased by 29 %). The pre-

vailing focus of expenditures on hardware and infrastructure is due to the specifics of the period in question, which was characterised by high demands on upgrade of the existing infrastructure or creation of a completely new technological infrastructure in newly established companies and branches of multinational companies.

#### Demand for applications and application software

The share of **application software** in Central and Eastern European countries remains relatively low compared to Western Europe (around 15 % of the total expenditure). The demand in this segment comprised mainly ERP corporate systems (Enterprise Resource Planning) and other types of applications were present to a limited extent only (electronic business, mobile business, applications for corporate content management, applications and tools for optimisation or reengineering of corporate processes and others). Nonetheless, we can conclude that the Business Intelligence applications and the related data storage, data markets, tools for transformation and cleaning data and tools for extraction of data increased in the CR in 2004 by 22 % compared to 2003.

#### Demand for services

In 2004, the sales of **ICT services** in the new EU member states recorded a year-on-year growth by 16.2 %. This is owing to the continuously increasing customer interest in outsourcing, not only at the level of information system development (as it was the case in the past), but also in information system operation or implementation of total outsourcing, i.e. a complete supplier solution of the ICT development and operation. Outsourcing of implementation services has retained its top share (51 %). However, the share of operational outsourcing in these services is very small (7 %), despite the significant growth recorded in this area (21 %). This situation is due to a certain lack of user faith in safety of the operation and reliability of supplier firms in operating services.

#### Expected development in demand for ICT up to 2009

The Czech Republic (together with other Central European countries) can expect that following the dynamic development of the basic infrastructure the demand will focus on **comprehensive software solutions and applications** with a significant impact on the development of corporate processes and the standard of company management. These application categories typically include comprehensive corporate applications (ERP II), customer relations management applications (CRM), e-Business, Business Intelligence and mobile business systems) and other so-called applications with added value. We can also expect higher demand for comprehensive infrastructure solutions, especially in ICT security and ICT management systems.

Generally, the year-on-year growth of ICT markets in Central and Eastern European countries is expected to be around 14 % during 2004–2009. The fastest growth can be reasonably expected in mobile services including development of mobile business (approx. 28 %). The market with ICT services is expected to grow by 16.9 % during the same period and the annual sales in these countries at the end of this period will be around USD 13 billion.

### 3.3 Supply on the ICT market

The analysis of **supply on the ICT market** draws from information sources describing especially the spectrum of this supply on the Czech information market. The over-



view of products and services offered by 172 major ICT companies in 2004 was used for these purposes.

### Supply of ICT services

Services represent the largest segment in the ICT market supply and this also corresponds with the demand trends described above. The current supply of **ICT services** is characterised by a relatively wide spectrum and comprehensiveness. Table 3 shows the distribution of individual service types among 172 major companies in 2004.

**Table 3: Services offered by the best ICT suppliers (2004)**

	Number	% in the total of suppliers
Systems integration	105	61.1
Implementations	120	69.8
Outsourcing	98	57.0
Operation services	41	23.8
Support and maintenance	131	76.2
Service	118	68.6
Consultancy	127	73.8
Training	113	65.7
Internet providers	9	5.2
ASP	50	29.1
Data processing	44	25.6
Network design	52	30.2

Source: Fatun (2005), own calculations.

The **structure** of services provided has undergone some significant positive changes over the last few years, including especially the following:

- Support and maintenance (76 %) and advice or consultancy (74 %) are the most frequent services offered by Czech ICT firms,
- Implementation services hold a very strong position (70 %). This segment includes implementation of standard application packages and development services, which overall also corresponds with software supply,
- The supply of system integration services on the Czech market is currently extensive. In 2004, 105 of the 172 monitored firms, i.e. 61 %, provided these services. However, individual firms have different understanding of this service and their system integration services range from comprehensive information system solutions to solutions of individual integration tasks at the technological level. This may lead to certain distortion of the supply data,
- Similarly to system integration, the supply of outsourcing services is very strong (57 %). However, the concept of outsourcing is also important in this regard as it can range from outsourcing of development to total outsourcing,
- A surprising growth occurred in the supply of ASP services (Application Service Provider). The growth in 2004 was 29 % compared to approx. 10 % in the previous years. This is due to relatively recent introduction of this service on the market and its very limited supply.

### Supply of ICT applications, software

Application software (i.e. standard or custom-developed software) is clearly the most widespread type of supply, corresponding also with the demand trends. This also means that:

- Corporate application suppliers (currently mainly suppliers of ERP or comprehensive ERP II systems) account for the largest share (approx. 50 %). The data on ERP or other systems on offer clearly show that standard application packages (mySAP Business Suite, Oracle e-Business Suite, Axapta, Navision and others), i.e. mainly foreign application systems, prevail in this group,
- The relatively large share of providers of custom-developed software (44 %) documents the increasing demand for this type of services,
- However, producers of their own basic software represent a negligible fraction.

### 3.4 ICT at the corporate level

Development of informatics at the corporate level is always conditional on priorities, current needs and organisational, financial and qualification resources of companies. The assessment of selected aspects of the ICT use at the corporate level pays special attention to ICT in small and medium size enterprises (SME).

#### Problems in development and use of ICT at the corporate level

Maximising the effects or effective use of ICT in a particular company and achieving the required support for the company's competitiveness is the basic objective pursued by managements when investing in these technologies. However, the actual outcome is subject to many factors whose character and weight differs greatly from case to case. Rather than being of a technological character, these factors depend mainly on the corporate culture, standard of human resources, and in general on the entire corporate IT management system.

Until recently, infrastructure solutions, in particular projects in system infrastructure, ICT security and system management, have been a priority. From the point of view of the objectives of ICT use projects of this type are mainly security-oriented but do not produce any significant competitive advantages. However, they create necessary conditions and environment for development of other, new applications, such as the above mentioned electronic and mobile business applications, SCM and others, which will bring these effects.

#### ICT in small and medium size enterprises

With regard to corporate ICT, attention is paid to information systems for small and medium size enterprises. Smaller enterprises tend to have simple and clear organisational structures allowing direct management and supervision and therefore also lower cost of company management and operation. This is exactly where the potential of SME collides and acts in synergy with the potential of ICT. The focus is especially on basic ERP corporate solutions owing to the specific situation of these enterprises. Information systems at this level are smaller compared to those of large organisations and as such do not require as strong infrastructures. On the other hand, the level of availability of standard integrated applications was insufficient.

ERP solutions are not the only option available to customers from the SME segment when deciding about the manner of securing their information systems. Suitability and adjustment of ICT products are not the only requirements in the ERP category for SME. Implementation of



these products in the conditions of SME is inevitably associated with changes and the implementation methodology including the approach of the supplier's consultants must be adjusted. This is because smaller enterprises are characterised by many specifics compared to their larger counterparts. These include especially the requirement for lower prices, shorter implementation periods and increased pressure on deriving benefits from the solutions. The fact that the implementation periods have been re-

duced significantly over the last ten years is a positive factor for SME.

Smaller enterprises often lack specialised ICT know-how and the time specialists can dedicate to ERP projects tends to be limited. Nonetheless, managerial function centralised in the hands of one or few managers allows flexible response to the rapidly changing conditions of the market environment.

## 4. Conclusion

The key issue for further development of the Czech Republic's growth performance is the country's ability to transform the sources of its competitiveness from predominantly low costs to quality-based factors. The CR has relatively favourable conditions for this change in terms of the accessibility of inputs with high qualitative intensity. However, problems faced by the CR in this respect include low effectiveness of the national innovation system and limited economic benefits of the information society development.

### Competitive advantage

The matrix and diamond model is the analytical tool used for assessing the **qualitative intensity** of the Czech Republic competitive advantage in the EU-25. The differences within the European Union at the country level are quite significant and they tend to persevere over time. The Czech Republic on average belongs to the EU-13 group with less advanced knowledge base. The EU-13 group, besides the new members, includes Spain, Portugal and Greece. The structural characteristics of their competitive advantage as well as level of their economic development are similar. The countries included in this group also (often significantly) lag behind more advanced knowledge-based economies in the EU-12 in most indicators.

The sources of the Czech Republic competitive advantage place the country (similarly to other EU-13 countries) within the **competitive advantage matrix** in the efficiency-driven stage, which however is still based mainly on low costs (prices). This is also reflected in persisting (generally) low labour costs (although there is a strong growing trend which will eventually weaken the cost-based advantage especially in relation to Eastern, even less developed countries). The ability to progress towards efficiency-driven competitive advantage that will be quality-based rather than cost-based therefore presents a key challenge. In addition, the Czech Republic faces significant differences between the local and foreign business sectors in their economic performance. The question is whether these differences in the economic performance of the two sectors currently reflect or will reflect in the qualitative level of the host country competitive advantage.

In terms of the sources of technology knowledge the Czech Republic belongs to the countries relying mainly on the external inputs but able to adjust the acquired knowledge to the local needs (nonetheless, still in an environment with mainly cost-based competitive advantage). The Czech Republic position as to its innovation capacity is transitional, i.e. its dependence on external technology knowledge is now combined with development of internal sources of knowledge, although this development remains

somewhat limited (this is reflected for example in the persisting below average GDP intensity in research and development and especially very low patent performance). The question is how we can support the effectiveness of technology transfer and gradual development of internal innovation capacity from this qualitative level. Innovation strategies of foreign companies play a crucial role in this matter (together with the effects of knowledge spill-overs).

The assessment of *production technology* in the **competitive advantage diamond model** shows the lagging behind of the Czech Republic and other EU-13 countries. When successfully integrated in the multinational production chain, these countries show positive tendency to catch up in the quality of their economic structures. The share of industries with technology intensity according to the traditional classification may then be comparable to or even higher than in the more developed countries. This is the case of the Czech Republic especially in terms of the large share of industries with medium-high technology intensity, while Hungary shows up a large share of high-technology industries. The Czech Republic has also recorded a significant decrease in the share of industries with high labour and resource intensity and a strengthening position of science-based industries and specialised suppliers (the importance of scale-based industries has so far decreased rather slightly).

Technological openness is the only aspect of the quality of production technology in the Czech Republic where relatively positive results are achieved. However, the prevailing low level of other characteristics of production technology development (i.e. lacking technological preparedness and sophistication of production procedures and business operations), which reflects the country position with low qualitative intensity in the value chain, hampers the use of the knowledge potential of industries belonging to groups with higher technology intensity. This lagging behind is also reflected in the currently adverse structure of innovators according to innovation strategy typology (in addition to the overall low innovation activity) with a significant prevalence of innovators who mainly adopt and adjust technologies (innovations are developed by external entities). Strategic innovators, i.e. those who use their own research and development activities, play a less significant role in the structure of innovators. The combination of a high-quality structure and a lower technology intensity presents a challenge especially with regard to the desirable increasing intensity of technology transfer.

The results in terms of the *value chain* confirm or further highlight the lagging behind of the Czech Republic and other EU-13 countries in their knowledge base develop-

ment. Despite their significant involvement in international production and trade activities (supported by their membership in the EU), which is reflected in the high share of intra-industry trade and the values of other indicators of export and import openness and penetration, these countries continue to hold positions with lower qualitative intensity compared to more advanced members in the multinational value chain. The extent of non-production activities is limited, sales are rarely carried out under the own internationally renowned brand, and the level of research and development expenditure tends to be low. This means that the value chain segments with higher qualitative intensity are mainly undertaken in parent companies. This simultaneously limits the intensity of knowledge transfer from foreign direct investment as a potential source of technology and economic catch-up.

The Czech Republic is one of the countries with a significant role of foreign companies in the local economy, including their share in the overall research and development expenditure (which continues to grow especially due to changes in the ownership structure in the group of large companies). The intensity of value added in knowledge-based activities, in terms of the intensity of research and development as well as the qualitative intensity of employment, remains low compared to more advanced countries, and this reflects in low performance characteristics (i.e. especially in the level of productivity). This is especially the case of industries included among technology high intensive activities (high-tech) according to the traditional classification. The combination of a high level of foreign direct investment and a low quality of the value chain requires intensive support for increasing the supply of local inputs with high knowledge intensity and developing infrastructure conditional to the development of national innovation system.

The situation in the Czech Republic (and other EU-13 countries) with regard to the *quality of the environment* is relatively positive in the intensity of competition, while the effectiveness of protection of competition is evaluated less positively. Lagging behind is obvious especially in sophistication of the demand and support for innovation of the private and public sectors (especially in the range of specific financial tools). The low innovation environment quality is adversely affected by the persisting strong regulatory burden. The quality of conditions for doing business in the Czech Republic is mainly below the EU average, while the regulation of product markets is very high but is combined with weak protection of intellectual property rights. With regard to the importance of individual sectors of the national innovation system, the Czech Republic is among the countries where R&D expenditure in the government sector falls significantly below the average and the share of business research financed directly from public resources is slightly above the average. The supply of venture capital is, however, insufficient. The combination of the environment quality and the share of business in performing research and development suggests an urgent need for improving institutional characteristics in order to stimulate business innovation activities.

The low quality of environment reflects in low intensity and insufficient diversity of *linkages and interactions*. The situation is positive in the quality and accessibility of local suppliers and to some extent also in the offer of training

and research services (however, this may in fact reflect the above-mentioned low sophistication of the demand and the generally low qualitative intensity of economic activities). The main problems include insufficient cooperation between the academic science and the business sector and more importantly a low level of cluster development. The share of the business sector in performing R&D in the government sector and at universities in the Czech Republic has long been one of the lowest in the European Union. Innovation systems in less developed member states thus remain relatively closed, with limited interactions among individual industries. This is demonstrated among others in the combination of low intensity of linkages and a low level of networked readiness. The effectiveness of innovation inputs in a system of this type is deteriorated and any innovation activities are implemented with greater difficulty.

### Inputs and outputs of innovation performance

The capacity of local **research and development** is a significant source of innovation performance. The CR holds one of the leading positions among the new EU member states according to the indicators of the extent of financial and human resources in research and development. Better results are achieved in Slovenia only and in some indicators also in Hungary. However, the extent of these resources remains below the average level for the EU. Despite the current growth trend, there is very little evidence of any significant move towards the standard situation in the EU. This assessment is supported among others by a relatively weaker position of the CR in the extent of human resources compared to the extent of financial resources and a slower growth in public funding for research and development. Limiting factors of the growth of research resources to the benefit of innovation performance stem from distribution of resources according to research sectors and branches of manufacturing industries and services, low intensity of flow among these segments and persisting institutional barriers. It is mainly an issue of interconnections between academic research and the government sector (funding and performance) and the underrated position of the university research and development sector (although the position of this sector is improving significantly, this development is accompanied by a range of internal problems). Openness between research sectors and the subsequent opportunities for using mutual interactions for their restructuring has not been promoted so far. The low level of flow between resources of business enterprise sector and the university research sector is one of the main strategic weaknesses. The evaluation included herein is confirmed by individual innovation indexes on the subject of innovation stimuli and creation of knowledge, which assess the innovation performance of research and development according to the dynamics of their key factors: with the exception of the level of employment in industries with higher technological demands, employment in services with high technological demands, education of the young generation and ICT expenditure, the entire education and research segment is characterised by low dynamics and very slow approach to the institutional framework of the EU.

The **innovation activity of corporations** is a crucial factor in the growth of the national innovation system's performance. Available internationally comparable and local studies suggest that although the relative share of innovating companies is far below the EU-25 level, their

profile according to innovation types is becoming increasingly similar to the proportions common in the EU. Similarly positive approach towards the EU standard can be observed in the share of small, medium and large companies in innovations and the level of activity of innovating companies in services can also be seen as positive. Innovating companies focus mainly on internal (research, qualification and financial) resources and acquisition of tangible assets (machinery and equipment) from external resources. External intangible resources (contracted research, consultancy, training, etc.) and especially commercial funding of innovation projects currently play a small role in the set of factors influencing innovation activities of companies.

The situation in the extent of adjustment of market factors to mobilisation of innovation activities in companies is relatively positive. However, this phenomenon focuses mainly on incremental product innovations (improving the quality, service) in relation to the market segment. Other external environment factors (public financial support, pressure of regulating standards) do not currently play any significant role in this regard. The prevailing impact of incremental innovations is also reflected in the profile of industrial property protection: greater attention is paid to protecting trademarks than to patent protection of products. Studies carried out at a regional level, which allow better specification of innovation activity even in the context of small companies, show that the micro-company segment (up to 10 employees) is characterised by high concentration of highly qualified labour, which creates favourable conditions for combining professional creativity and entrepreneurship.

The impact of **structural** factors, including their *institutional* aspects, was analysed from the perspective of innovation performance of research and development as well as findings concerning the entrepreneurial environment of innovating companies. As the impact of the knowledge base on the growth of innovation generally lessens, some positive structural conditions occur in the relatively high level of education in the young generation and the above-average position of the CR in the number of PhD graduates in natural and technical sciences. The CR is above the EU-25 average and even belongs to the four leading countries in this aspect. Analyses of CIS and EXIS data present a more comprehensive preview of structural characteristics. According to these analyses the innovation system of the CR displays the following growth factors: employment in industries with higher technological demands and services with high technological demands; education of the young generation; ICT expenditure accompanied by a relatively positive extent of organisational flexibility in companies; activity of small and medium-sized companies accompanied by a growth of their internal innovation resources; dynamics of the growth of corporate research in industries with higher technological demands and the impact of demand factors.

On the other hand, hindering factors are defined as follows: predominantly imitative character of innovations limiting opportunities for export; low dynamics of the growth of cooperation between small and medium-sized enterprises; significantly lagging rate of growth of the risk capital; poor level of indicators of new knowledge creation caused by the low level of funding of university research provided by the entrepreneurial sector; low quality of public administration. According to the available data, the profile of the infrastructure for supporting innovation is

described as adaptive. This means that those infrastructure elements that allowed the country to make use of openness to EU markets have been strengthened while those that allow modifying and based on the circumstances making use of or even asserting new types of innovations fall behind. The weak modification dimension typical for smaller and technically advanced countries is especially critical.

### Information society and ICT

Development of the information society in the Czech Republic is characterised by significant differences in individual areas of the information society. The Czech Republic ranks as the seventh country in Europe according to the overall extent of ICT investment. However, the second side of the coin is the problematic structure of these expenditures as the best part of this investment is intended for telecommunications. This situation is demonstrated in the position of the CR with regard to development of mobile networks and number of mobile phones per capita, where the CR holds the fourth place in Europe in the absolute numbers and the first place in the growth rate. On the other hand, the number of broadband internet users places the CR among the last countries in the EU-25.

Searching for information on products and services offered is clearly the most frequently used business oriented internet service for residents. While approximately 80 % of the adult population in Scandinavian countries and Germany makes use of this service, the same figure for the Czech Republic is just under 18 % and this places the country among the last countries in Europe. Internet banking is another example of an extensively used service in this area. The position of the CR is once again highly undesirable. Similarly to the previous example, great differences between the CR and other EU states occur in communication with the public administration (5 % only in the CR compared to 45 % in Finland). In contrast, corporate internet use in the CR is considerably more widespread and the number of connections and users' own web pages place the country in the first half of the EU-25 countries. Information services as special goods or as a value added to the basic products in Czech companies and state institutions are gradually becoming a part of business, including international activities. The share of ICT products in the overall trade in the Czech Republic accounts for 13 %, which is a figure at the average EU level.

From the perspective of the level and structure of the **demand on the ICT market** the Czech Republic is experiencing a significant year-on-year growth but the current absolute volume remains below the EU standard. What's more, the demand for products of the ICT infrastructure, i.e. technical equipment, networks and basic software, is currently the strongest. On the other hand, the demand for applications (with the exception of standard corporate systems) and especially services is significantly lower than in other EU states. This is associated with the problem of the structure, priorities and especially effective use of resources invested in ICT. The demand for applications that bring a new quality into information systems at various organisational levels, such as electronic and mobile business projects or comprehensive analytical tasks, is lower than in other EU countries. However, as the market has gradually become saturated with the basic products, significant changes in investment priorities can be expected despite this relatively adverse structure of the



demand and this development could take place within the next few years. The demand for ICT is expected to grow by approximately 14 % over the next few years and the demand for services should grow at the highest rate.

Very dynamic development can be observed in the **supply on the ICT market** as most foreign leading companies are present on the Czech market and offer the full range of technologies, application software and associated services. Czech companies are under a very strong competitive pressure, which simultaneously brings about their rapid development. This development is reflected in increasingly intense penetration of advanced foreign markets, including the USA by Czech ICT companies. The supply of applications and infrastructure products is associated with an extensive offer of mainly implementation services of varying quality. The latest studies carried out in the Czech Republic have shown their increasing standard.

According to the latest information and experience, the Czech Republic is experiencing some specific problems at the **corporate level** and all of these problems typically

have a common cause – the standard of management of information technology and information services and understanding and the concept of the role of information technology in management of companies or organisations. This brings about situations when for example fast and appropriate use of the potential of new ICT applications is not implemented comprehensively and partial solutions with a low level of mutual integration tend to be applied instead. Information services in the commercial sphere are only now gradually seen as a special commodity or as a value added to the basic products. Especially the spectrum of deployed and operated applications must be in line with this development. The volume of information services remains insignificant compared to developed countries. Over the last few years, infrastructure solutions, in particular projects in system infrastructure, ICT security and system management, have been a priority. As the extent and complexity of corporate information systems increases, it is crucial to understand the determination of information directors to minimise any risks associated with system failures or attacks and operational errors.

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## **Quality of human resources**





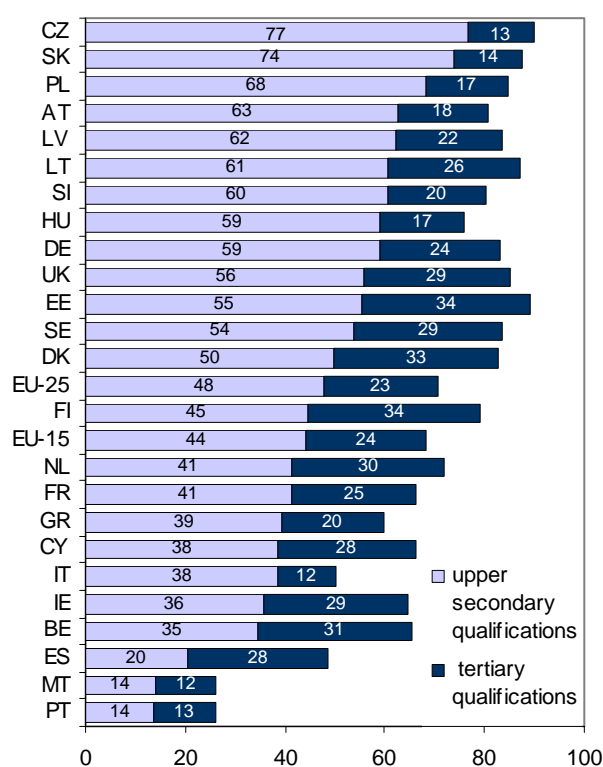
## 1. Knowledge and flexibility of population

It is only an educated and flexible population that is able to create, share and use new findings that are necessary for the economy to become knowledge-based. The educational attainment of the population is most frequently expressed in terms of the proportions of groups with particular qualifications in the overall population. Apart from this indicator the level of literacy in adults and occupational and geographical mobility are also subject to analysis.

### 1.1 Education structure and educational mobility

The education structure of the population reflects the proportions of groups with various qualifications in the overall population aged 25-64 (see Table 1A). In terms of economic development, the representation of groups with more advanced qualifications is particularly important. An educated population is capable not only of generating and applying new findings, but it is also technologically more advanced, demands more sophisticated goods and services and, in this way, stimulates innovation in enterprises.

**Figure 1: Share of population aged 25-64 with upper secondary qualifications and share of population with tertiary qualifications (2005, in %)**



Source: EUROSTAT (2005c).

As part of the Lisbon strategy the European Union aims, as one of its objectives, to ensure that, by 2010, 80% of the population aged 25-64 have at least secondary education. As Figure 1 shows, in 2005 nearly 71% of the EU-25 population and 68% of the EU-15 population aged 25-64 held at least upper secondary qualifications. The benchmark set as part of the Lisbon strategy was exceeded by 12 EU-24 countries as early as 2005 (data for Luxembourg is not available). The CR is one of them and it has been steadily showing the highest proportion of the

population in this age group who have at least secondary education. In 2005 it was almost 90%.

However, in terms of the proportion of the population with tertiary education the CR is far below the EU-25 average. Only 13% of the Czech population had tertiary qualifications as compared to the EU average of 23%. The situation is gradually improving as the capacity of both public and private higher education institutions and tertiary professional schools is increasing. Over the last eight years (1998–2005) the proportion of the population which completed tertiary education in the CR increased from 10.6% to 13.1%, i.e. by 2.5 pp. Unfortunately this has not reduced the gap between the CR and the EU-25 average. On the contrary, the gap has further widened. In 2000 the difference was 8.5 pp and in 2005 it was 9.7 pp. The development of shorter study programmes is of particular importance in this respect as developed EU countries are far ahead in terms of their supply. When making international comparisons it is also necessary to take account of the differences in education systems. It is typical of the education system in the CR that the vocational specialisation which, in other countries, young people mostly achieve at tertiary level, can be acquired as early as upper secondary level.

An educated workforce is expected to contribute more towards GDP. The relationship between the proportion of the workforce with tertiary qualifications and the level of GDP per capita in 2004 is illustrated in Figure 2. In the first quadrant there are countries where the proportion of people with tertiary qualifications is lower than the EU-25 average and GDP per capita is above the average. This favourable relationship is characteristic of Austria and Italy. The second quadrant shows countries, including the CR, which have a lower proportion of the workforce with tertiary education and a lower GDP. If the workforce with tertiary qualifications in the CR was to contribute to GDP development, as is the case with the EU-25 average, then GDP per capita would have to reach 12.6 thousand EUR, i.e. 1.5 times than the present level (8.5 thousand EUR).

The situation in the countries in the third quadrant is the least favourable in terms of the relationship under review. Although the proportion of groups with tertiary qualifications is above the average, GDP is below the average. This is the case with Estonia and Cyprus. The fourth quadrant includes countries with an above-average proportion of the workforce with tertiary qualifications and GDP per capita higher than the average. These are exclusively the old EU countries.

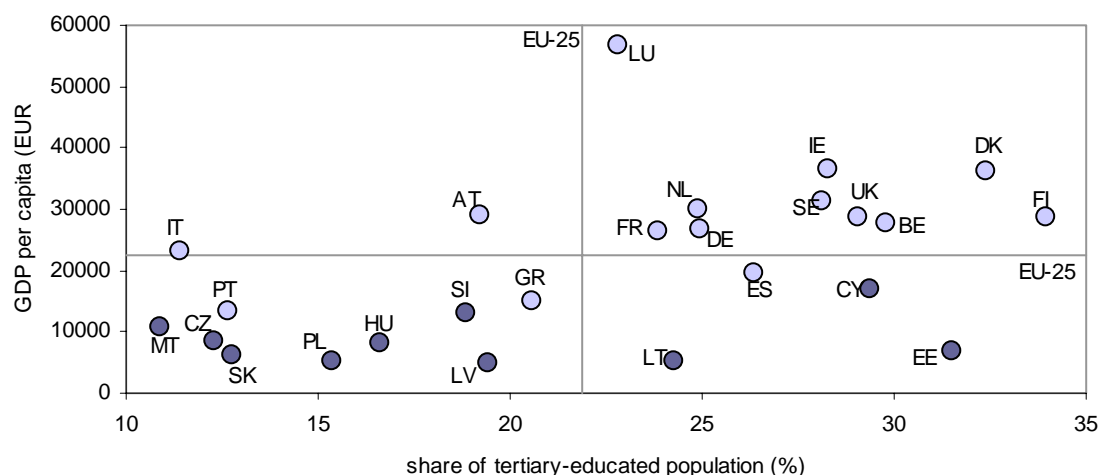
In terms of international comparisons, the low proportion of the population with tertiary education in the CR is offset by a high proportion of people with upper secondary education and a very low proportion of people who have only completed basic education. In 2005 people with only basic qualifications accounted for just 10% of the population in the CR while the EU-25 average was three times the figure (29%).

In the CR the low proportion of people without qualification is related to the traditional trend to pursue education at upper secondary level and, in particular, to the structure of educational provision which attempts to meet various study ambitions. Most young people continue studying upper secondary programmes of some type and complete

their studies successfully, although many transfer to a less demanding programme or school. However, in recent

years the proportion of drop outs from secondary education has slightly increased.

**Figure 2: Population with tertiary qualifications and GDP per capita**



Source: EUROSTAT (2005c).

## Educational mobility

Educational mobility is analysed by comparing the proportion of tertiary educated in the 25-29 age group with that in the 60-64 group. The reason is that it is important for the development of knowledge-based economies that those entering the labour market have higher qualifications than those leaving the labour market. Room for educational mobility is affected to a large degree by the proportion of individuals with tertiary education in the 60-64 age group as this proportion comes up against a certain natural limit which can only be overcome by lowering the demand for a high quality of tertiary education.

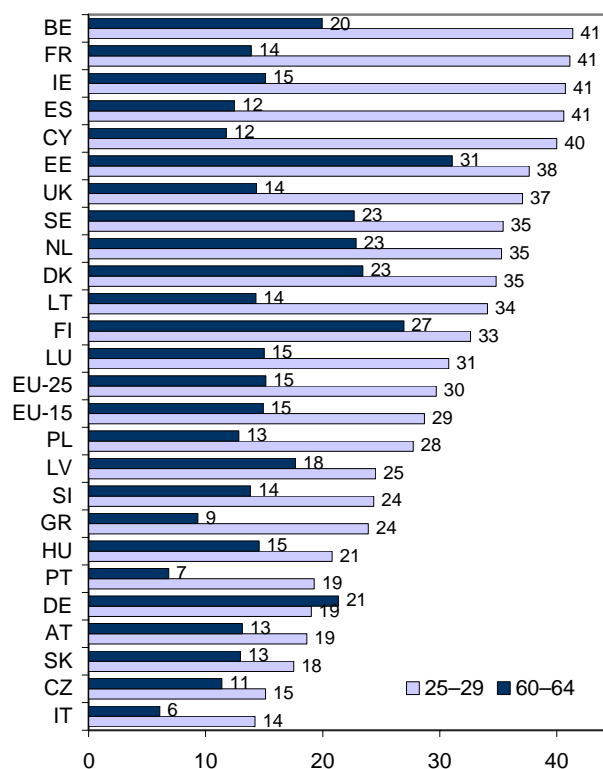
The Czech Republic, although it is among the countries with the lowest proportion of people with tertiary qualifications in the 60-64 group (i.e. a low comparison base) shows the lowest level of inter-generation mobility of all EU countries – less than 4 pp. (see Figure 3). In this respect the CR lags far behind the EU average. The average proportion of the European population with tertiary qualifications in the 60-64 group is 15%, while in the CR it is 11%. However, a far larger difference is seen in the 25-29 age group where the EU-25 average was 30% as compared to a mere 15% in the CR.

According to the data for 2005 there is positive educational mobility in all EU-25 countries except Germany. This negative trend is probably a result of the fact that, on average, students in Germany complete tertiary education later and often interrupt their studies due to work placements, studies abroad, changes of specialisation, etc. This suggestion is also supported by the fact that the 30-34 age group already shows positive educational mobility as compared to the population aged 60-64 (4 pp.).

Apart from the actual competencies and study aptitudes of young people, inter-generation mobility is also influenced by social background inequalities. Social background has a major impact on the development of young people's educational aspirations and perception of education as a value for their professional as well as personal and civic lives. Research shows that educational aspirations of young people in the CR are more influenced by the edu-

cational attainment of their parents than the financial situation of the family.

**Figure 3: Educational mobility between the 25-29 and 60-64 age groups (2005, in %)**

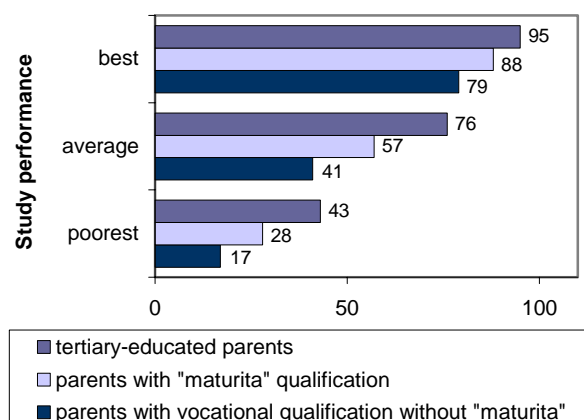


Source: EUROSTAT (2005c).

If the influence of a wider family background is negative in terms of educational aspirations, it should be modified by the education system so as to ensure that all individuals acquire education proportional to their capacities. The relationship between educational aspirations of children and the educational attainment of parents in the CR is

illustrated in Figure 4 which shows the link between the aspirations to pursue tertiary education among secondary school leavers with "maturita" on the one hand, and their study performance and their parents' education on the other hand. The "maturita" holders are broken down into three groups according to their study performance. The education of their parents is also divided according to three levels.

**Figure 4: Aspirations to continue study in tertiary education (in %)**



Source: Burdová, Matějů, Procházková (2003).

Aspirations to continue studying at tertiary level vary according to the parents' qualifications. An intention to apply for higher education was expressed by a higher percentage of students who had the poorest study performance but whose parent had a tertiary qualification, as compared to students with better (i.e. average) performance but whose parents did not reach a higher level than vocational qualification without "maturita".

Relatively strong educational ambitions are seen in students with the poorest study performance whose one parent has tertiary education; 43% of them aspire to achieve this qualification, while the same only applies to 17% of those whose parents have a vocational qualification without "maturita" (or lower) and 28% of those whose parents have "maturita". The link between the education of parents and the study aspirations of their children after completion of upper secondary schooling is the weakest in the group of students with the best study performance. In this group the difference in aspirations for tertiary education between students whose parents have tertiary qualifications and those whose parents have "maturita" is only 7 pp, and it is 16 pp for students whose parents have a vocational qualification without "maturita" (or lower).

## 1.2 Knowledge and skills of population

The knowledge and skills of the population are the result of lifelong learning, although initial education plays a decisive role as it is expected (a) to lay the foundations of education on which it is possible to build at later stages, (b) to provide instruments whereby an individual can learn and understand the possibilities of obtaining and processing information, and (c) to motivate for lifelong learning.

### Knowledge and skills of young population

Measuring the knowledge and skills (literacy) of the population aged 15 is the subject of an international study imple-

mented by the OECD and entitled PISA (Programme for International Student Assessment).

### Average literacy level of young people

The average results of pupils in the Czech Republic, except in the case of reading literacy, are above the OECD level. When comparing the results of EU member countries participating in the study, Czech pupils scored the best results in scientific literacy. The CR ranked third among EU countries, only Finland scored a statistically much better result. As regards the Netherlands, the difference is statistically negligible. However, Japan ranked much better.

In mathematical literacy the CR ranked fourth. Only Finland, the Netherlands and Japan had much higher scores in terms of statistics. As regards Belgium, the difference is not statistically important. In problem solving the rating of Czech 15-year-old pupils was lower as they ranked sixth on the scale. Only Finland scored a statistically much better result. The worst scores were received by Czechs in reading literacy where they occupied twelfth position, while five EU countries were rated much higher in terms of statistics.

Although the Czech education system certainly has various drawbacks, the quality of education of fifteen-year-olds is above average except in the case of reading literacy.

**Table 1: Mean literacy figures – 15 year old pupils**

mathematics		reading		science		probl. solving	
cou.	points	cou.	points	cou.	points	cou.	points
FI	544	FI	543	FI	548	FI	548
NL	538	IE	515	JP	548	JP	547
JP	534	SE	514	NL	524	BE	525
BE	529	NL	513	<b>CZ</b>	<b>523</b>	NL	520
<b>CZ</b>	<b>516</b>	BE	507	FR	511	FR	519
DK	514	JP	498	BE	509	DK	517
FR	511	PL	497	SE	506	<b>CZ</b>	<b>516</b>
SE	509	FR	496	IE	505	DE	513
AT	506	USA	495	HU	503	SE	509
DE	503	DK	492	DE	502	AT	506
IE	503	DE	491	PL	498	HU	501
SK	498	AT	491	SK	495	IE	498
LU	493	LV	491	USA	491	LU	494
PL	490	<b>CZ</b>	<b>489</b>	AT	491	SK	492
HU	490	HU	482	LV	489	PL	487
ES	485	ES	481	ES	487	LV	483
LV	483	LU	479	IT	486	ES	482
USA	483	PT	478	LU	483	USA	477
PT	466	IT	476	GR	481	PT	470
IT	466	GR	472	DK	475	IT	469
GR	445	SK	469	PT	468	GR	448

	above the OECD average
	deviance from the OECD average is not statis. signif.
	below the OECD average

Source: OECD (2005a).

The CR ranks among the countries with a major shift towards higher literacy levels in 15-year-olds between 2000 and 2003 in terms of mathematical and scientific literacy and problem solving (see Table 2A). The re-

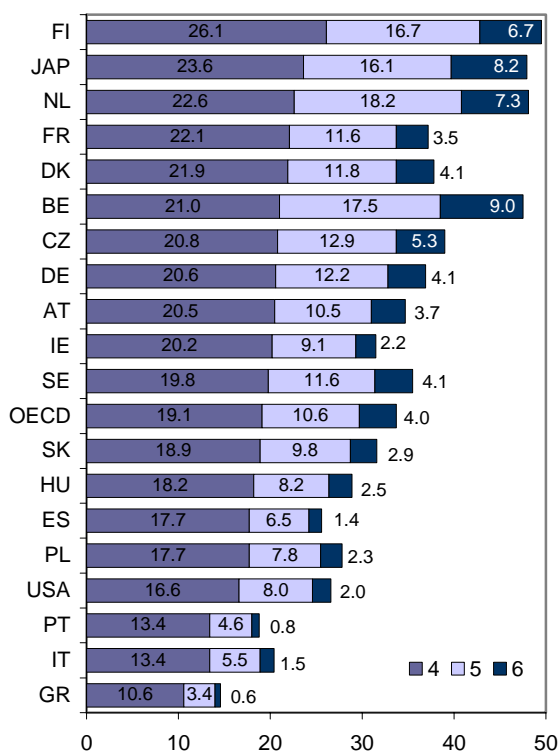
sults in reading literacy worsened in this period, although the difference is not a major one in terms of statistics. However, this is a very negative trend as in terms of reading literacy the CR occupies a place in the bottom half of the imaginary scale. It is obvious that in teaching increased attention must be paid to active work with written texts on the part of pupils.

#### The highest literacy level in the young population

In the PISA survey the level of mathematical literacy was rated using a seven-degree scale (0-6). It may be expected that pupils who score above-average results in mathematical and scientific literacy represent a potential for the development of science and technology.

Overall, Finland scored the best results in terms of the three highest levels of mathematical literacy, where almost a half (49.5%) of fifteen-year-old pupils achieved these levels. In the CR it was 39%, which is far less than the result of the best countries, but more than the OECD average (33.7 %). The lowest scores among EU countries were achieved by Greece and Portugal where the three highest levels of proficiency were only achieved by 14.6% of fifteen-year-olds (18.8% respectively (see Figure 5).

**Figure 5: Share of fifteen-year-old pupils scoring the highest levels of mathematical literacy (2003, in %)**



Source: OECD (2005a).

The largest contribution to the knowledge-based economy can in theory be expected from those who achieved the highest (i.e. the sixth) level of mathematical literacy. In this respect Belgian education scored the best results with 9% of fifteen-year-old pupils at this level. The Czech education system only produced 5.3% of pupils who demonstrated this level of proficiency.

Although the PISA results are not unfavourable for the CR, it does not mean that Czech education does not

need changes. On the contrary, the necessary changes are of a fundamental nature and they are related to the concept of lifelong learning, the implementation of which cannot go ahead unless the role of initial education as a whole is altered. Planned modification of initial education is embedded in long-term policy documents of the Ministry of Education, Youth and Sports which comply with the objectives of the education policy jointly adopted by EU countries. According to the Long-Term Plan for Education and Development of the Education System, the gradual alteration of initial education should take place via two long-term processes – decentralisation of education systems and modernisation of the content and methods of education. Both processes are already underway. The state has transferred its responsibility for setting up educational institutions to municipalities and regions, and the powers of school directors have been strengthened. The second part of the decentralisation process, which is related to school autonomy and the involvement of parents, community and social partners in school life, is also gradually being put into practice (especially involvement in the school curricula development and participation in the operations and management of school).

Modernisation of educational programmes has been launched via curricula reform which reinforces, to a large degree, the influence of schools and other stakeholders in the formulation of objectives and content of education. All changes related to enhancement of quality and effectiveness of education are conditional upon a change in the role and position of teachers, as the success of implementation of the planned policy measures will depend on them.

#### **Knowledge and skills of adult population**

The knowledge and skills of the adult population are largely based on the knowledge and skills acquired in initial education. However, they also illustrate the quality of continuing education. If initial education at school is not followed up by various forms of continuing education, the knowledge and skills acquired not only become outdated, but they can even be partially or entirely lost if they are not used in civic or professional lives. Moreover, continuing education may also redress the consequences of dropping out from schooling or of an earlier bad choice of educational pathway. Nevertheless, all studies show that if a positive attitude to education and learning is not acquired during compulsory schooling, this drawback is very hard to eliminate in adulthood.

The knowledge and skills of the adult population are analysed based on data obtained as part of an International Adult Literacy Survey (IALS) focusing on people aged 16-65. The CR took part in the second stage of the survey in 1998.

#### Average literacy level of adult population

The rating achieved by the adult population in the CR in comparison with other EU-25 countries is shown in Table 2. The level of literacy is expressed using a scale ranging from 0 to 500 points where the higher the number, the higher the level of literacy.

As with fifteen-year-old pupils, adults in the CR have the best results in quantitative literacy. Although its mean level of quantitative literacy was ranked third from the top, the difference from first-placed Sweden and second-placed Denmark is not statistically important.



In terms of document literacy the Czech population can be compared to that of Germany and Belgium. Four EU countries scored results far better in terms of statistics (Sweden, Finland, the Netherlands and Denmark). Document literacy and prose literacy are not among the strengths of the Czech adult population, while the situation is worst in terms of prose literacy. The CR's mean level is comparable with Belgium, Great Britain and Ireland, but it is far lower as compared to another five EU countries (Sweden, Finland, the Netherlands, Germany and Denmark) and the USA.

**Table 2: Average literacy level of adult population (15-64 year olds)**

prose lit.		document lit.		numeracy	
country	points	country	points	country	points
SE	301.3	SE	305.6	SE	305.9
FI	288.6	FI	289.2	DK	298.4
NL	282.7	NL	286.9	<b>CZ</b>	<b>298.1</b>
DE	275.9	DK	293.8	DE	293.3
DK	275	DE	285.1	NL	287.7
USA	273.7	BE	278.2	BE	287
BE	271.8	<b>CZ</b>	<b>282.9</b>	FI	286.1
<b>CZ</b>	<b>269.4</b>	USA	267.9	USA	275.2
UK	266.7	UK	267.5	HU	269.9
IE	265.7	IE	259.3	UK	267.2
HU	242.4	HU	249	IE	264.6
SI	229.7	SI	231.9	SI	242.8
PL	229.5	PL	223.9	PL	234.9
PT	222.6	PT	220.4	PT	231.4

	statistically significantly better than CR
	statistically significantly worse than CR
	difference is not statistically significant

Source: OECD (2000).

The average level of literacy in adults should be complemented by an indicator pointing to the percentages of the population at various literacy levels. IALS distinguishes five literacy levels, the fifth being the highest.

The third level constitutes the minimum of skills necessary for an individual to function actively in a modern developed society. A high proportion of the population at literacy levels 4 and 5 is an indisputable advantage for society. This population is expected not only meet the demands of globalised economies, but to facilitate progress of the national economy towards higher competitiveness. A high proportion of the population at level 3 and lower points to problems related to social integration and the inclusion of this population that is situated at the margin of society.

#### The highest level of literacy in adult population

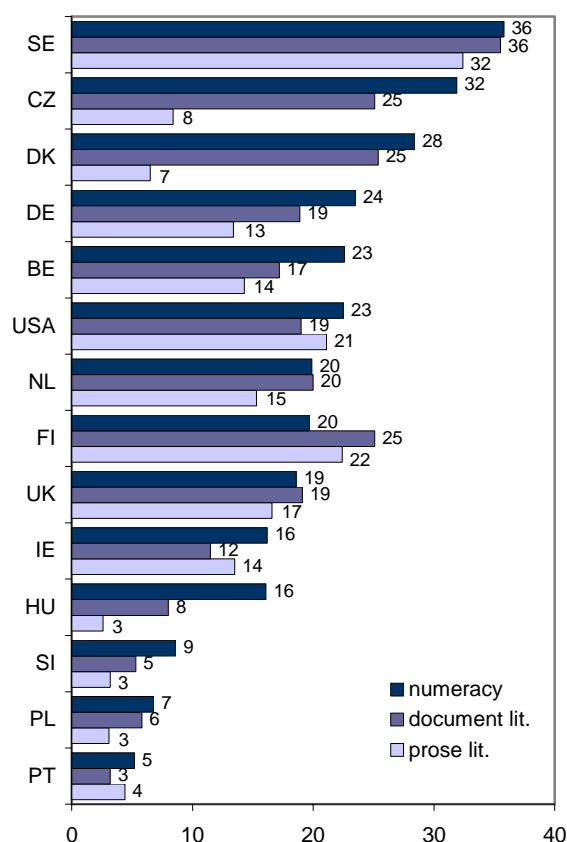
Although the CR has a relatively good comparative position in terms of the average level as regards the various adult literacy components (see Table 2), its position in terms of the proportion of the population achieving higher literacy levels is worse (see Figure 6). In prose literacy there are only 46% of the Czech population at the three highest levels, while in the "best" Sweden it is almost three quarters.

In the Czech Republic level 3 of prose literacy was achieved by 38% of adults, while in Denmark it was 48%. Levels 4+5 were scored by a mere 8% of the

Czech adult population, while in Sweden it was 32%. It is clear that the rate of our lagging behind increases along with a growing literacy level. Another alarming fact is that over a half of the Czech population only achieved levels 1 and 2 and therefore are not able to function actively in a globalised economy.

As regards document literacy, the results were slightly better. In terms of the percentage of the population at the two top levels the CR ranked in the first half of the imaginary scale. It is clear that the margin of difference from the best of the countries under review is not so dramatic as is the case with prose literacy. The proportion of Czech adults at level 3 was, as with prose literacy, 38%, but the proportion at levels 4+5 was a nice 25%. The largest proportion of the population at level 3 was in the Netherlands (44%), and at levels 4+5 it was Sweden (36%).

**Figure 6: Share of adult population at the two highest levels of literacy (1998, in %)**



Source: OECD (2000).

The best results were scored by the Czech population in quantitative literacy where the margin from the best country is the smallest. Level 3 was achieved by 37% of the population of the CR, levels 4+5 by 32% in total (in Sweden it was 36%).

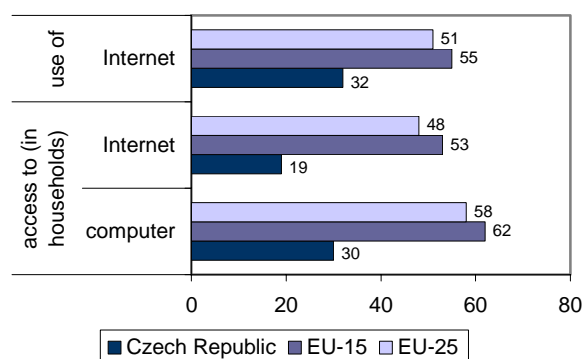
#### 1.3 Computer literacy of population

The competitiveness of enterprises and individuals is increasingly linked to the use of information and communication technologies (ICT), and a certain level of proficiency has become one of the necessities of an ordinary civic life. This is why all developed countries seek to establish equal opportunities for the acquisition of ICT com-

petencies. These concern not only an across-the-board provision of the relevant infrastructure and its wide accessibility, but also respect for the specific needs of various population groups in terms of age, gender, social position, geographic location and health and intellectual capacity.

Access to ICT has a positive impact on an individual's competitiveness, provided that ICT are used for learning and searching information about employment opportunities. The most comfortable environment for these activities is a household with a PC and connection to the Internet. Households in the CR have a below-the-average level of facilities in this respect, both in terms of EU-15 and EU-25 comparison. (see Figure 7). On average over a half of households (58%) have a computer in EU-25 while it is less than a third in the CR (30%). Almost a half of households in EU-25 are connected to the Internet, while it is less than one fifth in the CR (19%). The situation is even worse in terms of EU-15 comparison as ICT facilities available in the old member countries are at a far higher level as compared to the new members (data for individual countries – see Table 3A).

**Figure 7: ICT facilities and use of Internet in households (2005, in %)**



Source: EUROSTAT (2005d).

The main barrier to improvement in terms of ICT facilities and Internet connection in households is the relationship between an average family income and the costs of living on the one hand, and the PC and Internet connection costs on the other hand. The importance attributed to these facilities also plays a certain role. The level of facilities in households in the CR varies largely depending on whether or not there are children in the household.

Among households consisting of two adults and no children only 15% had a PC and 10% had an Internet connection in 2005, while the figures for households with two adults and children were 56% and 35% respectively<sup>1</sup>.

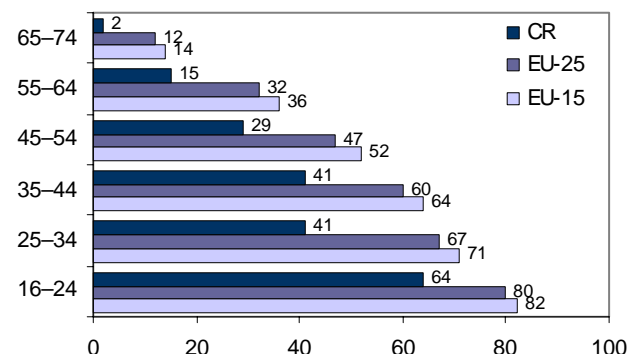
Children constitute a major stimulus for ICT acquisition. However, age also plays a certain role. It may be expected that a large proportion of households without children consist of elderly people who have a more reserved relationship to PCs and the Internet as compared to younger generations. The most frequently stated reasons for not having a PC and access to the Internet are the

level of fees (38% of households) and the fact that household occupants have access to the Internet elsewhere, particular at work, at school, etc. (35%).

The population in the CR aged 26-74 uses the Internet much less in comparison with the EU population. In 2005 during the three months before the survey an average of 51% of the population in EU-25 used the Internet, while it was only 32% in the CR. In EU-15 it was over a half of this age group (55%). These low figures reflect both the low level of ICT facilities in households and a lower level of employment in professions using the Internet, a lower level of Internet-connected ICT facilities in schools and a limited development of services provided via the Internet.

The use of the Internet by the population depends on age (see Figure 8). In the CR as in the EU (on average) the use of the Internet decreases as age increases. According to EU-15 as well as EU-25 figures this decline is more or less even across ten-year age groups, and a more radical decline occurs in the 55-65 and 64-74 age groups. The CR shows a relatively large difference between the youngest age group (16-24) and the following group (25-34). The latter also shows the biggest difference as compared to the EU-25 average (26 pp) and EU-15 average (as many as 30 pp). However, in the next age group there is no change and the proportion of the population aged 35-44 who use the Internet is the same – 41%.

**Figure 8: Individuals using Internet by age groups (2005, in %)**



Note: The figures on the use of the Internet relate to the three months before the statistical survey. Source: ČSÚ (2005b).

It is clear that older people who did not have an opportunity to acquire basic computer skills in initial education only clear their paths to ICT use with difficulties. The National Programme for Computer Literacy, which was launched by the Ministry of Informatics in February 2003, aims to help people overcome fears of new technologies and to support computer literacy. Since 2003 nearly 132 thousand people have participated in the courses. This testifies to a great interest on the part of both the general public and companies, as many participants were signed in by their employers. It may be expected that these are mostly small enterprises with limited resources for the training of their employees.

#### 1.4 Flexibility of population

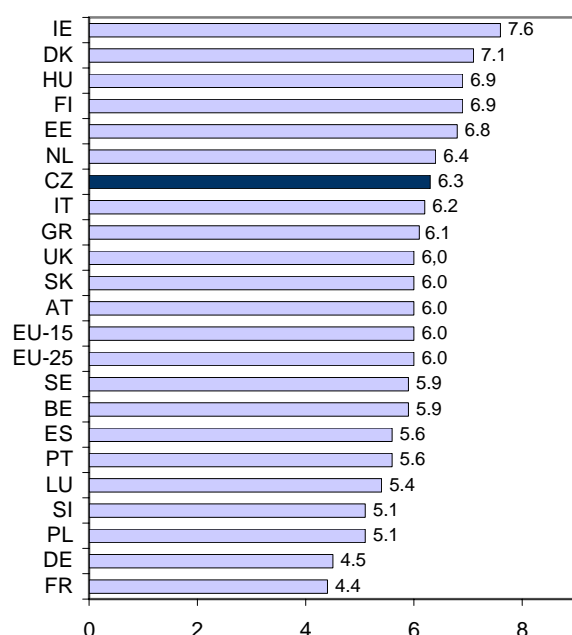
In economic terms the flexibility of the population can be defined as a capacity to adjust to the changing needs of the labour market. This capacity is becoming an increasingly important quality of an individual and it is influenced by his/her education and attitude and, particularly, willingness to acquire new knowledge and skills.

<sup>1</sup> The analysis of household facilities in the CR is based on a publication by ČSÚ (2005b).

The International Institute for Management Development (IMD) in Switzerland publishes annually the rates of population flexibility in its World Competitiveness Yearbook. The flexibility is evaluated based on questionnaires where domestic and foreign experts answer the question "The flexibility and adaptability of people in the economy is low – high when confronted with new demanding tasks". The rate of flexibility is ranked on a ten-degree scale.

In 2005 the Czech population was ranked more flexible as compared to the EU-25 and EU-15 average (see Figure 9). Only 6 EU member countries showed a higher level of flexibility than the CR. In terms of flexibility the Czech population made major progress between 2004 and 2005. Conversely, there was a decline in terms of the EU average. In 2001-2004 the rate of flexibility in the CR ranged from 5.5 to 5.8 points, in 2005 it scored to 6.3 points which is a year-on-year increase of 0.6 pp.

**Figure 9: Flexibility and adaptability of people in the economy (2005, points)**



Source: IMD – International Competitiveness Year Book (2005).

As flexibility is a quality which cannot be expected to show large year-on-year increases, it is necessary – if there is no change in legislation in the given year – to put off evaluation by another two years to see whether the increase points to a longer-term positive trend or merely a year-on-year fluctuation. The levels of indicators ascertained via questionnaires are sensitive to the overall economic situation. If there is positive economic development or positive expectations the evaluation is usually more optimistic. In terms of international comparison there may also be an influence of varying levels of criticism on the part of respondents in various countries.

## Geographical and occupational mobility

In advanced countries occupational mobility is supported by retraining (see Chapter 2), guidance services and the activities of institutions which assist individuals in finding a suitable position in the labour market. Occupational mobility may be a substitute for geographical mobility, provided that an individual finds a job for which he/she has a

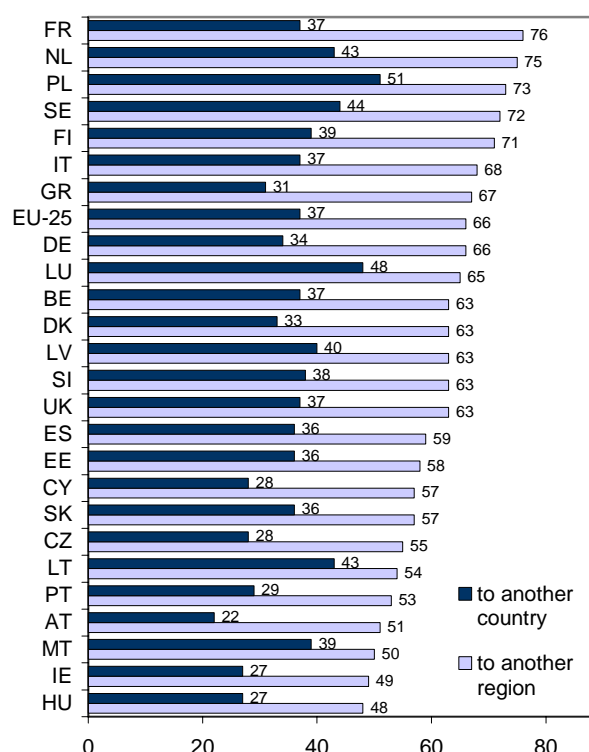
qualification in another region. Geographical mobility, in the form of a change of residence or commuting, need not always be linked to the use of the individual's current qualification. There can be a number of other reasons from the need to change an environment to better economic prospects in general.

A prerequisite for both occupational and geographical mobility is good awareness of employment opportunities. Willingness to change an occupation or a residence is to a large degree undermined by an overly generous safety net which fails to force individuals to quickly find a new job and spend the resources necessary for doing so (either financial or intellectual). The fact is that mobility is supported by measures which lower the risks an individual must undertake during its implementation.

Mobility on the European labour market should be boosted in 2006 as this year has been designated by the European Commission as the European Year of Workers' Mobility. A special survey carried out in 2005 aimed to identify the views of EU citizens on geographical and occupational mobility.

The first results of the survey (see Figure 10) show that people in the CR are not too much in favour of geographical migration. In the EU-25 two thirds of the respondents on average are willing to leave their region to find a new job, while it is only a half in the CR (54%). France and the Netherlands have the most willing people to move outside their region for work (almost 80%), whereas in Hungary and Ireland less than a half of the respondents expressed their willingness for inter-regional intrastate migration.

**Figure 10: Share of population willing to move to get a job in the event of unemployment (2005, in %)**



Source: EC – Eurobarometer (2006).

The willingness to move abroad is lower in all countries as compared to intrastate migration. Only 37% of respon-

dents were willing to move to another EU country to take a job in the case of unemployment, which is almost twice as low a figure as compared to intrastate mobility. In the CR the percentage of those willing to move to a foreign country is even lower – 28%. Lower willingness was only expressed by respondents in Hungary, Italy and Austria. On the contrary, Poles show the highest level of willingness in this respect (51%).

On average respondents see insufficient language competencies and problems related to adaptation to a new environment as the most severe obstacle to international mobility (50% and 20% respectively). Access to social security and services is viewed as a barrier to migration by relatively fewer people (15%), and less than 10% see a problem in recognition of qualifications and diplomas, and in work permit acquisition. The issue of a work permit is seen as the most severe problem by new member countries in view of the restrictive measures on free movement of their workforce adopted by most old member countries.

#### Occupational mobility

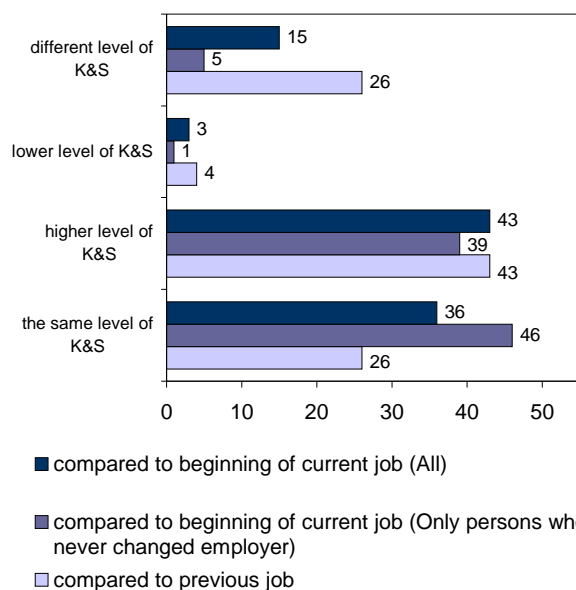
Occupational mobility expressed in terms of the number of jobs was on average 3.9 in the EU-25 and 3.2 in the CR. The lowest number was shown by Austria (2.7 jobs), the highest by Denmark (5.9) and Great Britain (5.7).

Although the Czech population shows a relatively low level of mobility, there is a widespread opinion that it is good to change a job every once in several years. 60% of respondents in the CR believe in the positive effects of frequent job changes, whereas the same is only true of 40% for the EU-25 average.

The low occupational mobility rate in the EU-25 can also be demonstrated by the fact that a full quarter of the respondents never changed an employer, and this proportion does not change significantly in relation to age. 24% of the respondents aged 25-39 had never changed job, in the 40-54 age group it was 20% and 25% in the age group 55+. Nor do Europeans consider the plan for a future change of employer. 54% have given no consideration to changing their job within the following five years. The decisive reason for retaining the current job is satisfaction with their current employment.

According to the survey results the change of employer plays a decisive role as regards the acquisition of new knowledge and skills. A quarter of those who have changed employer had to acquire new knowledge and skills, as compared to a mere 15% of those who stayed with the same employer. However, the change of employer is not normally linked to a higher level of knowledge and skills. The same percentage of people (43%) had to enhance their knowledge and skills in the case of an employer change and in the case of staying with the same employer. People who remain with the same employer for too long have the lowest chance of improving their knowledge and skills. Nearly a half of those who never changed an employer (46%) still use the same knowledge and skills as they did after taking on the job.

**Figure 11: Knowledge and skills needed – difference between current position and first position and between current job and previous job (2005, in %)**



Source: EC – Eurobarometer (2006).

The survey revealed that occupational mobility relates to changes in the knowledge and skills acquired so far, and that these changes further promote mobility. On the other hand, too long a period in one job results in stagnation of knowledge and skills, unless the individual progresses on the corporate ladder towards more demanding posts (see Figure 11).



Table 1A: Educational attainment of the 25-64 year-old population (2005, in %)

	2000		2001		2002		2003		2004		2005	
	ISCED		ISCED		ISCED		ISCED		ISCED		ISCED	
	3-4	5-6	3-4	5-6	3-4	5-6	3-4	5-6	3-4	5-6	3-4	5-6
EU-15	42.1	21.2	42.4	21.5	42.9	21.8	43	22.5	43.8	23.1	44.2	24.0
EU-25	46.0	20.0	46.3	20.1	46.9	20.4	47.2	21.1	47.8	21.9	47.9	22.8
Austria	61.7	14.5	62.5	15.2	62.8	15.1	63.1	15.2	60.3	19.2	62.7	17.8
Belgium	31.2	27.2	31.3	27.8	32.4	27.9	33.2	28.2	33.9	29.8	34.7	30.7
Cyprus	37.7	25.1	37.7	26.8	37.4	29.1	36.5	29.5	36.2	29.4	38.4	27.8
<b>Czech Republic</b>	<b>74.6</b>	<b>11.5</b>	<b>74.7</b>	<b>11.6</b>	<b>76</b>	<b>11.8</b>	<b>76.5</b>	<b>11.9</b>	<b>76.7</b>	<b>12.3</b>	<b>76.8</b>	<b>13.1</b>
Denmark	54.0	25.8	53.0	28.1	51.7	29.0	50.1	31.8	50.6	32.4	49.7	32.9
Estonia	55.8	28.9	56.2	29.8	57.8	29.7	57.7	30.4	57.3	21.5	55.5	33.6
Finland	40.5	32.6	41.0	32.5	42.2	32.4	42.7	32.8	42.6	34	44.6	34.5
France	..	..	..	..	..	..	41.3	23.5	41.3	23.8	41.4	24.9
Germany	57.4	23.8	59.0	23.5	60.7	22.3	59.5	24.0	59.0	24.9	58.9	24.4
Great Britain	52.8	28.2	52.5	28.6	52.4	29.4	51.9	30.7	55.3	29.1	55.6	29.5
Greece	34.5	16.9	35.0	17.2	35.9	17.9	37.2	18.6	38.1	20.6	39.2	20.5
Hungary	55.2	14.0	56.0	13.9	57.2	14.0	58.8	15.2	58.5	16.6	59.0	17.0
Ireland	35.7	21.6	35.5	23.4	35.0	25.1	35	26.8	34.7	28.3	35.6	29.0
Italy	35.6	9.6	33.2	10.0	34.0	10.4	36.1	10.8	37.5	11.4	38.4	11.9
Latvia	65.1	18.0	60.9	18.1	63.1	19.6	64.2	18.2	64.6	19.4	62.1	21.5
Lithuania	42.4	41.8	61.7	22.4	62.9	21.9	62.8	23.2	62.4	24.2	60.6	26.5
Luxembourg	42.5	18.5	41.2	18.1	42.9	18.8	54.8	14.9	54.8	22.8	..	..
Malta	12.8	5.4	9.6	9.6	9.6	8.6	11.4	9.0	12.3	10.9	14.1	12.1
Netherlands	42.0	24.1	42.9	24.0	42.7	24.9	..	..	..	..	41.5	30.3
Poland	68.3	11.4	68.3	11.7	68.6	12.2	68.2	13.9	68.1	15.3	68.1	16.5
Portugal	10.6	9.0	10.9	9.3	11.5	9.5	11.7	10.5	12.6	12.6	13.6	12.7
Slovakia	73.3	10.3	74.3	10.6	75.0	10.8	75.1	11.6	73.9	12.8	73.7	13.9
Slovenia	59.1	15.7	61.2	14.1	62.1	14.8	60.7	17.8	60.5	18.8	60.5	20.0
Spain	15.9	22.4	16.6	23.5	17.2	24.4	17.7	25.0	18.5	26.4	20.5	28.2
Sweden	47.5	29.7	55.0	25.5	55.0	26.4	54.8	27.2	54.8	28.1	54.0	29.5

Source: EUROSTAT, Labour Force Survey, 2nd quarter data of the relevant year.

Table 2A: Mean value changes in mathematics, reading and science proficiency (2003 in comparison with 2000)

proficiency	Belgium	Czech Republic	Denmark	Finland	France	Ireland	Italy	Japan	Latvia	Hungary	Germany	Poland	Portugal	Austria	Greece	Spain	Sweden	USA
mathematics A	28	17	-14	6	7	3	16	-12	34	1	14	20	11	5	-13	4	-12	11
mathematics B	22	30	10	14	5	5	9	0	37	16	22	33	19	0	6	13	3	0
reading	1	-3	-5	-3	-9	-11	-12	-24	32	2	7	17	7	-16	-2	-12	-2	-9
science	13	12	-6	10	11	-8	9	-3	29	7	15	15	9	-28	20	-4	-6	-8

Note: A-space and shape, B-changes and relations

statistically significantly better than in year 2000

no statistically significant difference in comparison with year 2000

statistically significantly worse than in year 2000

Source: Ministry of Education, Youth and Sports, ÚIV, SVP ÚRVŠ PedF UK, Učení pro život, Výsledky výzkumu OECD PISA 2003 (Education for Life, OECD PISA 2003 research results) in Učitel'ské noviny 46/2004.

Table 3A: ICT facilities and use of the Internet in households (2005, in %)

	AT	CY	CZ	DE	EE	ES	FI	GR	HU	IT	LT	LU	LV	NL	PL	PT	SE	SI	SK	UK
fac. comp.	63	46	30	70	43	55	64	33	42	46	32	87	30	78	40	42	80	61	47	70
fac. Int.	47	32	19	62	39	36	54	22	22	39	16	77	42	78	30	31	73	48	23	60
use of Int.	55	31	32	65	59	44	73	22	37	34	34	69	42	79	35	32	81	47	50	66

Note: Three months reference period; 16-74 year-old population. Source: EUROSTAT, Information Society Statistics, March 2006.

## 2. Lifelong learning

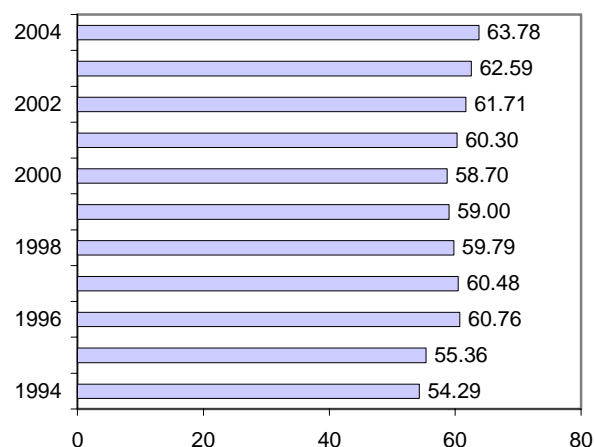
In association with the demands placed by a knowledge-society on individuals, life-long learning, which consists of initial and continuing education, is receiving increasing attention. When analysing it we focus on the participation of young people in secondary and tertiary education, the involvement of adults in continuing education as a whole and in its various forms, and on the expenditure on education.

### 2.1 The initial education of young people

#### Participation in secondary education

In terms of international comparisons the CR traditionally ranks high for the participation of young people in **secondary education** and the proportion of the adult population with upper secondary qualifications. After compulsory education most young people (approx. 95%) continue studying at some secondary school. The drop-out rate at this level in the CR is relatively low as compared to other countries (some 6%). This is the result of a rather well-developed structure of secondary education which makes it possible for students who have failed in a chosen type of school to transfer to a less demanding programme. This is why only some of those who drop out end up without a qualification. There is also a positive trend towards widening access to programmes completed by “maturita”. This is particularly due to the development of secondary technical and vocational programmes at this level (ISCED 3A). The proportion of “maturita” programmes increased from 54% in 1994 to nearly 64% in 2004 (see Figure 1).

**Figure 1: Proportions of students in 1<sup>st</sup> years of secondary programmes with “maturita” (in %)**



Source: The Development of Education and Programme Structure of Students in Secondary and Tertiary Professional Education in the CR and in its Regions 2004/05. NUOV (2005).

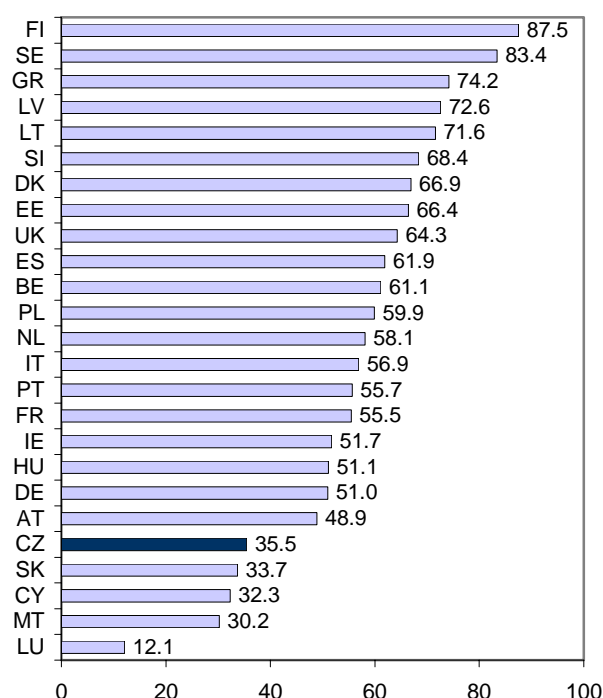
The CR is among the countries where, at secondary level, technical and vocational education largely predominates over general education (*gymnázia*). Except in the case of Prague the proportion of general secondary education in the CR is low (less than 20% of secondary school students). The advantage of the Czech education system is that technical/vocational and general educational paths are considered as equal. When entering tertiary education no distinction is made between “maturita” examinations taken in technical/vocational and general educational programmes.

#### Participation in tertiary education

Participation in tertiary education reflects the proportion of individuals taking part in all forms<sup>1</sup> of this education in the population at an age typical of this education level. The relevant age group varies from country to country and depends on the system of initial education, the age of entering compulsory education, the length of compulsory education and on the length of education that must be completed before entering the tertiary sector.

In 2002 the participation in tertiary education in EU-25 reached 56% on average and ranged from 12% (Luxembourg) to 88% (Finland). The CR with its 35.5% occupied one of the bottom positions with only 4 EU countries ranking lower (Luxembourg, Malta, Cyprus and Slovakia) (see Figure 2). The CR is far below the average of developed countries in terms of the chances to study at a higher education institution. The situation in the CR is only slowly improving, although the relevant age groups are getting less numerous and the capacity of institutions is amplifying.

**Figure 2: The proportion of students in tertiary education in the typical age group, (2002, in %)**

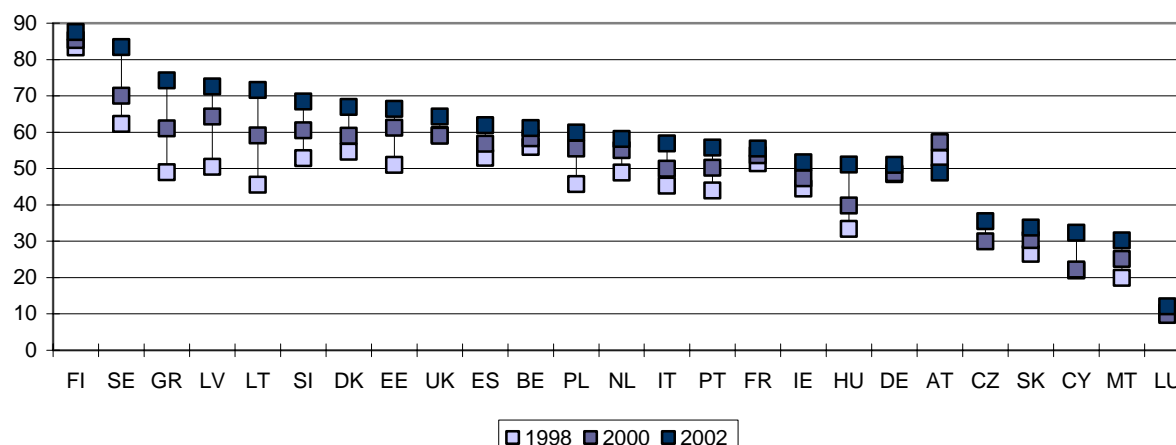


Source: The World Bank – KAM.

European countries seek to establish education policy so as to ensure a wide range of opportunities for their population to acquire tertiary education. With the exception of Austria they have been successful and the participation in tertiary education increased in 1998–2002 (see Figure 1). The largest increases were scored by Lithuania, Greece and Latvia. In 2002 the rate of participation in tertiary education exceeded 70% in four EU countries (Finland 88%, Sweden 83%, Latvia 73% and Lithuania 72%).

<sup>1</sup> Full-time (daily attendance), distance and combined education.

Figure 3: Proportions of students in tertiary education in the population at an age typical of this level of education (%)



Note: Listed according to 2002 data. Source: The World Bank – KAM.

Although the CR is far behind, there was no major increase in participation in tertiary education in 1999-2002. This differentiates the CR from a majority of new EU member countries which have been rapidly enhancing their rankings. Baltic countries and Hungary in particular have made a solid leap forward. For the CR to achieve at least the European average by 2010 it would have to increase participation of young people in tertiary education by 4 pp per annum. This is a great challenge if we consider that, between 2000 and 2002, the year-on-year increase was less than 1 pp. With such dynamics the CR would achieve the EU average as late as 2025 provided that the rate of participation in tertiary education in European countries remained stagnant.

## 2.2 The participation of the adult population in continuing education

Continuing education is mostly understood to mean education which takes place after completion of initial schooling at later stages in the life of an adult individual<sup>2</sup>. The importance of continuing education increases as the process of innovation and technological changes speed up and as their impact on all economic and social activities enlarges. Consequently, the knowledge gained in initial education becomes outdated more quickly. The ageing of the Czech as well as European population has brought about a situation where the need for new knowledge and skills cannot be satisfied only by the generation entering the labour market as in the past, and where the older generations are forced to brush up and update their knowledge.

Continuing education may be analysed using many perspectives. In terms of the form of education there is formal, non-formal and informal education. Formal education

is provided by schools and it is analogous to the initial education of young people. Non-formal education takes the form of various training courses, and informal education entails various forms of self-education. This classification is used by EUROSTAT. Our analysis of participation in continuing education is based on data ascertained as part of the Ad hoc module 2003.

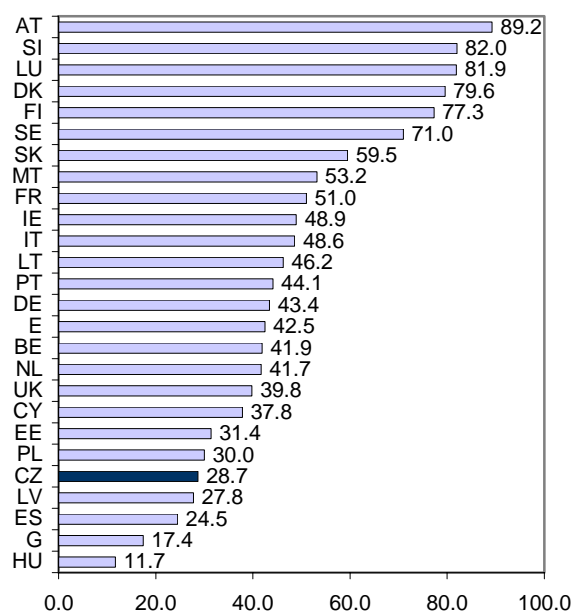
### The rate of participation in continuing education in the previous 12 months

There are large differences between European countries as regards participation in continuing education with the rates ranging from 89% in Austria to some 12% in Hungary (see Figure 5). On average some 42% of the population in EU-25 aged 25-64 is involved in some form of continuing education. The rate of participation in continuing education is often related to the individual's level of initial education. A higher level of initial education is a stimulus for further participation in various forms of continuing education. This has been statistically proved in most countries. Nordic countries, which rank among those with the highest educational attainment, also have the highest rates of adults' participation in continuing education. In Sweden, Finland and Denmark continuing education is being undertaken by some three quarters of adults. However, there are exceptions to this rule. These include, for example, Austria and Slovenia where almost the entire population (80-90%) is involved in continuing education although (or perhaps exactly because of this) only a small proportion achieved tertiary qualifications as part of initial education (only some 18% which is below the EU average).

The CR is among the countries with a very low rate of participation in continuing education CR – ranking 21<sup>st</sup> among the EU-25. The results show that in other countries people pay much more attention to updating their qualifications, even in countries whose socio-economic conditions are comparable or worse. Economic factors are less important in this case and they are outweighed by personal initiative and flexibility. The range and structure of educational opportunities and the existence of systemic support for participation in continuing education may also play a role.

<sup>2</sup> This concept of continuing education takes account of the individual's age. This means that any education of an adult individual, i.e. also part-time education at school (including distance education), is considered to be continuing education. This concept is used in the LFS – ad hoc module statistical surveys. However, there is another definition of continuing education which takes account of the provider. In this case continuing education is only education which takes place outside school – i.e. in courses provided by institutions on a commercial basis and training provided by enterprises.

**Figure 5: The participation of the population aged 25-64 in all forms of continuing education (2005, in %)**

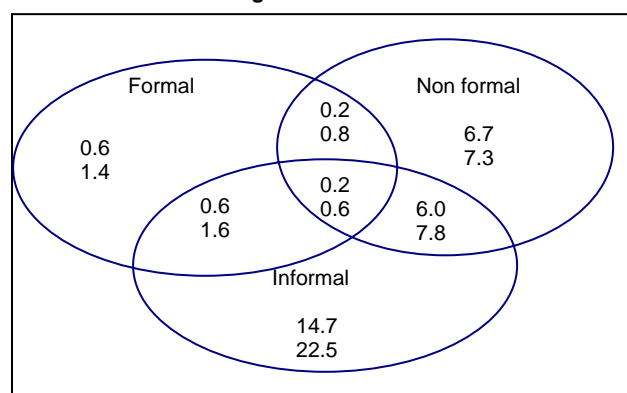


Note: Participation in education in the previous 12 months. Source: EUROSTAT, LFS. Ad hoc module on lifelong learning 2003 (2005).

Various forms of continuing education complement or substitute for one another. This is illustrated in Figure 6 which shows participation in various forms of continuing education and their combination as an EU-25 average and in the CR. Formal school education normally excludes participation in non-formal education. Only a few people go to school and attend a course at the same time (in the EU-25, out of the 16.8% of people undergoing courses of non-formal education, only 0.8% also study at school). On the other hand, school attendance is often accompanied by various forms of self-study, and self-study is even more frequently complementary to non-formal education courses. Nearly a half of those undergoing non-formal education courses are involved in self-

study (7.8% out of the 16.8% undergoing non-formal education). The proportion of people who are engaged simultaneously in all forms of education is very low (only 0.6%). In the CR there are similar relations between the forms of education, except in the case of the combination of formal and non-formal education which is less common compared to the EU. It may be said that the mutually exclusive relationship between these two forms is stronger in the CR.

**Figure 6: Percentage of population 25-64 years old involved in education and training in the CR and EU-25**

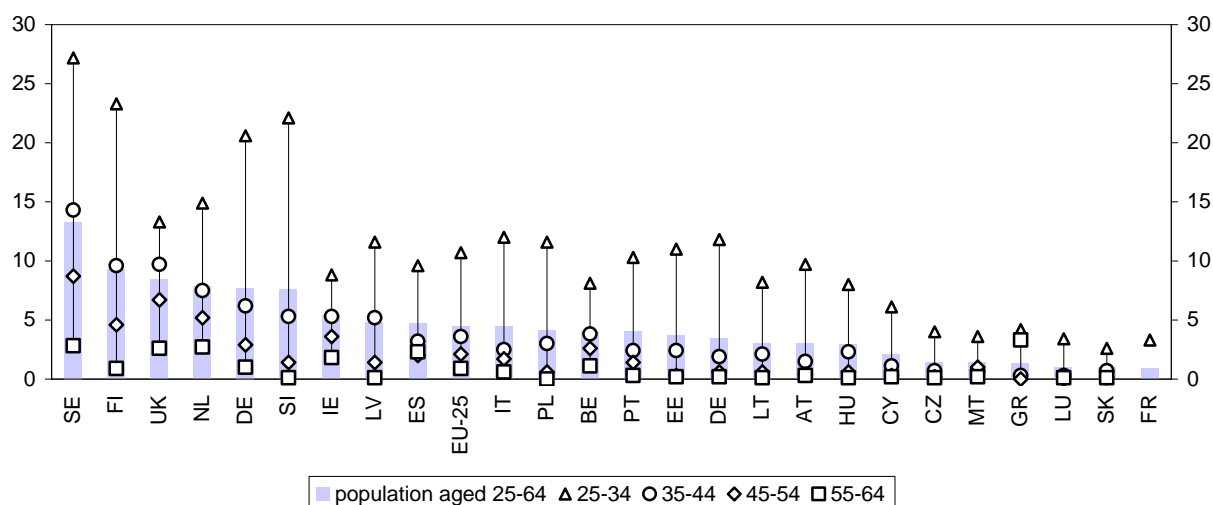


Note: The top figure is for the CR, the bottom one is for the EU-25. Source: EUROSTAT, LFS, Ad hoc module on lifelong learning 2003.

### Participation of adults in formal education

Adults' participation in formal school education is relatively rare. In the EU-25 it is on average 4.5% of people aged 25-64. Although most national education systems provide for various part-time forms of study, the programmes last several years and often saddle the learner with a heavy time burden. Lack of time may be coupled to decreased or eliminated income during studies, which for people with family obligations further complicates the situation. This educational path is more often opted for by younger people (see Figure 7).

**Figure 7: Participation of adults in formal education by age (%)**



Source: EUROSTAT, LFS, Ad hoc module on lifelong learning 2003.



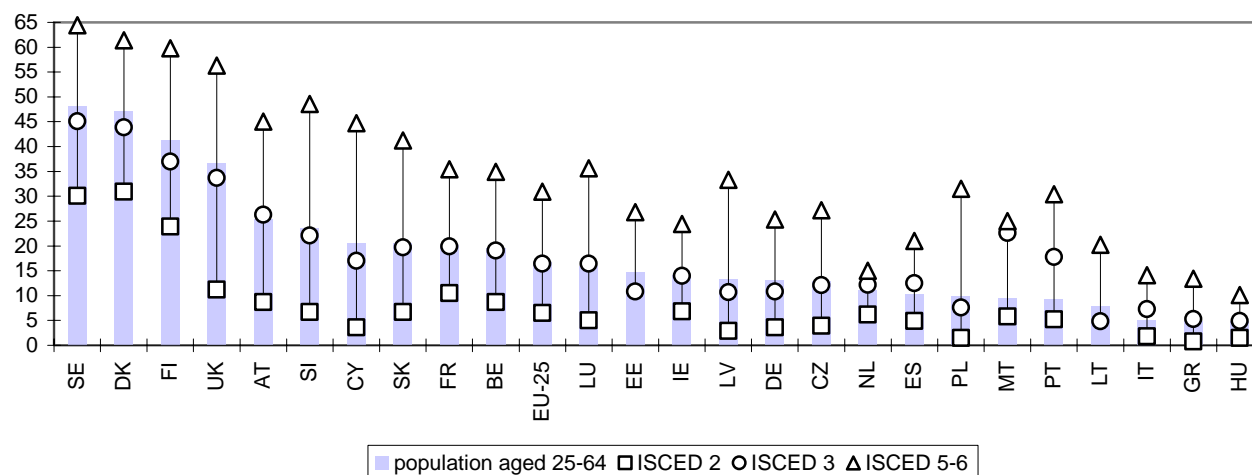
Higher participation in formal education (between 8% and 13%) is seen in Nordic countries, Great Britain and the Netherlands. Formal education in these countries is attended by 20-27% of the population aged 25-34. The rate of participation of the other age groups, including pre-retirement, is also above the average. For example, in Sweden, the Netherlands and Great Britain the participation of the oldest age group ranges between 2.6% and 2.8%, which is double the average participation of the entire population in the CR. This testifies not only to successful education policy in these countries which stimulates schools and other institutions to adjust to the needs and means available to the adult population, but also to the use of effective instruments promoting participation of adults in learning.

In the CR the rate of participation in formal education is only 1.4%. Older and middle age groups over 45 virtually do not participate (0.1 %-0.2 %). Even the youngest age

group (26-34) undertakes formal education only sporadically (4% compared to 11% in the EU).

In terms of qualification groups there is a low proportion of people with basic and secondary qualifications seeking to achieve a certificate of more advanced education. If we consider that there are only 11% of people in the CR with only basic or lower secondary education, the low participation in continuing formal education is not surprising. Negative is the fact that only a small portion of the very numerous group of adults with upper secondary qualifications in the CR (nearly 77% of the 25-64 age cohort) pursues tertiary education. The figure is 1.1%, which is five times lower the EU average for this group (see Table 1A). People with secondary qualifications in the CR also differ considerably from tertiary degree holders. They behave more like low-skilled groups which sets them apart from their EU counterparts.

Figure 8: Participation of adults in non-formal education according to educational level (in %)



Source: EUROSTAT, LFS, Ad hoc module on lifelong learning 2003.

### Participation in non-formal education

**Non-formal education** consists of various courses, short-term training programmes or lectures at the workplaces or elsewhere both during working hours and in free time. There are large differences among countries as regards involvement of the population in this form of education. On average 17% of the EU population aged 25-64 participates in non-formal education. In the CR the figure is 13% which is not such a dramatic lag as compared to other forms of education.

Those with secondary and low qualifications attend non-formal education less often than people with tertiary qualifications (see Figure 8). This is generally true of most EU countries. The CR shows one favourable feature - small differences in participation between groups with various qualification levels. The rates of participation of the groups with the highest and the lowest qualifications is slightly lower in the CR than in the EU (roughly by 1 pp). This is probably linked to massive investment in revitalisation of production plants and the inflow of foreign investment. Due to the introduction of new technologies employers must also arrange for the training of low-skilled workers who work with them.

In the CR the participation of women in non-formal education is lower than that of men. This is particularly true of the youngest age group (25-34) and the oldest one (55-64) where the participation of women is almost 4 pp lower compared to men. This pattern is not common in the EU and demonstrates a relatively lower willingness to undergo further education on the part of Czech women at an age when families are typically established and before retirement. To a degree this also reflects the attitudes of employers who organise a major part of non-formal education. On the other hand, the engagement of Czech women in self-education is almost the same as with men.

The number of hours spent in non-formal education is far lower in the CR than in the EU (50 hours and 84 hours per year respectively). This does not so much concern people with tertiary qualifications, who can compare with the EU average, but people with lower qualifications. They are only involved in short courses totalling some 25 hours per year which, as in Slovakia and Poland, is the lowest figure of the entire EU (87 hours per year).

In most developed countries of the EU-15 the higher the level of education, the shorter the duration of non-formal education courses. People with low qualifications spend many more hours in non-formal education than people

with tertiary qualifications. This reflects the fact that people with low educational attainment must absorb significantly larger chunks of knowledge than people with the most advanced qualifications. This link does not occur in new member countries. On the contrary, individuals with the highest level of education spend the largest amount of time in non-formal education, while those with the lowest qualifications spend the lowest number of hours. This is also true of the CR. It appears that the short duration of courses undertaken by low-skilled people corresponds to the needs for acquiring simple skills for line production which, in terms of technology, predominates in the CR.

#### Retraining

Retraining began to develop in the CR after 1990 in parallel with the development of employment services. The numbers of those retrained per year did not exceed 18 thousand until 1998, and after this year began to grow to almost 47 thousand per year in 2005. However, in relation to unemployment figures their proportion did not exceed 10% (except in 1992), which is a very low figure in view of the long-term structural mismatch between the skills of the workforce and the employers' requirements. The employers' unsatisfied demand for many professions and the overall large rate of unemployment opens up considerable room for retraining. However, its implementation comes up against barriers the elimination of which is slow and difficult.

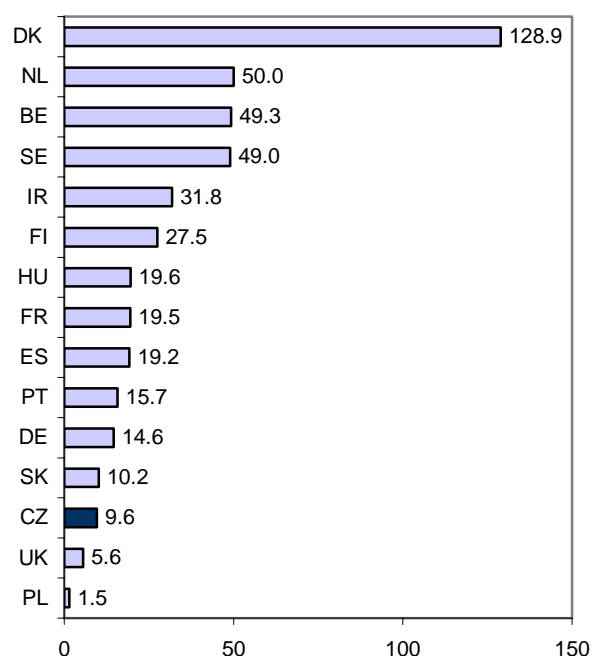
The obstacles to retraining include a low supply of vacancies reported to labour offices and the personal characteristics of job seekers – low interest in retraining. This interest lessens along with growing age and lower qualifications. In 2005 nearly a third of all registered job seekers were classified in the category of auxiliary and non-skilled professions. This on the one hand points to a severe need for continuing training, particularly in view of the fact that only 16% of the jobs on offer do not require a vocational qualification. On the other hand, the total number of vacancies reported to labour offices only corresponds to one tenth of the overall number of job seekers, which narrows the room for specific retraining targeted to specific jobs. This facilitates a larger range of non-specific retraining which does improve the quality of the workforce but fails to prepare them for direct entry into the employment. A higher age is also a barrier to retraining. The fact is that some 25% of the unemployed are older than 50 and the two limiting factors (i.e. age and low qualifications) are often combined in this very group.

Statistical data of the Ministry of Labour and Social Affairs show (see Table 2A) that a large group undergoing retraining is young people up to 25. They are, above all, graduates of schools on various placements where they acquire practical experience. This type of retraining has the highest rate of efficiency expressed in terms of taking on a job within 12 months of retraining completion. The rate approaches 70% while the average retraining efficiency is less than 40%. The proportion of women in retraining is growing, but their efficiency is lower (some 35%).

The lower participation in retraining in the CR is evident by an international comparison of the rates of participation of job seekers in retraining. This indicator states the proportion of job seekers in retraining in the overall number of job seekers (see Figure 9). As the situation in the labour market differs from country to country, this indicator

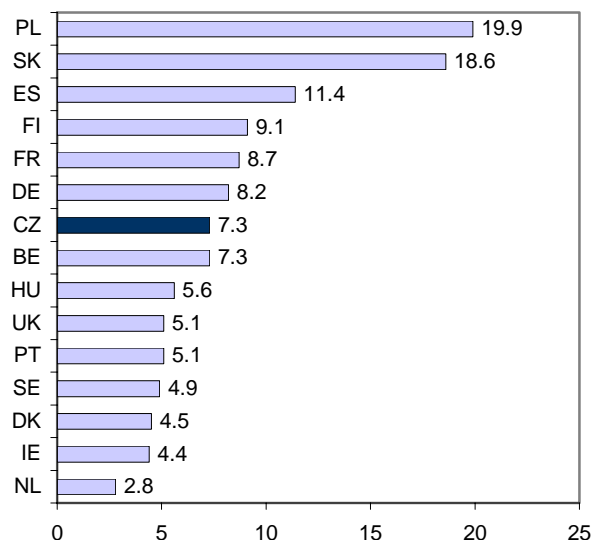
should be interpreted in relation to the rate of unemployment (see Figure 10).

**Figure 9: The proportion of job seekers in retraining out of the total unemployed in selected EU countries (2002, in %)**



Source: OECD (2003), Employment Outlook, own calculations.

**Figure 10: The rate of unemployment in selected EU countries (2005, in %)**



Note: Data for 2005. The data for Great Britain and Sweden are preliminary. Source: EUROSTAT, Structural Indicators (2006).

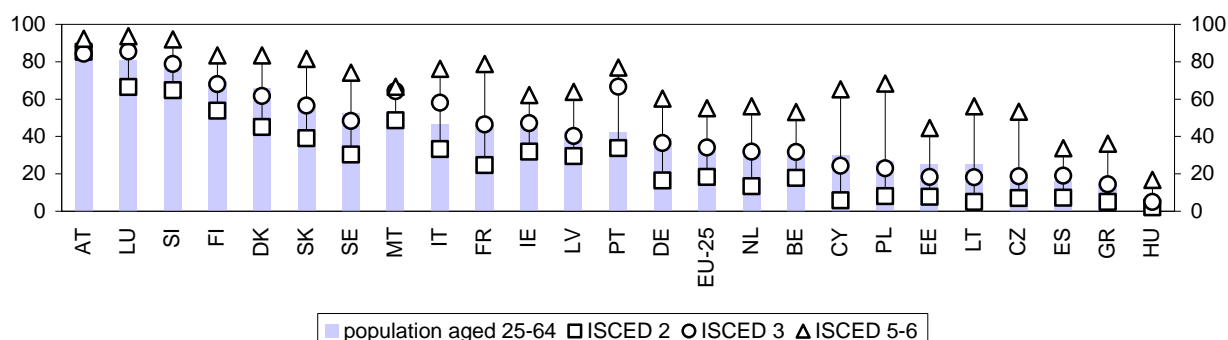
In the group of countries under review the CR is among those with higher rates of unemployment, while it ranks among the countries with the lowest proportion of job seekers in retraining. Poland is worse off than the CR in this respect with the highest rate of unemployment and the lowest proportion of the unemployed undergoing retraining. Conversely, Denmark, for example, has the highest number of retrained job seekers and low unemployment.

### Participation in informal education

Informal education covers a wide variety of self-study methods from visits to educational centres and lectures through the use of the Internet to following professional programmes in the media. In the EU-25 every third adult on average is involved in self-education. There are enormous differences among countries in terms of the rate of self-education, ranging from some 86% in Austria to 4% in Greece.<sup>3</sup> The CR is in the bottom group where only every fifth adult undertakes self-education (see Figure 11).

Self-study often complements other forms of learning – at school or in specialist courses. It is therefore true of most countries that the country's rankings in terms of the participation of the population in informal education and participation in other forms of education (particularly courses of non-formal education) are very similar. However, the Czech population is involved in self-study far less (21<sup>st</sup> place) than is suggested by the rate of involvement in non-formal education (15<sup>th</sup> place).

Figure 11: Participation of adults in informal education according to educational attainment (in %)



Source: EUROSTAT, LFS, Ad hoc module on lifelong learning 2003.

As self-education is largely a leisure activity, a low participation rate may suggest preference for personal comfort or, conversely, an excessive workload (some international surveys show that the number of hours spent at work in the CR is higher as compared to other European countries). For the sake of completeness of data we should mention a possible distortion of data as the definition of informal education is very broad and it is up to the respondent which activities (including, for example, watching TV) he/she denotes as self-education.

As regards self-education there are considerable differences in the CR between qualification groups. The margin of difference between the rate of self-education in the groups with the highest and the lowest qualifications is on average 37 pp in the EU, while in the CR it is 46 pp. While Czechs with tertiary education practise self-education similarly to their European counterparts, the CR ranks among the lowest for participation of people with basic education.

Larger participation in informal learning is seen in workers in the sector of public services and in more demanding industries of the tertiary sector, but even here participation very much depends on the level of educational attainment. In terms of the field of initial education, it is mainly teachers who learn informally.

### 2.3 Expenditure on education

Expenditure on education is an investment that promotes economic growth, enhances labour productivity and, if equal access to education is ensured, contributes to social cohesion. The level of expenditure on education

reflects not only the economic resources, but also the importance attributed to education by society, enterprises and individuals. The total expenditure on education consists of public and private expenditure.

It is virtually impossible to assess whether or not expenditure on education is sufficient, as there is no generally valid criterion expressing an optimal level of expenditure per learner. Therefore there is an assumption that higher expenditure renders better educational services and learning outcomes. Although expenditure on education predetermines, to a large degree, the quality of the education system, learning outcomes do not only depend on financial costs. They are the result of a combination of these costs and the related material facilities on the one hand, and modern education policy including timely reforms in the content, methods and organisation of education on the other hand. Last but not least, learning outcomes are also affected by the quality and commitment of teachers and the motivation and willingness to learn on the part of students.

#### Expenditure on initial education

Expenditure on initial education depends on a number of inter-linking factors such as the demography of the population, rate of participation in education, GDP levels, wage levels in the education sector and the education system as such.

In terms of EU comparison the CR is not among the countries with a high expenditure on educational institutions as a proportion of GDP (see Table 3A). The CR ranked at the bottom of the scale in 2002 with 4.4%. In this year most money was spent on education in Denmark (8.5% of GDP), the least in Luxembourg and Greece (3.9% of GDP). As Table 3 illustrates, in 1999-2001 the CR failed to narrow the gap from the average levels of indicators with the difference hovering at 0.9 pp.

<sup>3</sup> Hungary showed only a 6% rate of involvement in informal education. However, this result may be influenced by a high proportion of incomplete answers to questionnaires which were assessed statistically as non-participation.

The situation slightly improved in 2002 where the gap was narrowed to 0.8 pp. Whether or not this is a signal of further catching up due to a faster growth in expenditure in the CR compared to the average figures remains to be shown by indicators in the following years.

**Table 3: The level of public expenditure on educational institutions as a proportion of GDP (in %)**

	1999	2000	2001	2002
EU-25	5.0	4.9	5.1	5.2
EU-15	5.0	4.9	5.1	5.2
<b>Čzech Republic</b>	<b>4.1</b>	<b>4.0</b>	<b>4.2</b>	<b>4.4</b>
difference between ČR and EU-25	0.9	0.9	0.9	0.8

Source: EUROSTAT – New Cronos, Indicators on Education Finance (2005).

The results of international comparisons change considerably if different purchasing power parities (PPP) are used for education and for GDP to calculate the expenditure. Table 4A clearly illustrates that the use of different PPP affected the level of the indicator in individual countries to a varying degree. It had strong effects in the countries where PPP for education and for GDP differ considerably. The CR ranks among the countries with far lower PPP for education compared to GDP (10.3 vs 16.5). As a result of this public expenditure on education as a proportion of GDP increased statistically in 2002 from 4.4% to 7.1%, and the CR improved its position slightly among the EU countries. From 6<sup>th</sup> from the bottom it moved up to 9<sup>th</sup> from the top.

PPP are lower for education than for GDP in all new member countries and this difference reaches up to 50% (e.g. in Estonia, Lithuania and Latvia). Conversely, in some developed countries PPP are higher for education than for GDP – e.g. in Denmark, Portugal and Luxembourg. When the same PPP were used, the old member states showed the highest proportions of public expenditure (Denmark, Sweden), but with different parities they were overtaken by a great margin by new Baltic member states (Lithuania, Estonia, Latvia).

The European Commission urges member countries to increase investment in education, but, in view of limited public finances, it also stresses the necessity of a larger involvement of private resources, particularly where there is a high level of individual and corporate return on such investment. The level of private expenditure on educational institutions reflects not only the importance attributed to education by individuals and private enterprises, but also the proportion of private education in the education system as a whole and the degree of co-funding in the case of public education. Important also is the impact of legal regulations which foster indirect instruments for encouraging private investment in education (tax allowances, etc.).

Private expenditure on education as a proportion of GDP is less than 1% in all countries under review. In the CR this indicator is below the EU average and this difference deepened in 2002 when it reached 0.3 pp

(see Table 5A). Year-on-year differences may also be influenced by the methods of research, since private expenditure is identified at the level of individual educational institutions which may not always be willing to report all private revenues, and this may result in figures that understate the levels involved.

### The effectiveness of expenditure on education

One of the ways of comparing internationally the level of effectiveness of educational expenditure is to compare cumulative expenditure per pupil aged 6-15 with the average level of literacy of 15-year-old pupils (see Chapter 1). Figure 12 below bears out the fact that learning outcomes are not merely directly dependent on expenditure on education and that lower expenditure does not automatically produce lower literacy level.

The graph breaks the countries (17 EU countries, the USA and Japan) down into four groups according to national levels of selected indicators related to the average for 17 EU countries. The smallest is the group including the CR, Ireland and Germany. These countries are typical for below-average expenditure on education and an above-average level of literacy. The second group, which is the largest, consists of six countries where both expenditure on education and the level of literacy are above the average (e.g. Finland, the Netherlands). Another group of five countries shows above-average expenditure on education and below-average level of literacy (e.g. Portugal, Italy). Finally, the last group is made up of five countries with both expenditure and literacy levels below the average (e.g. Slovakia, Poland).

### Corporate expenditure on the training of employees

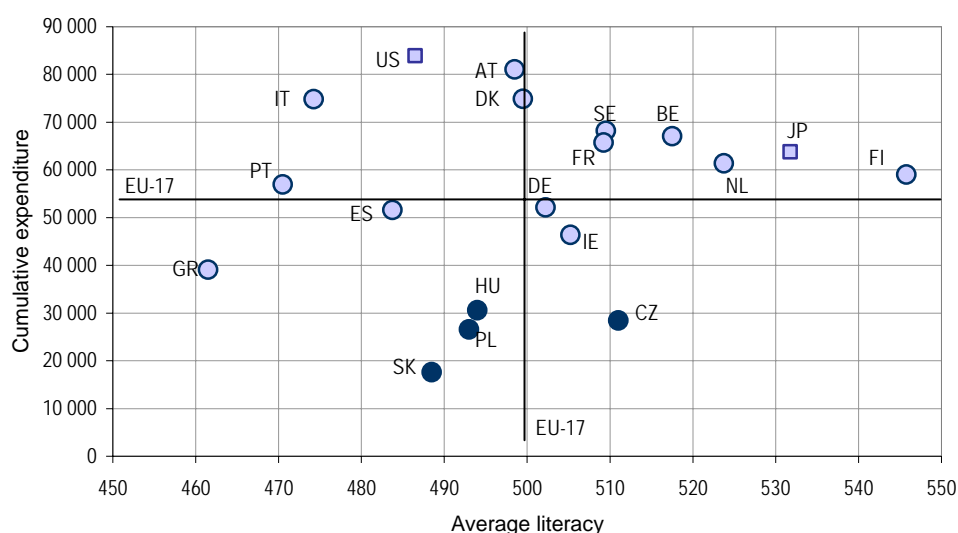
The training costs of enterprises depend on the scope and structure of the training provided. The governments of developed countries normally acknowledge the importance of a well-educated workforce and therefore adopt policies and instruments which aim to stimulate training in enterprises.

The analysis of the training expenditure of enterprises is based on a EUROSTAT study of 2000 which relates to 1999 (CVTS 2 – Continuing Vocational Training Survey).

In terms of corporate training expenditure comparison the old EU countries are positively in the lead, which is the result of their higher economic level and a more stable position of enterprises. The total costs per one course participant depend on company size and the nature of the industry. The CR ranks among the countries where the total costs per learner and year grow along with company size. In small enterprises (10-49 employees) the costs per one employee in the CR were 575 PPS, in medium-sized companies (50-249 employees) it was 597 PPS and in large companies (over 250 employees) it was 608 PPS (see Table 5). In terms of EU comparisons the CR is among the countries with the lowest training costs per employee (see Table 7A).



**Figure 12: The relationship between the average level of literacy of 15-year-old pupils (PISA 2003) and expenditure per pupil aged 6-15**



Note: The average level of literacy is calculated as a non-weighted average of mathematical, reading, scientific and problem-solving literacy. The expenditure per pupil aged 6-15 was calculated using data on expenditure on education for 2002 and it is expressed in USD using PPS. Source: OECD – Education at a Glance 2005, own calculations.

**Table 5: Total training costs of enterprises calculated per one participant (PPS, 1999)**

	CR	EU
Number of employees		
10-49	575	1325
50-249	597	1436
250 and more	608	1329
Branch (NACE)		
Manufacturing (D)	416	1298
Wholesale and retail sale (G)	651	1124
Financial intermediation (J)	1449	1799
Real estate, renting (K)	1436	1955
Other community, social and personal service activities (O)	589	1122
Other	529	1171

Note: The EU average is calculated as a non-weighted average. Source: Continuing Training in Enterprises in Europe, European Commission, 2005. Own calculations.

It is clear from Table 5 that enterprises in the CR lag far behind the EU average. The training costs in small enterprises only amounted to 43% of the EU average, and the situation is similar in medium-sized companies (42%). Large companies were the closest to the EU average (46%), which is linked not only to the fact that large companies have more resources, but also to the fact that they are usually owned or co-owned by foreign capital which brings about the introduction of systems for human resources management that are similar to those in the home countries.

In terms of branches, companies concerned with financial mediation are doing well in terms of international comparisons (their training costs reach 81% of the EU average), and so are companies dealing with real estate, renting and business activities (some 73%).

The total training costs of enterprises consist of three components: (a) direct costs, (b) wages of participants

during their training, and (c) the difference between payments and revenues from funds designated to support continuing training. As distinct from all other countries (except Lithuania) enterprises in the CR do not contribute to a specific fund designated for the development of continuing training. However, they do obtain public resources for the training of their employees. In 1999 these subsidies (calculated per one trainee) ranked among the lowest (see Table 6A). Czech companies got 4 PPS per one employee in training, which was approximately 1% of the direct costs.

The proportions of direct costs and wage costs vary considerably from country to country. They range from 78 : 22 in Great Britain to 38 : 62 in Spain. In the CR direct costs and wage costs account for 61% and 39% of the costs respectively. The large differences in the proportions of these types of cost among countries are mainly the result of varying national approaches in terms of the distribution of costs between enterprise and individual, and the education structure of the trainees which influences the level of wage costs per trainee.

In all countries the largest chunk of the direct training costs were payments to external training organisations and trainers. In the CR these costs made up 60% of the total costs, while travel, accommodation and board costs accounted for 10% of the total costs. In terms of these proportions Czech companies compare to the EU average, but differ considerably in terms of the proportion of the wages of internal trainers and the costs of rooms, facilities and equipment. The wages of internal trainers in the CR account for 10% of direct costs, while the EU average is 20%. This reflects the fact that pedagogical work in the CR is underestimated both in initial and continuing education. On the other hand, the CR shows a high proportion of the costs of facilities etc. (19%) as compared to the EU average which is only 7% (see Table 6A).



**Table 1A: Participation of adults in formal education according to educational level (in %)**

ISCED	SE	DK	NL	FI	ES	UK	IE	DE	BE	SI	IT	AT	PT	HU	PL	FR	CZ	EE	GR	SK	LV	LT	EU-25
2	6.8	6.2	3.3	2.9	2.1	2.0	1.6	1.4	1.2	1.2	1.1	1.1	1.0	0.4	0.3	0.2	<b>0.1</b>						1.4
3	11.4	7.7	7.9	10.8	7.0	7.9	5.2	4.0	3.5	8.0	8.0	3.1	13.0	3.1	3.0	0.6	<b>1.1</b>	3.2	2.3	0.8	4.5	2.4	5.2
5-6	20.8	8.6	13.2	12.0	9.0	14.1	10.9	3.6	8.6	14.2	9.7	5.4	16.2	6.6	14.3	2.4	<b>4.3</b>	5.9	2.1	2.9	9.8	6.0	8.5

Source: EUROSTAT, LFS, AHM 2003.

**Table 2A: Retrained job seekers by age, sex and educational level**

		total	age				gender	education (ISCED)			
			15 - 24	25-34	35-49	50+	women	0-2	3c	3a,b	4-6
2001	persons	43,560	15,602	12,867	12,136	2,955	25,000	5,928	14,680	20,354	2,594
	in %	100	35.8	29.5	27.9	6.8	57.4	13.6	33.7	46.7	6
2005	persons	46,772	13,157	13,084	14,440	6,091	28,042	6,068	16,977	20,599	3,113
	in %	100	28.1	28	30.9	13	60	13	36.3	44	6.7

Source: MPSV – <http://portal.mpsv.cz/sz/stat>, own calculation.

**Table 3A: Public expenditure on educational institutions as a percentage of GDP**

	1999	2000	2001	2002
EU-25	5.0 <sup>s</sup>	4.9 <sup>s</sup>	5.1 <sup>s</sup>	5.2 <sup>s</sup>
EU-15	5.0 <sup>s</sup>	4.9 <sup>s</sup>	5.1 <sup>s</sup>	5.2 <sup>s</sup>
Austria	5.8	5.6	5.7	5.6
Belgium	..	..	6.1	6.3
Cyprus	5.6	5.6	6.2	6.8
<b>Czech Republic</b>	<b>4.1</b>	<b>4</b>	<b>4.2</b>	<b>4.4</b>
Denmark	8.1	8.3	8.5	8.5
Estonia	6.1	5.5	5.4	5.6
Finland	6.3	6.1	6.2	6.3
France	5.9	5.8	5.7	5.8
Germany	4.5	4.5	4.5	4.7
Greece	3.6	3.7	3.9	3.9
Hungary	4.6	4.5	5.1	5.5
Ireland	4.5	4.3	4.3	4.3
Italy	4.7	4.5	4.9	4.7
Latvia	5.7	5.4	5.7	5.8
Lithuania	6.1	5.6	5.9	5.8
Luxembourg	..	..	3.8	3.9
Malta	4.4	4.5	4.4	4.5
Netherlands	4.7	4.8	4.9	5
Poland	4.8	5.0	5.5	5.6
Portugal	5.7	5.7	5.9	5.8
Slovakia	4.4	4.1	4.0	4.3
Slovenia	..	..	6.1	6
Spain	4.5	4.4	4.4	4.4
Sweden	7.4	7.3	7.3	7.6
United Kingdom	4.5	4.5	4.6	5.2

Note: s – EUROSTAT estimate; i – DK: Expenditure at post secondary non-tertiary levels of education is not available; FR: Without French Oversea Departments; CY: Includes financial assistance to students studying abroad; LU: Expenditure at tertiary level of education is not available; Imputed retirement expenditure is not available; PL, SK: Including child care expenditure at pre-primary level of education; GR, PT: Imputed retirement expenditure is not available; PT: Expenditure at local level of government is not available; UK: Adjustment of GDP to the financial year that is running from 1st of April to 31st of March. Source: EUROSTAT – New Cronos, Indicators on Education Finance (2005).

**Table 4A: Purchasing Power Parity and public expenditure on educational institutions as a percentage of GDP in 2002**

	Purchasing Power Parity		Share of Public Expenditure	
	Education	GDP	equal PPP	specific PPP
Austria	1.227	1.056	5.6	4.8
Belgium	1.157	1.023	6.3	5.6
Cyprus	0.5564	0.5073	6.8	6.2
<b>Czech Republic</b>	<b>10.26</b>	<b>16.53</b>	<b>4.4</b>	<b>7.1</b>
Denmark	11.121	9.759	8.5	7.5
Estonia	4.052	8.838	5.6	12.2
Finland	1.258	1.12	6.3	5.6
France	0.967	1.043	5.8	6.3
Germany	1.494	1.11	4.7	3.5
Greece	0.6448	0.785	3.9	4.7
Hungary	78.5	132.9	5.5	9.3
Ireland	1.216	1.161	4.3	4.1
Italy	1.0172	0.9554	4.7	4.4
Latvia	0.1453	0.2949	5.8	11.8
Lithuania	0.76	1.658	5.8	12.7
Luxembourg	1.875	1.135	3.9	2.4
Malta	0.254	0.2838	4.5	5.0
Netherlands	1.087	1.067	5.0	4.9
Poland	1.304	2.114	5.6	9.1
Portugal	1.0006	0.7625	5.8	4.4
Slovakia	9.81	18.77	4.3	8.2
Slovenia	161.6	167.1	6.0	6.2
Spain	0.7881	0.8603	4.4	4.8
Sweden	11.37	10.85	7.6	7.3
United Kingdom	0.8392	0.7066	5.2	4.4

Source: OECD, Purchasing Power Parities and Real Expenditures, 2002 Benchmark Year, 2004. EUROSTAT, New Cronos, Structural Indicators (2005), own calculation.

**Table 5A: Private expenditure on educational institutions as a percentage of GDP**

	1999	2000	2001	2002
BE	0.3	0.4	0.4	0.4
<b>CZ</b>	<b>0.5</b>	<b>0.4</b>	<b>0.4</b>	<b>0.2</b>
DK	0.2 <sup>i</sup>	0.2 <sup>i</sup>	0.2 <sup>i</sup>	0.2 <sup>i</sup>
FI	0.1	0.1	0.1	0.1
FR	0.5 <sup>i</sup>	0.4 <sup>i</sup>	0.4 <sup>i</sup>	0.4 <sup>i</sup>
IE	0.5	0.4	0.4	0.3
IT	0.5	0.5	0.3	0.4
CY	1.8	1.8	1.3	1.5
LV	0.8 <sup>i</sup>	0.7 <sup>i</sup>	0.7 <sup>i</sup>	0.7 <sup>i</sup>
HU	0.6	0.6	0.6	0.6
DE	1	1	1	0.9
NL	0.5	0.5	0.5	0.5
PL	0.2	..	..	0.7 <sup>i</sup>
PT	0.1 <sup>i</sup>	0.1 <sup>i</sup>	0.1 <sup>i</sup>	0.1 <sup>i</sup>
AT	0.3	0.3	0.3	0.4
GR	0.3 <sup>i</sup>	0.3 <sup>i</sup>	0.2 <sup>i</sup>	0.2 <sup>i</sup>
SK	0.1 <sup>i</sup>	0.1 <sup>i</sup>	0.1	0.2
SI	..	..	0.9	0.9
ES	0.7	0.6	0.6	0.6
SE	0.2	0.2	0.2	0.2
UK	0.8 <sup>i</sup>	0.8 <sup>i</sup>	0.8 <sup>i</sup>	0.9 <sup>i</sup>
EU-25	0.6 <sup>s</sup>	0.6 <sup>s</sup>	0.5 <sup>s</sup>	0.5 <sup>s</sup>

Note: s – EUROSTAT estimate; i – FR: Without French Overseas Departments; PL: Private expenditure at tertiary level of education; DK, GR, LV, PT: Payments from other private entities (i.e. firms, non-profit organisations etc.) are not available; UK: Adjustment of GDP to the financial year that is running from 1st of April to 31st of March. Source: EUROSTAT – Structural Indicators (2005).

**Table 6A: Contributions and subsidies to/from public training fund/institutions and total direct costs of CVT courses and their structure in 1999**

	Expenditure in PPS			Structure of direct cost (in %)			
	Contr.	Subs.	Dir.c.	Ext.	Overh.	Wages	Facil.
AT	2	18	701	64	14	13	9
BE	89	28	654	:	:	:	:
<b>CZ</b>	<b>0</b>	<b>4</b>	<b>372</b>	<b>60</b>	<b>10</b>	<b>10</b>	<b>19</b>
DE	3	10	869	51	14	24	11
DK	44	42	1,249	63	19	6	11
EE	1	5	725	73	13	10	4
ES	197	114	549	49	12	32	8
FI	18	55	623	61	18	15	6
FR	261	112	770	57	6	35	1
GR	166	158	671	46	21	24	9
HU	319	23	483	80	7	8	5
IE	19	38	893	53	5	39	3
IT	5	144	1,508	63	9	22	6
LT	0	3	386	67	16	11	6
LV	1	9	500	65	18	10	6
NL	:	:	:	72	6	18	4
PL	1	1	386	60	19	16	4
PT	2	83	740	67	9	20	5
SE	6	49	819	64	11	20	4
SI	1	17	311	69	13	16	3
UK	86	61	984	32	9	43	16
EU-20	61	49	710	61	12	20	7

Note: Contr. - Contributions PPS, Subsidies PPS, Direct costs PPS, External PPS, Overh. - Travel, accommodation, alimentation; Wages - Wages of internal trainers; Facil. - Rooms, equipments, utilities.

Source: Continuing Training in Enterprises in Europe, EUROSTAT (2005), own calculation.

**Table 7A: Total costs of Continuing Vocational Training courses per participant by size class and NACE (in PPS)**

	Employees			NACE					
	10-49	50-249	250 and more	D	G	J	K	O	Others
Austria	1,020	1,104	1,232	1,189	930	1,807	1,383	582	1,052
Belgium	1,651	1,765	1,592	1,553	1,596	1,800	2,019	1,316	1,462
<b>Czech Republic</b>	<b>575</b>	<b>597</b>	<b>608</b>	<b>416</b>	<b>651</b>	<b>1,449</b>	<b>1,436</b>	<b>589</b>	<b>529</b>
Denmark	1,879	2,297	2,163	2,083	1,499	3,019	3,388	2,311	1,948
Estonia	1,278	1,306	732	678	1,641	1,727	2,286	305	691
EU-22	1,325	1,436	1,329	1,298	1,124	1,799	1,955	1,122	1,171
Finland	1,381	1,311	1,418	1,433	1,128	1,975	1,734	1,027	1,326
France	1,238	1,373	1,751	1,524	1,036	1,980	2,104	1,614	1,720
Germany	1,003	1,548	1,736	1,601	949	2,614	2,394	909	1,059
Greece	1,512	2,935	1,165	2,371	1,637	1,131	1,974	1,216	869
Hungary	1,390	1,317	1,057	1,000	1,224	1,246	2,089	1,042	1,150
Ireland	1,620	1,319	1,453	1,538	1,144	1,454	1,614	1,142	1,472
Italy	2,913	2,430	1,927	1,979	2,471	2,737	3,708	2,823	1,658
Latvia	524	672	676	510	602	761	914	230	749
Lithuania	1,037	649	656	402	864	813	1,365	403	786
Luxembourg	1,603	1,174	1,930	1,630	896	2,554	2,218	1,010	877
Netherlands	1,467	1,954	2,462	2,072	1,430	3,628	2,666	1,543	1,856
Poland	735	494	609	555	799	523	715	618	558
Portugal	1,105	1,208	1,473	1,125	854	2,382	2,723	1,424	1,413
Slovenia	859	530	481	376	368	1,013	1,087	788	631
Spain	1,352	1,380	1,590	1,569	1,116	2,098	1,390	1,473	1,483
Sweden	1,229	1,263	1,544	1,398	1,034	1,423	1,894	1,183	1,424
United Kingdom	1,768	2,971	991	1,544	853	1,436	1,914	1,127	1,059

Source: Continuing Training in Enterprises in Europe, EUROSTAT (2005), own calculation.

### 3. Human resources for a knowledge-based economy

Human resources for a knowledge-based economy are analysed from two perspectives. The first is the proportion of technology-intensive manufacturing industries and the knowledge-intensive service industries in overall employment, and the demands they place on scientists, technicians and people with tertiary education. An international comparison of the representation of skills-intensive and ICT professions in the economy is also made.

The second perspective is the supply of human resources for a knowledge-based economy with an exclusive focus on graduates of tertiary programmes, as issues related to R&D workers are part of the chapter on innovation. Specific attention is paid to graduates of science and technology programmes. A quantitative international comparison is complemented by evaluation of the higher education quality.

#### 3.1 Employment structure

One of the characteristics of developed economies is a strong representation of R&D-intensive industries in the economy. These are technology-intensive manufacturing industries and knowledge-intensive service industries. Employment in these industries provides an overall picture of a knowledge-based economy development degree.

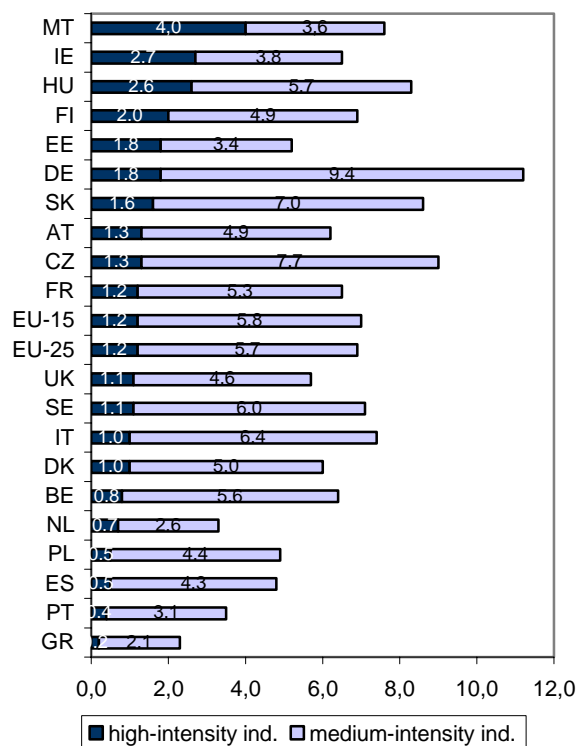
Technology- and knowledge-intensive industries in various countries may differ significantly in terms of their real intensity – i.e. R&D intensity. It is therefore impossible to state clearly that higher proportions of these industries in overall employment imply a more technologically developed economy. For more accurate conclusions it is advisable to add an indicator of the structure of employment according to educational attainment and the representation of skills-intensive professions. A higher proportion of these employees points to a higher technology and knowledge intensity of the particular industry. Labour productivity also has an influence that is not negligible.

#### Employment in technology-intensive manufacturing industries

According to OECD and EU statistics technology-intensive manufacturing industries include high-intensive ones (NACE 30 - Manufacture of office machinery and computers, 32 - Manufacture of radio, television and communication equipment and apparatus, 33 - Manufacture of medical, precision and optical instruments, watches and clocks) and medium-intensity industries (NACE 24 - Manufacture of chemicals and chemical products, 29 - Manufacture and repairs of machinery and equipment, 31 - Manufacture of electrical machinery and apparatus, 34 - Manufacture of motor vehicles, trailers and semi-trailers, 35 - Manufacture of other transport equipment).

The CR ranked among EU countries with the highest employment in technology-intensive industries. In 2004 it was 9% in overall employment – only Germany scored higher (11.2%). Although in 1998-2004 this proportion in the CR would not always increase year-on-year, the overall increase was 2.5 pp. This was mainly due to direct foreign investment which, however, continues to flow into the car industry especially – i.e. an industry with a medium technology intensity. Investment in highly technology-intensive industries, such as the production of TV sets, is also targeted to so-called “lower intensity levels” – i.e. assembling.

Figure 1: Share of technology-intensive manufacturing industries in overall employment, 2004 (in %)



Source: EUROSTAT (2004).

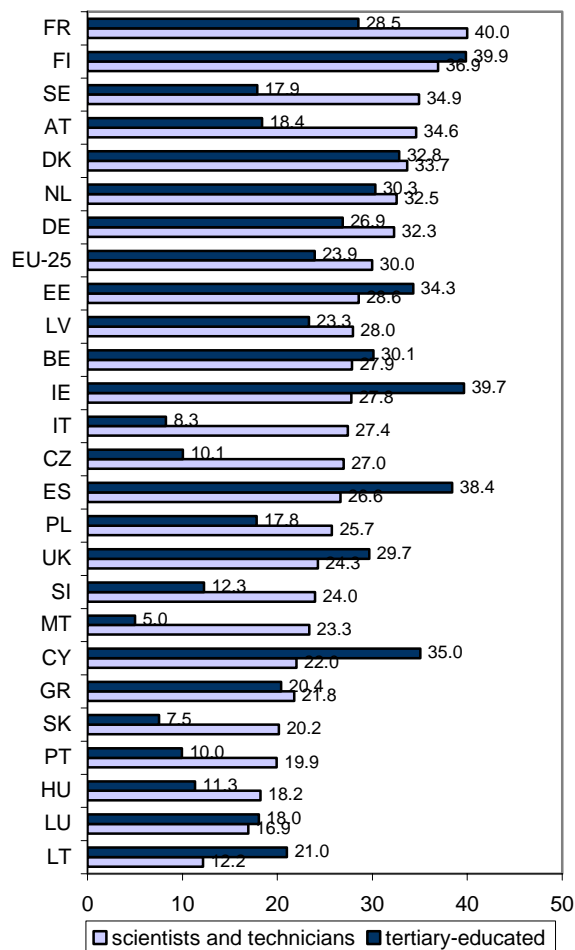
The high proportion of employment in technology-intensive industries in the CR is influenced, above all, by employment in medium-intensive industries which, in 2004, accounted for 7.7% of total employment, whereas it was only 1.3% for highly-intensive industries. The highest proportion of high-intensity industries in employment in 2004 was shown by Malta (4%) and Ireland (2.7%), for medium-intensity industries it was Germany (9.4%) and the CR (7.7%).

In 2004 scientists and technicians<sup>1</sup> accounted, in EU-25 average terms, for almost one third (30%) of employment in technology-intensive industries. The differences between countries illustrate the degrees to which these industries are advanced. From this perspective the most advanced technology-intensive industries are in France and Austria where the proportion of scientists and technicians reached 40% and 34.6% respectively. The CR tends to have less intensive activities, as is documented by a below-average level of this indicator (27%).

The number of scientists and technicians employed in technology-intensive industries increase over time. The year-on-year pace of growth in 2000-2004 was on average 0.4 pp in EU-25 and slightly lower, 0.3 pp, in the CR. These relatively low dynamics reflect the fact that the representation of these professions did not always show a year-on-year increase and there were also downturns.

<sup>1</sup> ISCO 2 – Scientists and professionals, ISCO 3 – Technicians, healthcare personnel and teachers.

**Figure 2: Share of scientists, technicians and people with tertiary qualifications employed in technology-intensive manufacturing industries, 2004 (in %)**



Source: EUROSTAT (2004).

Figure 2 clearly shows that in most countries the proportions of scientists and technicians are higher than those of people with tertiary qualifications. The margin of difference in favour of scientists and technicians in 2004 was 6 pp in EU-25. Only 9 countries had a larger proportion of people with tertiary qualifications, and in three countries (Denmark, Luxembourg and Greece) the proportions were nearly identical – the difference oscillating around 1 pp in both directions. A relatively strong prevalence of people with tertiary education over scientists and technicians was identified in Ireland, Spain and Cyprus (some 12 pp). This difference shows that people with tertiary qualifications in these countries occupy, to a large degree, other positions than those of scientists and technicians, particularly the positions of senior officials and managers (ISCO 1).

The CR ranks among the countries with a relatively large difference between the proportion of scientists and technicians on the one hand and the proportion of people with tertiary qualifications on the other hand. Individuals with tertiary education only account for 10.1% of overall employment in technology-intensive industries, which is 17 pp less than the proportion of scientists and technicians. Only Italy and Malta showed a larger difference, while the figures are comparable in Austria and Sweden.

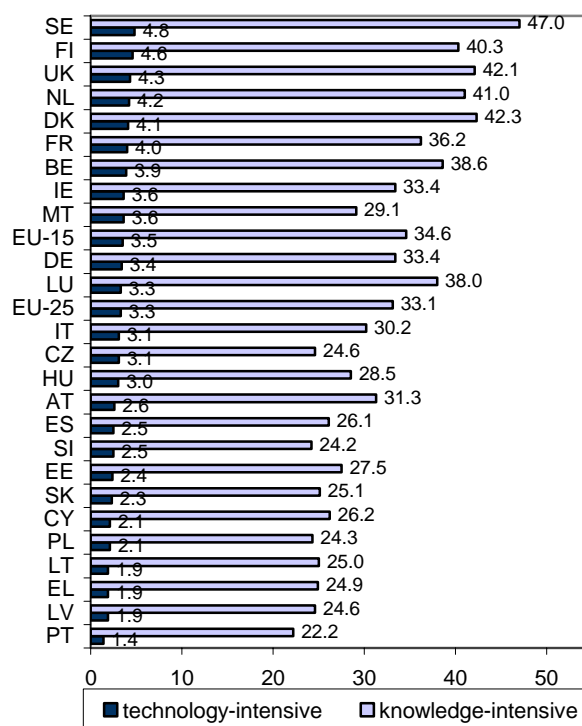
The differences testify to the fact that the professions of scientists and technicians are, to a large degree, practised by people with lower than tertiary education, which reflects not only international differences in educational attainment, but also a varying intensity of industries and differences in education systems. To acquire certain qualifications only secondary education is required in some countries, while in others one needs to complete shorter tertiary education.

#### Employment in knowledge-intensive services

Knowledge-intensive services consist of 14 industries which are grouped into (a) technology-intensive services (NACE 64 – Post and telecommunications, 72 – Computer and related activities, and 73 – Research and development), (b) market services, (c) financial services, (d) other knowledge-intensive services.

Employment in knowledge-intensive services as a proportion of overall employment was one third in EU-25 in 2004 (33.1%) (see Figure 3). Sweden showed the highest level of advancement in this area (47%), Portugal ranked the lowest (22.2%). The CR was among the countries with this proportion approaching one fourth of the overall number of employed persons (24.6%) – i.e. countries that are underdeveloped in this respect.

**Figure 3: Share of knowledge- and technology-intensive services in overall employment, 2004 (in %)**



Source: EUROSTAT (2004).

Although a high level of development of knowledge-intensive services is an important feature pointing to high economic standards of a country, what is even more relevant in this respect is the proportion of technology-intensive services – i.e. post and telecommunications, computer and related activities and research and development. As the figure above illustrates, these three service industries accounted for some 3.3% of overall employment in EU-25 in 2004.



There are quite strong differences in the EU with this indicator ranging from 1.4% in Portugal to 4.8% in Sweden. The countries with higher proportions of knowledge-intensive services normally also show a higher proportion of technology-intensive services. The largest proportions are seen in old member states (except Portugal and Greece), the lowest in new member countries.

The proportion of technology-intensive services in the CR in 2004 was slightly below the average at 3.1% of overall employment, which is 0.2 pp less than the EU-25 average. Over the last five years (2000-2004) there was no major improvement in the CR. The proportion of technology-intensive services ranges between 3.0 and 3.2%.

The proportion of technology-intensive services in total employment in knowledge-intensive service industries in the CR was 13% in 2003, which was the largest figure in terms of EU-25. The proportions of other components of knowledge-intensive services were as follows: market services – 20.1 %, financial services – 8.5 %, other knowledge-intensive services – 58.4 % (see Table 1A). The comparison with average figures for developed EU countries demonstrates that the CR has an underdeveloped sector of market and financial services.

As technology-intensive services as well as technology-intensive manufacturing industries include activities with varying levels of intensity, it is advisable to look at the occupational and education structure in these sectors. The proportion of scientists (ISCO 2) and technicians (ISCO 3) in employment in technology-intensive services increased in EU-25 from 42% to 49.9% between 1999-2004. The CR with its 50% ranks slightly above the EU average (see Figure 4).

The representation of people with tertiary education is slightly lower than that of scientists and technicians. In EU-25 average terms their proportion was 39.3% in 2004, which is 10.2 pp less compared to the proportion of scientists and technicians. The proportion of people with tertiary qualifications increased in 1999-2004 (by 6 pp). However, the increase is slower in comparison with scientists and technicians (by 7.9 pp).

The larger proportion of scientists and technicians than that of people with tertiary qualifications reflects, as in the case of technology-intensive manufacturing industries, the fact that these professions are practised with lower qualifications. This is typical of most EU countries, only in nine countries is the opposite true. The largest prevalence of individuals with tertiary qualifications over scientists and technicians was in Ireland (12.7 %).

In the CR people with tertiary education accounted for 26.6% of employment in technology-intensive services in 2004, which is far less than the EU-25 average (by 12.7 pp). This is the result of a generally lower proportion of people with tertiary education, and the differences in education systems, the impact of which has been already mentioned in relation to technology-intensive manufacturing.

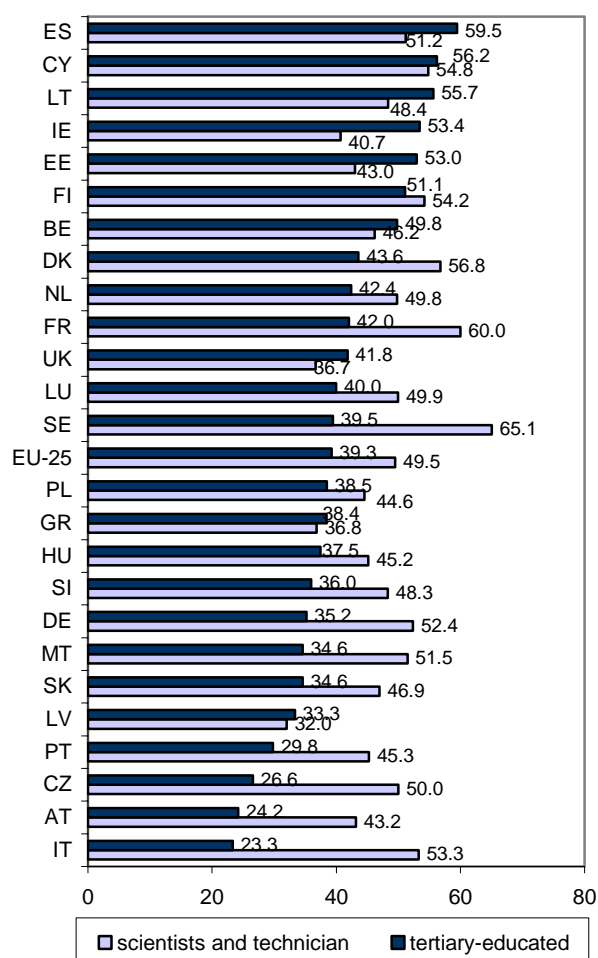
#### Scientists and technicians in the economy

The development, application and use of modern technologies in the economy is mainly the job of scientists and professionals (ISCO 2) and technicians (ISCO 3). Their proportion in overall employment in EU-25 exceeds one fourth. In 2005 it was almost 30%. The largest proportion of these professions was in Sweden (39%), the smallest in Portugal (16.9%) (see Figure 5).

In 2000-2005 the proportion of these professions in overall employment in EU-25 increased slightly (from 27.3% to 29.7%). Some countries report a stable increase (Sweden, Germany), others show periods of year-on-year increases alternating with periods or years of downturn. In the course of 2000-2005 the highest increase in the proportion of scientists and technicians occurred in Austria (6.5 pp) and Slovenia (6.1 pp). A negative trend was reported from only one member country, Finland (decrease of 1.3 pp).

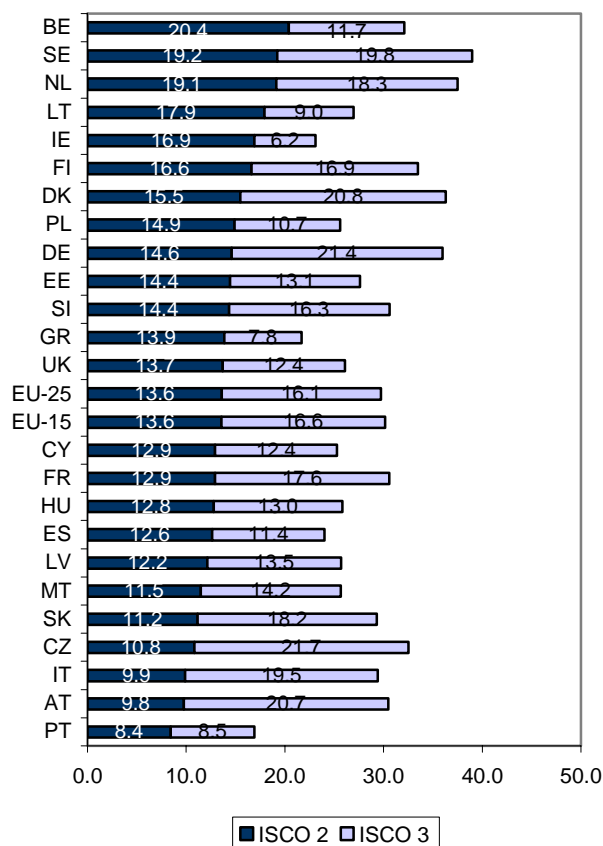
In the CR scientists and technicians accounted for nearly one third of employment in 2005 (32.5%). In 2000-2005 the level of the indicator hovered around both the EU-25 and EU-15 average, the overall increase was 3 pp. As Figure 5 clearly illustrates, the CR's favourable international ranking for the proportion of scientists and technicians is the result of a large share of technicians (ISCO 3), i.e. less demanding positions. Their proportion in overall employment in 2005 was 21.7%, which was the highest in the EU. Conversely, the representation of scientists (ISCO 2) in the CR in 2005 was below the average (2.8 pp difference). It is evident that the Czech economy still cannot be denoted as knowledge-intensive.

Figure 4: Share of scientists and technicians and people with tertiary education employed in technology-intensive services in overall employment in these services, 2004 (in %)



Source: EUROSTAT (2004).

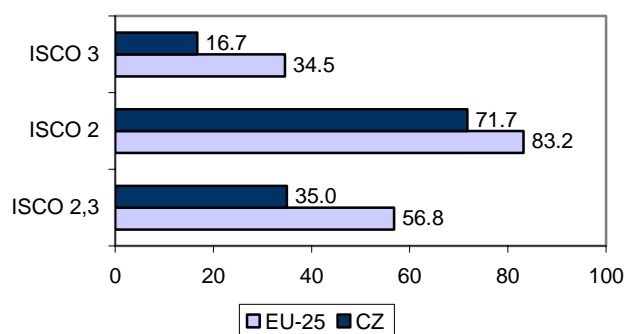
Figure 5: Share of scientists and technicians , 2005 (in %)



Source: EUROSTAT (2005).

A similar conclusion may be drawn from a comparison of the education structure of those who hold the positions of scientists and technicians. In these professions the CR has a below-average proportion of people with tertiary qualifications (see Figure 6).

Figure 6: Share of tertiary educated working as scientists and technicians, 2005 (in %)



Source: EUROSTAT (2005).

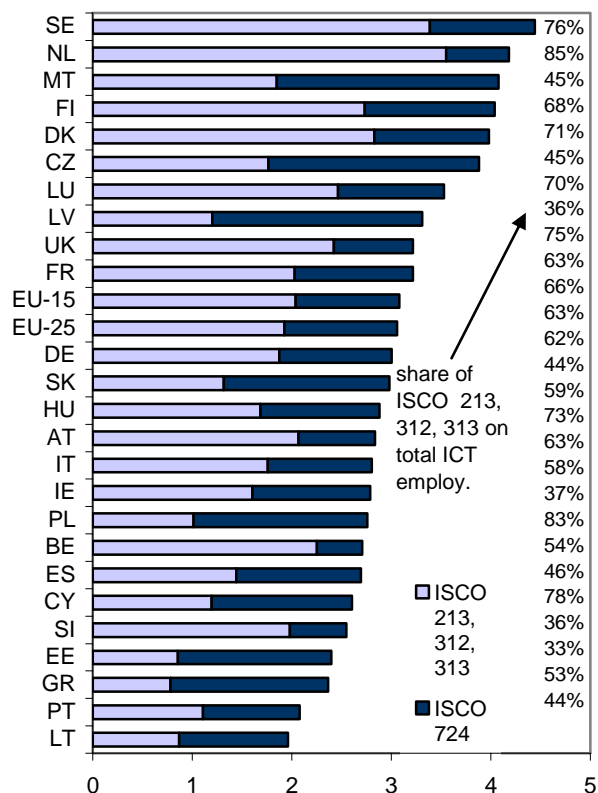
This below-average proportion of tertiary educated people employed as scientists and technicians in the CR is directly linked not only to the overall below-average representation of people with completed tertiary education, but also to the lower qualification requirements of these professions. There is also an influence of differences in education systems. In the countries where the relevant vocational knowledge and skills are acquired as early as secondary education, the proportion of tertiary qualifica-

tion holders is lower than in the countries where similar professions require lower tertiary qualifications. While in EU-25 the proportion of people with tertiary qualifications in the positions of scientists and technicians is some 57% on average, it is only 35% in the CR (see Table 3A).

### ICT professions in the economy

The OECD publication "Science, Technology and Industry: Scoreboard 2001" defines ICT professions using the following ISCO categories: 213 – computing professional, 312 – computer associate professionals, 313 – optical and electronic equipment operators and 724 – electrical and electronic equipment mechanics and fitters.

Figure 7: Share of ICT jobs in overall employment and share of ICT jobs with high skills intensity in total ICT employment (in %)



Source: EUROSTAT, LFS. Data for 2<sup>nd</sup> quarter of 2004.

The proportions of ICT professions in employment in the CR and the EU are shown in Figure 7. The CR with nearly 4% ranks 6<sup>th</sup> among European countries. This proportion is above the EU average (1 pp), which suggests a stronger potential for ICT support for the economy and society development compared to other countries.

ICT professions may be broken down into those with high skills-intensity (ISCO 213, 312 a 313) and those with lower skills-intensity (ISCO 724) (see Figure 7). In terms of comparison with other EU countries the CR has a lower proportion of high skills-intensity professions which deal with the development of new hardware and software. These only account for 45%, while mechanics and service engineers predominate (ISCO 724).

The largest proportion of ICT professions requiring high skills in EU terms can be seen in the Netherlands and Belgium (over 80%). The EU-25 average is 63 %.

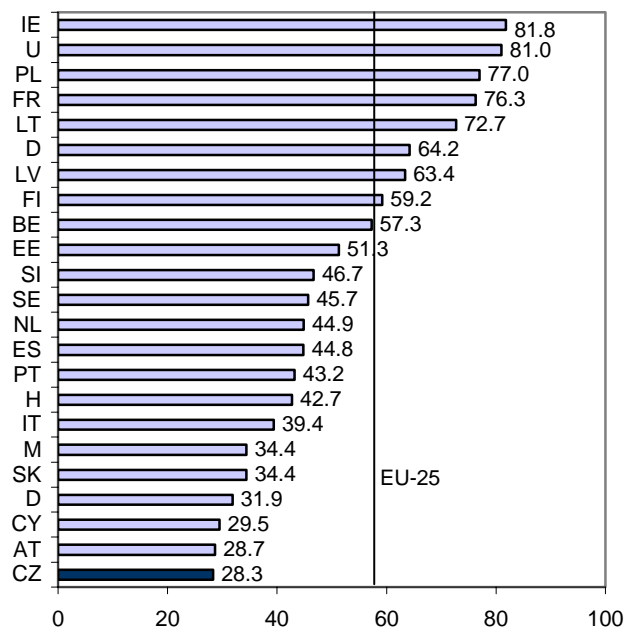
### 3.2 Preparation of human resources at tertiary level

A high number of students in tertiary education is a precondition for implementation of R&D, innovation and their practical application. People with tertiary education contribute not only to the society development as a whole, but also face less severe difficulties finding employment. They are also more willing to learn throughout their lives.

The scope of training of young specialists for skills-intensive professions can be expressed in terms of the number of graduates of tertiary programmes in relation to the age group which typically completes this education (20-29). In the CR tertiary education can be obtained in ISCED 5B programmes lasting 3 years (in healthcare disciplines 3.5 years). These studies are practically focused and provided, in the CR, by tertiary professional schools (*vyšší odborné školy*).

Higher education institutions (*vysoké školy*) provide programmes at ISCED 5A level. They include bachelor programmes the standard length of which is at least three and at most four years. They are focused on training for various occupations. There are also master programmes following on upon bachelor programmes and focusing on acquisition of theoretical knowledge, its application and the development of creative skills. They normally last one to three years. There is a specific type of master programme which does not follow from a bachelor programme and lasts four to six years. Doctoral study programmes (ISCED 6) are concerned with scientific research and independent creative activities. They normally last three years.

**Figure 8: Tertiary education graduates per 1,000 population aged 20-29, 2003**

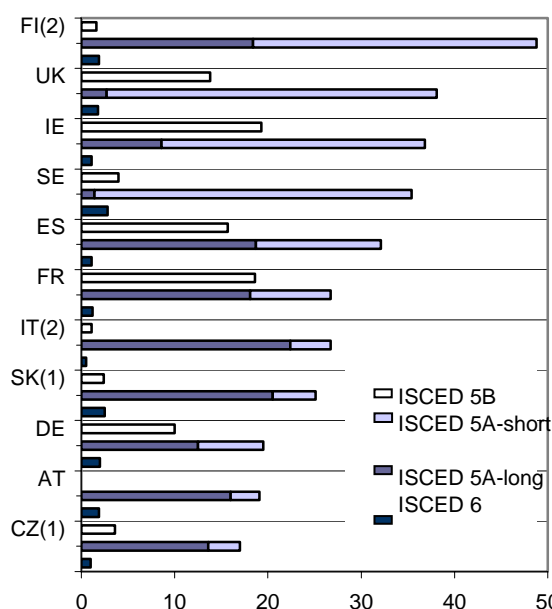


Source: EUROSTAT, own calculations.

The sources of inflow of young specialists into qualified professions are insufficient in the CR. As Figure 8 shows, the proportion of graduates in the age group mentioned above was far below the EU-25 average in 2003. While the average proportion of graduates in the EU was some 5.3%, it was only about 2.8% in the CR.

The number of graduates of study programmes of various lengths differs from country to country. In most old EU countries the internal differentiation of tertiary education occurred much earlier and its scope was larger than in the CR. At present, young people in the CR achieve tertiary education mostly in longer (i.e. 5-6-year) master programmes. The proportion of graduates of these programmes in the relevant age group is comparable with that in Germany, it is higher than, for example, Ireland, and compared to Great Britain, it is higher by fivefold. In these countries graduates of shorter programmes predominate. (see Figure 9).

**Figure 9: Share of tertiary education graduates, 2003**



Note: (1) proportions of graduates may include a double calculation of graduates of tertiary studies of A and B type; (2) the data relates to the year 2002. Source: Education at a Glance, OECD 2005.

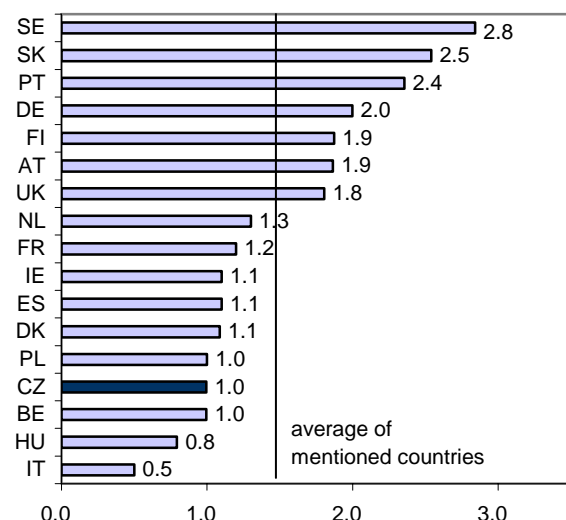
In 2003 the scope of shorter forms of tertiary studies was much less extensive in the CR than in other countries. The proportion of graduates of ISCED 5B study programmes, in the population group representing a typical age for completion of such tertiary education, was twice to three times lower as compared to Germany, Great Britain and Ireland. In the CR a stimulus for the expansion of the range of shorter tertiary programmes was an amendment to the law on higher education institutions of 2000 which has established a more solid framework and timetable for the transfer of Czech HE institutions to structured studies. While before the amendment was enacted the proportion of students admitted to the first years of bachelor programmes oscillated between 20% and 30% (immediately before its adoption it even dropped), after the amendment was passed the proportion experienced a steep growth rate to the current 75%. The educational path through tertiary education has become more flexible and students can complete its shorter part. However, most institutions design bachelor programmes as a first cycle of master studies rather than as an independent, practice-focused education. This is why most students continue studying the follow-up master degrees. The real transformation of higher studies into a binary education system still requires further development.

The production of specialists in shorter tertiary programmes, practically focused bachelor programmes in particular, is falling short of prompting a solid improvement in the inadequate qualifications structure in the CR. A shortage of these specialists cannot be offset by qualifications at the secondary level, as the requirements for the practice of various professions are increasing, tertiary education is demanded even in the jobs where secondary qualifications have until now sufficed.

#### Graduates of doctoral study programmes

As regards the preparation of specialists for research and development, it is important how HE institutions address the training of doctoral students. The number of graduates of doctoral studies in the CR has experienced a steep increase – it doubled between 2000 and 2003. Despite this the rate of participation in doctoral studies, as a proportion of graduates in the population of typical age for completion of this level of education, is about two thirds of the European average. Similar unfavourable rates can be also seen in Poland and Belgium.

**Figure 10: Share of doctoral programmes graduates, 2003 (in %)**



Notes: A net rate of graduates is calculated as a sum of the rates for individual age groups, with the exception of France and Italy. Source: Education at a Glance 2005, OECD.

Slovakia, which until recently showed similar characteristics as the CR (see Figure 10) achieved a far larger participation in doctoral studies than the CR in 2003. The highest proportion of graduates of doctoral programmes in the relevant age group was in Sweden, the lowest in Italy.

#### Graduates of science and technology

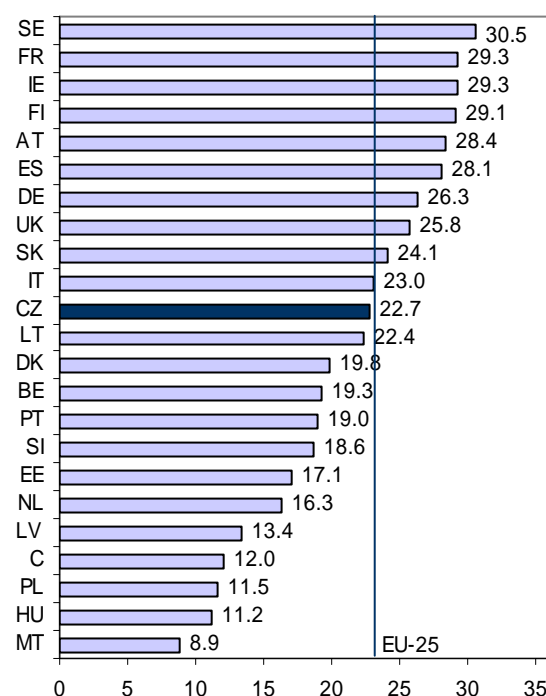
Graduates of science and technology programmes (S&T) at tertiary professional schools and higher education institutions, and graduates of doctoral studies in these disciplines constitute the largest potential for the development and application of new findings.

In terms of the proportion of graduates of S&T programmes in all graduates of tertiary studies the CR ranks 11<sup>th</sup> of 23 EU countries (Greece and Luxembourg not included). In 2003 the level of this indicator in the CR was 22.7%, which is only 0.6 pp less than the EU average (see Figure 11). Among the new member states the CR,

together with Slovakia, achieved the best results. The CR was 1.4 pp behind Slovakia.

The average level of this indicator hides considerable differences between various countries. In Sweden graduates of S&T programmes accounted for nearly one third of all graduates of tertiary studies, which reflects a favourable situation both in terms of the capacity of schools providing education in these disciplines, and the interest shown in these fields and the study success rate as compared to other fields of study. Conversely, the least favourable figure was scored by Malta, followed by Hungary.

**Figure 11: Share of science and technology programmes graduates, 2003 (in %)**



Source: EUROSTAT (2005), own calculations.

What is unfavourable is the finding that the overall proportion of S&T graduates in the CR has decreased slightly in recent years (see Table 1). In 1998 it was nearly 25% making it only 1.4 pp behind Sweden, which in the same period expanded the range of these programmes and in 2003 topped the EU list with 30.5% of S&T.

The number of graduates of doctoral programmes in S&T as a proportion of the 25-34 population is 0.5 per thousand in the CR, which is only some 40% of the EU-25 average. This proportion has been increasing but the pace of growth is slower than in both EU-15 and EU-10. This leaves the CR increasingly behind both groups of countries.

**Table 1: Share of science and technology programmes graduates (in %)**

	1998	1999	2000	2001	2002	2003
EU 25	24.4	24.1	23.5	23.4	:	23.3
EU 15	26.1	26.2	25.9	26.3	:	26.1
EU 10	15.3	14.9	13.8	12.8	:	13.6
CZ	24.6	24.0	24.4	22.0	23.2	22.7

Source: EUROSTAT, own calculations.

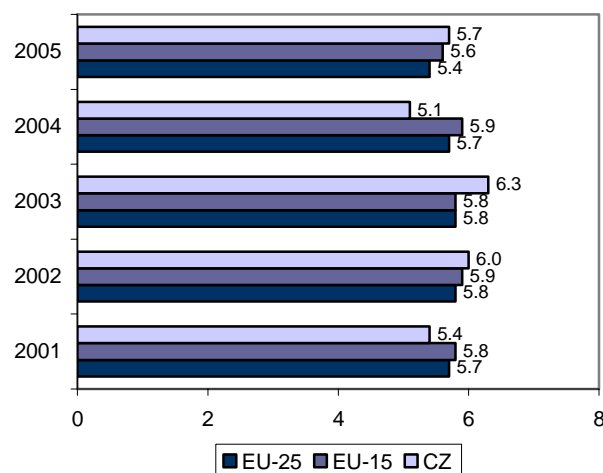


The proportion of graduates of doctoral studies in S&T in the CR is quite favourable – 53% of the total number of doctoral graduates. It is roughly 11 pp more than the EU-25 average. However, there has been a relative decrease in interest in doctoral studies in these disciplines. Between 1998 and 2000 the proportion of graduates of doctoral programmes in these fields was higher (57%).

### Quality of tertiary education

Besides the quantitative view of tertiary education, the aspects of quality are also important. The quality of higher education institutions is conducive to the competitiveness of the labour force in the given country, and it is one of the key parameters investors consider when deciding on investments with a high value added allocation. Good quality education entails not only the capacity to take over technological innovations, but also the capacity to take active part in their development.

Figure 12: Quality of tertiary education in 2001-2005



Source: IMD – International Competitiveness Yearbook, 2005.

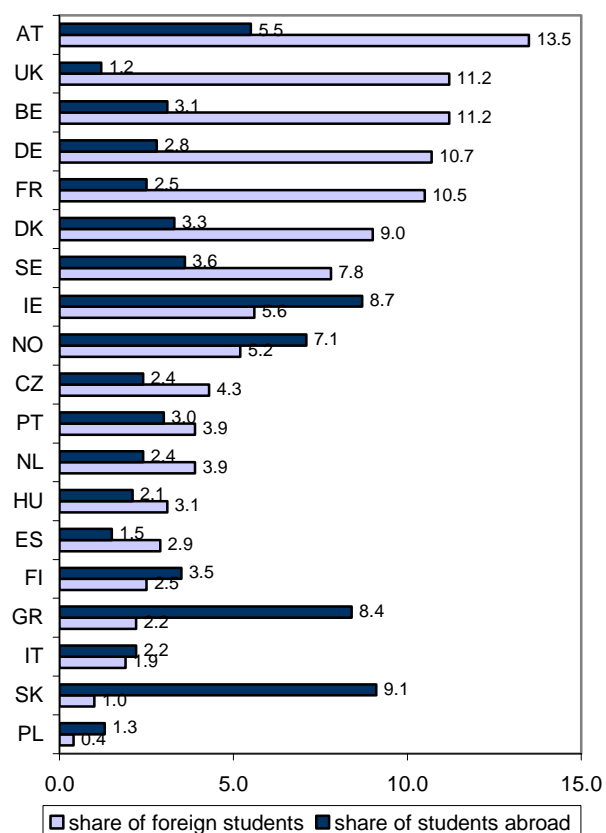
Evaluation of the quality of tertiary education is a subject of research by the Swiss International Institute for Management Development which carries out annual surveys via questionnaires involving domestic and foreign experts and domestic executive officials. The respondents answer the question “How does the quality of higher education meet the needs of a competitive economy”? The quality of tertiary education is assessed on a 0-10 scale. The higher the number of points, the better the quality meets the needs of a competitive economy.

The CR ranked slightly above the EU-25 and the EU-15 average for the quality of tertiary education in 2005 (see Figure 12). Finland topped the scale for the quality of tertiary education keeping this exclusive position throughout the entire period for which the data are available – i.e. 2001-2005. A problem attached to surveys via questionnaires is the level of objectivity. Although changes in the quality of tertiary education occur slowly and over a longer period, it is clear from Figure 12 that the year-on-year ratings in this period relatively fluctuate. The quality of tertiary education in the CR in the period under review was for three years above the EU-25 and EU-15 average, and for two years below this average (see Table 2A).

Another approach to evaluation of tertiary education quality consists in a ranking of world universities. This

approach is used by the Shanghai University; ranking is based on evaluation of pedagogical and research performance of the relevant university. According to these criteria only one Czech institution, Charles University, was rated among the top five hundred. Out of European universities the top 500 included 42 British, 12 Dutch, 8 Swiss, 5 Finish, 5 Austrian, and 5 Danish institutions. As regards the new EU members, the list included 3 Hungarian and 2 Polish universities. It is clear from this rating that the research potential of Czech higher education institutions is low not only as compared to advanced world research centres, but also as compared to some Central European countries.

Figure 13: Share of foreign students, 2003 (in %)



Notes: DE,NL,PL – without doctoral programmes ISCED 6, PL without tertiary programmes ISCED 5B Source: OECD.

The quality of national systems of tertiary education increasingly reflects the aspect of openness towards foreign students and teachers. The openness of HE institutions brings along not only an increase in the quality of study programmes and instruction methods, but also the possibility of acquiring additional financial resources in the form of tuition fees from foreign students.

As Figure 13 clearly illustrates the openness of Czech HE institutions lags behind the EU average. As compared to European countries which rank the best for admission of foreign students, e.g. Austria, Great Britain, Germany and France, the proportion of foreign students in the CR only accounts for some 40% of the proportions of foreign students in these countries. However, if we compare these data with countries which, similarly to the CR, do not have the advantage of the national language being international, the results compare better.



**Table 1A: Structure of employment in knowledge-intensive services (% , 2003)**

	high-tech	market	financial	other
<b>CZ</b>	<b>13.0</b>	<b>20.1</b>	<b>8.5</b>	<b>58.4</b>
FI	11.8	22.6	5.2	60.5
IE	11.7	22.0	12.3	54.0
FR	11.5	23.9	8.2	56.5
HHU	11.3	20.6	6.6	61.6
SI	11.0	20.7	10.0	58.3
AT	11.0	23.1	11.6	54.3
UK	10.7	22.7	10.9	55.6
IT	10.7	25.0	11.3	53.0
SK	10.5	16.8	8.2	64.5
DK	10.4	18.6	6.5	64.4
EU-25	10.4	23.5	9.8	56.3
EU-15	10.4	23.8	9.9	55.9
SE	10.3	21.9	4.4	63.4
BE	10.2	20.7	9.4	29.7
DE	10.1	23.0	11.5	55.4
LV	9.6	19.0	5.3	66.1
NL	9.6	25.9	8.6	55.8
ES	9.1	29.0	9.4	52.5
GR	7.7	26.5	11.2	54.6
EE	7.3	27.0	4.8	61.0
PT	7.3	23.3	8.7	60.8
LT	6.9	15.7	3.8	73.6

Source: CSU.

**Table 2A: Quality of tertiary education**

	2001	2002	2003	2004	2005
EU-25	5.7	5.8	5.8	5.7	5.4
EU-15	5.8	5.9	5.8	5.9	5.6
AT	6.3	7.2	7.3	7.0	6.4
BE	7.3	7.1	7.6	7.6	7.0
CZ	5.4	6.0	6.3	5.1	5.7
DE	5.5	4.5	4.6	5.1	5.0
DK	6.7	6.8	6.8	7.0	6.6
EE	5.9	5.7	5.4	6.1	5.5
ES	5.5	5.1	5.0	4.7	4.2
FI	8.2	8.9	8.7	8.2	8.0
FR	5.3	6.3	6.1	6.0	5.7
GR	4.6	3.9	4.3	4.3	4.1
HU	7.0	7.0	6.7	6.1	6.4
IE	8.1	8.0	7.6	7.6	7.5
IT	3.9	4.3	4.3	4.1	3.8
LU	3.0	3.4	4.5	4.0	3.5
NL	6.8	7.0	5.3	6.2	6.6
PL	4.4	3.9	4.7	5.3	4.3
PT	4.2	3.9	4.2	4.9	4.0
SE	6.0	6.3	6.0	6.6	6.0
SI	4.7	5.0	4.5	3.8	3.3
SK	6.2	6.4	5.9	5.7	5.2
UK	5.4	5.4	5.2	5.0	5.2

Note: 0 – lowest level; 10 – highest level. Source: IMD: International Competitiveness Year Book.

**Table 3A: Educational structure of scientists and technicians (% , 2005)**

	ISCO 2 + 3			ISCO 2			ISCO 3		
	ISCED			ISCED			ISCED		
	0-2	3,4	5,6	0-2	3,4	5,6	0-2	3,4	5,6
EU-25	5.5	37.7	56.8	1.5	15.3	83.2	8.9	56.6	34.5
EU-15	6.3	36.3	57.4	1.8	14.9	83.3	10.0	53.8	36.2
Austria	4.8	55.5	39.6	1.6	12.9	85.4	6.4	75.6	18.0
Belgium	6.7	23.9	69.4	2.3	12.4	85.2	14.4	43.9	41.7
Cyprus	4.5	23.6	71.9	2.2	2.2	95.6	6.8	45.5	47.7
<b>Czech Republic</b>	<b>0.6</b>	<b>64.4</b>	<b>35.0</b>	<b>0.0</b>	<b>28.3</b>	<b>71.7</b>	<b>1.0</b>	<b>82.3</b>	<b>16.7</b>
Denmark	4.2	29.3	66.5	1.4	12.5	86.1	6.3	41.8	51.9
Estonia	0.0	33.9	66.1	0.0	21.8	78.2	0.0	47.4	52.6
Finland	7.0	26.3	66.7	2.7	20.3	77.0	11.2	32.3	56.5
France	9.6	30.2	60.2	4.0	15.1	80.9	13.7	41.3	45.0
Germany	6.2	44.0	49.9	1.4	16.6	82.0	9.4	62.7	27.9
Greece	0.7	22.3	77.0	0.0	5.8	94.2	2.0	51.5	46.5
Hungary	1.3	42.0	56.7	0.0	8.9	91.1	2.6	74.5	22.9
Ireland	5.2	19.8	74.9	2.8	14.3	82.9	11.9	34.7	53.4
Italy	7.6	54.2	38.2	1.7	19.3	79.0	10.5	72.0	17.5
Latvia	0.0	41.5	58.5	0.0	23.8	76.2	0.0	57.4	42.6
Lithuania	0.0	31.1	68.9	0.0	20.2	79.8	0.0	52.6	47.4
Malta	21.6	29.7	48.6	0.0	12.5	87.5	38.1	42.9	19.0
Netherlands	5.7	35.4	58.9	1.7	14.1	84.2	9.9	57.7	32.4
Poland	0.0	41.4	58.6	0.0	16.0	84.0	0.0	76.8	23.2
Portugal	17.7	22.1	60.2	2.3	6.7	91.0	33.1	37.5	29.4
Slovakia	0.0	59.5	40.5	0.0	28.2	71.8	0.0	78.8	21.2
Slovenia	0.0	47.1	52.9	0.0	8.1	91.9	0.0	81.7	18.3
Spain	7.7	15.7	76.5	0.9	2.8	96.4	15.3	30.1	54.5
Sweden	4.8	35.8	59.4	2.4	21.3	76.3	7.1	49.9	43.0
United Kingdom	1.7	31.2	67.1	0.6	19.4	80.0	2.9	44.3	52.8

Note: Data for 2<sup>nd</sup> quarter of 2005. Source: EUROSTAT. LFS.

## 4. Conclusion

The quality of human resources in the CR is not very favourable in terms of international comparisons. An improvement in the comparative position of the CR as part of the EU is a long-term process, nevertheless appropriate measures must not be put off. These measures must concern both the supply of and demand for high qualifications.

### Knowledge and flexibility of population

The development of new knowledge and its practical application place great demands for the **educational attainment** of the labour force. In 2005 the CR had the largest proportion in the EU of the population aged 25-64 with at least upper secondary education (90%), and the lowest proportion of people with nothing but basic (and lower) education (10%). This favourable qualification structure is the result of a structured supply of upper secondary education and a relatively good transferability within this type of education. This is why most young people complete upper secondary education with success, although in some cases in a less demanding programme or even type of school. Early school leaving is less frequent than in other countries, although there has been a slight increase in recent years.

On the contrary, the CR ranked 4<sup>th</sup> from the bottom for the proportion of people with tertiary qualifications in EU-25 in 2005 (13%). This unfavourable situation is the result not only of a limited capacity of institutions, making it impossible to satisfy in full the demand for these studies, but also of the differences in national education systems. In some countries including the CR it is possible to acquire a vocational qualification as early as secondary level, while in other countries tertiary education is required. The representation of people with tertiary qualifications in the Czech population is slightly increasing, but the increase is too slow to boost the CR's international position.

The growing demands for knowledge on the part of the economy are linked to growing **educational mobility**. The CR ranks the lowest of all EU countries for the rate of educational mobility. The proportion of the population with tertiary qualifications entering the labour market in the CR in 2005 was only less than 4 pp higher compared to the total population leaving the labour market, while in EU-25 the average is 15 pp.

In terms of the economic development of society and the personal development of an individual it is not only the level of education achieved that is important. Important is also the quality of the knowledge and skills acquired. As regards an international comparison of literacy levels the **fifteen-year-old population** in the CR fared very well in 2003 in mathematical, scientific and problem-solving literacy. It achieved better results in these types of literacy than the OECD average. However, in reading literacy the results were below the average. What is alarming is that in between 2000 and 2003 this level even slightly decreased.

As with the fifteen-year-old population, the **adult population** (16-64) ranked much better in quantitative literacy as compared to prose and document literacy. Among the EU countries which took part in the survey better average results in quantitative literacy than the CR were only

scored by the population in two countries, four countries ranked better than the CR for document literacy and five countries for prose literacy. It is clear that the inadequate attention paid in Czech education to an active work with texts has negative effects throughout the entire lives of individuals.

The competitiveness of companies and the population is increasingly being linked to the use of ICT. It places great demands for **computer literacy** on the part of the population. Its importance is equal to other components of the comprehensive literacy concept. Further development of computer literacy requires that households be equipped with PCs and an Internet connection. The level of ICT facilities in the CR in 2005 was below the EU average. In EU-25 over a half of households had a PC (58%), while in the CR it was less than a third (30%). Almost half of households in EU-25 had an Internet connection (48%), while in the CR it was less than one fifth (19%).

The lower level of ICT facilities, the less extensive range of Internet-based services and the low rate of employment in professions using the Internet result in a below-average proportion of the population using the Internet. In EU-25 an average of 51% of the population aged 16-74 used the Internet during the three months prior to the survey in 2005, while in the CR the figure was only 32%. This lag behind the EU is smaller compared to the lag behind European level of ICT facilities in households. It means that population uses very often other access points than households – i.e. cafes, libraries, schools, etc.

One important precondition for holding a good position in the labour market throughout one's life is **flexibility**. The flexibility of the population in the CR in 2005 was rated as above-average in relation to the EU. An important feature of flexibility is occupational and geographic mobility. The Czech population is less willing, in the case of unemployment, to move out of their region (55%) as compared to the EU-25 average (66%). The willingness to migrate out of the country is even lower in the CR (28 %), but it is also lower in EU-25 average terms (37 %). The CR also shows a lower occupational mobility as expressed in the number of jobs performed (3.2 jobs) in comparison with EU-25 (3.9 jobs).

### Lifelong learning

Lifelong learning is a basic condition for improving the quality of human resources. It includes both initial and continuing education.

In international terms the CR traditionally ranks very high for participation of the young population in **upper secondary education**. This is partly the result of the large variety of educational programmes at this level. The attractiveness of secondary education increased due to the fact that during the last ten years the proportion of "maturita" programmes has been considerably expanded. Maturita examination opens the door to the tertiary education as well as to the good jobs in the labour market. In 2004 over 90% of the Czech population aged 22 had an upper secondary qualification. However, the CR is not succeeding as regards a further increase in participation of young people in secondary education. On the contrary, there has been a slight decrease. As this proportion is considerably increasing in most other European countries, it is clear that the

young generation in the CR will lose this favourable position over some time.

Most European countries try to open **tertiary education** to the largest possible number of young people. In 2002 tertiary programmes were attended by 56% of the population of typical age for this type of studies, while in the CR it was only 35.5%. The situation in the CR is only slowly improving, despite the fact that the relevant age groups are weakening and, at the same time, the capacity of HE institutions and tertiary professional schools is gradually expanding.

Neither is the participation of the adult population in continuing education in the CR in line with current European trends. In EU-25 there are on average 42% of people aged 25-64 involved in some form of continuing education – in the CR it is only 29 %. The CR lags behind not only developed EU-25 countries, but also most new member states. It ranks among the bottom group of EU countries for participation of adults in **formal education** (1.4%). The age groups over 45 virtually do not participate in this form of education in the CR at all, and there is also a very low proportion of people with upper secondary qualifications participating in formal education – only 1.1%, which is five times less than the EU average.

The **non-formal education** of adults takes the form of participation in various courses at the workplace as well as outside it. On average 17% of the population in the EU take part in this form of education and some 13% in the CR. The lagging behind the EU average here is not so severe as in other forms of education. The differences in participation rates of various qualification and occupational groups are lower than in other EU countries.

The length of courses of non-formal education is considerably shorter in the CR (50 hours per annum) compared to other EU countries (84 hours per annum). Low-skilled workers in particular only take part in very short training courses (25 hours per year), which is, similarly to Slovakia and Poland, the lowest figure in the entire EU (87 hours per annum). The short length of courses apparently corresponds to the need for acquisition of simple skills for line production which so far prevails in the CR in terms of technology.

The rate of participation of women in non-formal education in the CR is lower than that of men. This is particularly true of the youngest and oldest age groups (25-34 and 55-64 respectively). This pattern is not common in the EU. It points not only to a relatively lower willingness of Czech women of a typical age for having a family and before retirement to embark on further learning, but also to the attitudes of employers who organise a major part of non-formal training. On the other hand, self-education is pursued almost equally by Czech women as Czech men.

**Retraining** is less extensively implemented in the CR compared to developed EU countries. Of the total number of unemployed only less than 10% undergo retraining, while in most countries it is two to four times as many. The causes of this low proportion are linked to a large degree to the attitudes of the job seekers, but there are also financial, organisational and legislative difficulties in the implementation of an active employment policy.

**Informal education** consists of a wide variety of self-education modes. On average in EU-25 terms every third

adult pursues self-education, while in the CR it is every fifth person.

In terms of creating conditions for increasing participation of the population in education, **funding** is an important issue. The CR does not rank among the EU countries with a high level of public expenditure on education as a proportion of GDP. With its 4.4 % it ranked at the bottom end of the scale. When comparing the expenditure levels internationally, it is important to take into account the influence of purchasing power parities (PPP) used. When using different PPP for GDP and education the indicator for the CR increased to 7.1%, which also entails a more favourable position in international terms (a move from 6<sup>th</sup> place from the bottom to 9<sup>th</sup> place from the top on EU-25 scale).

The CR does quite well as regards evaluation of the effectiveness of public expenditure on initial education. The expenditure on the education of pupils aged 6-15 is below the EU average (data were available for 17 states), but the level of literacy of Czech 15-year-olds is above this average.

The level of **corporate expenditure on education** in the CR does not even reach a half of the EU-25 average, but it is more favourable in terms of a comparison with new EU members. Developed countries consider company training to be an important factor in the competitiveness of the economy, and this is why most of them encourage enterprises to invest in training. There is no system for supporting training in companies, there are only separate programmes funded from the state budget or co-funded from European structural funds.

## Human resources for a knowledge-based economy

One of the features of a knowledge-based economy is a large proportion of R&D-intensive industries in the economy. These are technology-intensive manufacturing industries and knowledge-intensive service industries.

Employment in **technology-intensive manufacturing industries** in the CR was one of the highest in EU-25. In 2004 it accounted for 9% of overall employment. Only Germany had a higher percentage. High employment in this sector in the CR is influenced by employment in medium-tech manufacturing (7.7%). Evidence of the higher representation of less R&D intensive activities is also provided by a lower representation of scientists (ISCO 2) and technicians (ISCO 3), who accounted for almost one third of employment in this sector in EU-25, and only for 27% in the CR. In most EU countries the proportion of scientists and technicians was higher than the proportion of people with tertiary qualifications. The difference was 6 pp in EU-25 average terms, in the CR it was as many as 17 pp. This testifies to the fact that in the CR these professions are, to a relatively large degree, practised by people with lower than tertiary education.

In economically developed countries employment is gradually shifting from manufacturing to services. Employment in **knowledge-intensive services** as a proportion of overall employment was about one third in EU-25 in 2004 (33,1 %). The CR with 24.6% ranks among underdeveloped countries in this respect.

One important characteristic of the economic development of a country is the representation of **technology-intensive services** – i.e. communications, computing and research and development. These three service industries

accounted for 3.3% of overall employment in EU-25 in 2004, in the CR it was only 0.2 pp less. The proportion of scientists and technicians totalled 50% and it hovers very slightly above the EU average. The proportion of people with tertiary qualifications is about twice as low (26.6%), which is far less than the EU-25 average (12.7 pp). The reasons are similar as with technology-intensive manufacturing industries.

The development, application and use of modern technologies is particularly the job of **scientists and technicians**. Their proportion in overall employment in EU-25 exceeds one fourth – in 2005 it was almost 30%. In the CR it was 32.5%. This high proportion was achieved thanks to a high representation of technicians, whose share was the highest in the CR of all EU countries (21.7%). On the other hand, the proportion of scientists was lower than the EU average totalling 10.8%. These figures prove once again that the Czech economy cannot still be designated as a technology-intensive, knowledge-based economy. A similar conclusion may be drawn from the data on the education structure of scientists and technicians. In EU-25 some 57% of individuals in these positions had tertiary qualifications in 2005, in the CR it was only 35%. The reason is the lowest proportion, in EU terms, of people with tertiary degrees in the position of both technicians (16.7%) and scientists (71.7%).

Information and communication technologies (ICT) constitute one of the main stimuli for technological development. The use of ICT potential assumes there is a sufficient number of experts working in this area, as well as enough workers capable of using these technologies. **ICT professions** are divided into those with high skills intensity (ISCO 213, 312 and 313), and those with a lower skills intensity (ISCO 724). The former accounted for 1.8% of overall employment in the CR in 2004, which is only slightly below the EU-25 average (1.9%). However, as part of these highly-intensive ICT professions the proportion of scientists (ISCO 213) was far below the average. Their proportion in the CR was only 18.7%, while the EU-25 average was 32.6%. It is obvious that the Czech economy is still failing to show the features of a technology-intensive, knowledge-based economy.

In order to boost the proportion of skills-intensive professions and the development of skills-intensive activities, it

is necessary that the education system should produce the relevant number and structure of young people with tertiary degrees. The scope of their training can be expressed using **the number of graduates of tertiary programmes** per 1,000 population representing a typical age for completion of this education (20-29). In the CR this group consists of graduates of tertiary professional schools and bachelor, master and doctoral programmes at higher education institutions.

The sources of inflow of young specialists into qualified professions are insufficient in the CR. While the average number of graduates in the group described above in EU countries was around 53, in the CR it was only about a half (around 28). However, unlike most EU-15 countries young people in the CR reach tertiary degrees mainly via long (i.e. 5-6-year) programmes. Although the range of short tertiary programmes both at tertiary professional schools and at HE institutions is expanding in the CR, the number of graduates still falls short of inducing a major positive shift in the qualification structure in this country. As concerns the preparation of young specialists for R&D the development of **doctoral studies** is important. The number of graduates has been growing dramatically in the CR, doubling between 2000 and 2003. Despite this their proportion in the relevant age group is roughly two thirds of the EU average.

The potential inflow of human resources for the purpose of technological development is being monitored via the proportion of graduates of tertiary programmes in **science and technology fields** per 1,000 of the population aged 20-29. The CR with 6.4 graduates ranked 20<sup>th</sup> among the 25 EU countries in 2003. This is the result of overall low number of graduates of tertiary education in the CR. As regards the disciplines, the CR only shows a slightly below-average representation of graduates of S&T programmes compared to EU-25 (1 pp). The fact that this proportion has decreased slightly in recent years is, however, less positive.

**The quality of higher education** in the CR in terms of passing down knowledge and education provision is, according to an IMD survey, at the European average. In terms of contribution to the development of scientific knowledge and innovation, Czech higher education is far from being comparable internationally.

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## **Challenges for the Czech Republic**



The research in the Czech Republic competitiveness within the European Union has identified particularly the following key challenges for a successful transition to the knowledge-based economy in the fields of macroeconomic stability, institutional quality, and innovation performance.

### Macroeconomic performance and stability

**Economic growth** of the Czech Republic in the years 2000-2005 accelerated and became healthier from the point of view of the factors on the supply and demand side. Restructuring and modernization on the supply side was supported by strong inflow of foreign investments, which strengthened investment and exports. They became main drivers of growth on the demand side. EU accession eased remaining barriers in foreign trade and gave impulse to the acceleration of exports and industrial production. Real convergence to the average level of EU became sustainable. Czech Republic belongs within EU-25 to the group of mid-developed countries and is placed before new post-communist member countries (with the exception of Slovenia) and some less developed „western“ economies (Malta, Portugal). Positive change was enabled by the growth of total factor productivity, which was in this period in the international comparison exceptionally high. Rapid economic growth is not granted in the long run in the case that the Czech Republic will not implement reforms striving for removing growth barriers and will not support innovation activity, research and education, including improvement in general business conditions.

Priority of economic strategy of the Czech Republic lies in reaching robust economic growth, which will ensure rapid process of real convergence and will be based on increased labour productivity and higher utilization of free labour resources. Implementation of this strategy is demanding and needs several reforms, which will support transition to knowledge-based economy utilising qualitative growth factors. The government approved in this direction National Lisbon Programme concentrated on continued reforms of public finances, creation of environment stimulating science, research and innovations, infrastructure development and simplification of business conditions. Important challenge after EU accession is adoption of common currency, particularly the question of appropriate term for entering euro zone with adequate exchange rate, which will not endanger the competitiveness of the country on the one side and will not lead to disproportioned impoverishment on the other side. The influence of common currency on the stabilization process is to be related to the economic level of the country.

**The convergence process** of the Czech economy to the average level of EU will depend to a higher degree on changes in the sources of competitiveness which was based up to now on low costs (prices). An advantage of the Czech economy is a low level of unit labour costs (ULC) which amounts in nominal terms to only one third of the EU-25 average. Having two thirds of level of labour productivity in EU, it enables to reach less than a half of ULC in relation to GDP. Low ULC support the flow of capital from high wages countries and make effective competition of suppliers, using broader division of labour, especially that linked with German companies. The catch-up strategy needs important changes in the factors of growth. In the future a robust economic growth of the mid-developed country can not be based mainly on price (cost) competitiveness. This strategy is not perspective in the light of the potential competition coming from the very low-cost countries such as two acceding South-east European countries (Bulgaria, Rumania), other

European countries outside the EU (Ukraine, Russia and other countries of CIS) and especially from aggressive competition of China and other Asian (emerging) countries. There is a main challenge for the country – higher utilization of qualitative advantages of competition linked with a broader use of possibilities of the knowledge-based economy. The Czech economy was up to now insufficiently engaged in this process. The historical tradition of long-term industrial development and relatively good education of labour force were to a great extent devalued in the complicated conditions of last fifty years. The main challenge of the Czech Republic lies in a revival of this tradition and in a full engagement in an innovative process set up in the Lisbon strategy.

Economic policy supporting economic growth is to be associated with the objective of **macroeconomic stability**, which represents a condition of balanced economic development, full realization of growth potential and nominal convergence which will lead to smooth entering of the Czech Republic to euro zone. Rapid economic growth in the years 2000-2005 was accompanied in this sense by contradictory tendencies. The Czech Republic had to complement its own resources by foreign savings which resulted in high deficits on the current account of the balance of payments. High public investments in backward infrastructure together with generous social policy led to higher deficits of public finances. On the other side the Czech Republic is a country with low inflation. Contributing factors can be seen in monetary policy with lowering interest rates and appreciating currency. Risks of future development can be seen in declining savings rates of households and general government sector. Public finances can be seen as a weakest chain link of the economy. Persisting high deficits of public finances in the period of fast economic growth are dangerous and their reduction necessitates reforms of public finances based on relative reduction of expenditures. Pension reform and positive real interest rates can support savings of households. The Czech Republic experienced in last years similarly as in developed countries a strong increase of credits (first of all mortgages) provided to households. This was caused by low interest rates and by privatization of banks and their active policy vis-à-vis households. Indebtedness of households remains by international standards low. Nevertheless, there exists a risk of unbalanced development of assets and liabilities of households which can worsen the macroeconomic stability.

### Institutional quality

Economic performance and effectiveness of innovative and education systems are negatively influenced by the extremely low level of the **institutional quality**. However, improvement of the institutional quality is a long-run process and outstanding economic performance can help this process to be perceived as successful. Nevertheless, a lot of measures can be carried out relatively fast and can bring benefits especially on the field of business environment quality. On the contrary, a correction of corruption perception in the society through realization of anti-corruption programmes as well as a better evaluation of the quality of public institutions (including the effectiveness of government) are undoubtedly rather „long-distance races“.

A great challenge in the Czech Republic in case of the corruption control reflects particularly political parties' performance and the transparency of public procurement.

Under the consensus of the impact of institutional environment on the economic performance and competitive-

ness, primary and the most important challenge for the Czech society is essential cultivation of overall **institutional environment** as to converge to the most prosperous European economies level. In a long-term horizon it requires a very strong and a wide institutional change which will together result in the institutional reform. This institutional reform should include more than a remedy of the most problematic institutional characteristics as the corruption in the Czech republic (especially in the areas of public resources and in the process of political decisions making) and the quality of legal system dealing with important tasks as strengthening the independence of the courts, increasing the quality of new legislation and a better law enforcement. These problems are short-term requiring an immediate solution, although these fields will help to improvement of the institutional framework of economy as well. However, increases in the effectiveness of government and in a quality of regulation represent another necessary institutional change. The institutional reform should be done under conditions of democracy and political stability. With respect to the fact that there are different models of capitalistic system in developed European economies, while making essential institutional changes, it is advisable to focus on the imitation of the countries which are the most economically prosperous and competitive. The most successful capitalistic system in EU-15 is currently Nordic social democratic system, followed by Anglo-Saxon and central European system.

Higher transparency and better enforceability of commercial law including bankruptcy law is essential for the continuity of the Czech **corporate governance** improvement. However several challenging issues still require further attention. Cultivation of the nomination process as well as long-term composition of Boards based on real needs of the governed companies must replace widely used practice of nepotism, clientelism and political ties. This calls especially to the Supervisory Boards, where lack of financial expertise prevents the Boards from fully functioning. Higher qualification, higher compliance awareness among Board members and lower acceptance of multiple Board memberships requires revision of the quality of remuneration processes and highlights the necessity of continuous corporate governance education.

Another challenge is to follow positive trends in EU markets mainly the opportunity to establish European Public Company, which can be registered in any member states in the EU, and the registration can be easily transferred to another member state, and to adopt one-tier governance system.

Improvement of **business environment** quality makes a necessary systemic condition for the decrease both of corruption behaviour and informal economy (and, consequently, for an increase of tax revenues). It also makes possible a more efficient exploitation of available private and public resources, markedly facilitates development of entrepreneurship and innovation activities, especially of small and medium-sized enterprises, and increases employment. In the Czech Republic, all the mentioned fields have been supported with a number of specific programs with considerable financial resources. Their effectiveness, however, would have undoubtedly been much higher when the business environment itself was improved. The example of the Baltics has shown that also the less developed new EU members, burdened with socialist past, are able, in a relatively short period, to reach remarkable progress in this area. In the first place, it is desirable to focus on the fields where the necessary changes can be

realized rather quickly and with low cost, and, at the same time, to prepare deeper and time more demanding systemic changes including comprehensive legal reforms. The most efficient way to the decreasing time demand and (indirect) cost of procedures related to doing business is the minimization of court participation to the cases which cannot be settled by private agreements.

### Innovation performance

Differences in qualitative levels of **competitive advantage** and its components among the EU-25 members are very significant. The comparison also showed major lagging of the less developed EU-13 group behind the more developed members. Competitive advantage structural characteristics applicable to the Czech Republic are similar to those of other EU-13 members, although the level of development is among the highest within the group. These national differences require adequate adaptation of concepts, instruments and supporting policy measures to reflect the country-specific maturity of competitive advantage. Inappropriate focus of these instruments resulting, for example, from mechanically adopting experiences of countries at a significantly higher level of development, increases the tendency towards inefficient exploitation of resources. Furthermore, it is necessary to distinguish between the countries with less developed competitive advantage quality and adjust the necessary support according to the sources and extent of weaknesses. Where weaknesses are more of an exception and include only some points of individual components, support should be specifically targeted. On the other hand, if the overall quality of competitive advantage is very low, attention must be paid to supporting system approaches with the widest achievable impact. According to the previous comparison, the Czech Republic is currently at a transitional stage. The average qualitative level is one of the highest within the EU-13, i.e. the fundamental conditions for its development have been created. However, there is a lack of sufficiently effective (system and at the same time strong) impulse for significant advancement.

The performance growth of **national innovation system** has been conditioned both by the growth of its elements and, in particular, their restructuring. The comparison with the situation in the EU has indicated that the relative size of the key element of innovation performance – research and development – is located under the average level of EU-25 but at the first position among the new EU member countries. This position has been also confirmed by data about the relative size of published scientific articles. The research and development in the enterprises is now also well situated. It is not only because of their traditionally strong position in the national research and development system but also its funding growth and dynamics of research in the technology advanced branches of manufacturing and services. The unfavourable position of research at higher education sector has also got improved. A more radical changes in this sector have been constrained – besides its internal issues – by slow-down in public funding of research and development, upon which the higher education sector is still dependent. Negligible share of enterprise resources in funding research at higher education is also one of reasons of its weak position in the national innovation system.

Comparatively favourable situation can be identified in the **innovation performance** of enterprises. The share of innovating enterprises is still under the average level of



EU-25 but at the front position in the group of the new EU member countries. The innovation capacities of the enterprises have been mobilised in particular by influence of market factors (demand for innovation and growth in the implementation of product innovations). The weaknesses of innovating firms have been emerging in their insufficient links to knowledge producing organisations (research organisations, faculties of higher education, consulting firms, patent servicing). A low interest of banking sector in financial support of innovation projects can be also mentioned as another source of their weakness. The evaluation of this issue is suggesting that the pattern of the domestic infrastructure for support of innovation has turned out to be productive in adaptation of innovating firms to available innovation resources (mostly in the form of capital and technology transfers from abroad) but weak in their creative modification to a more advanced technological application and market implementation. A transition from the adaptation pattern to the modification one (the latter one being more suitable for small and technology advanced countries) can be - in the case of the Czech Republic - supported by some available resources: level of education of population, size and level of new scientific personnel in natural sciences and engineering, dynamics of research and development in the technology-advanced manufacturing and services. So far, the mobilisation of such resources has been constrained by a closure of academic institutions in relation to challenges of innovation in industries and by the implementation of ineffective regulatory means of innovation policy.

The nature of **information society** in the Czech Republic is developing fast in the context of steady stronger potential of information technology (IT). Individuals and mainly households are IT equipped less than other countries (only mobile devices are exception). The technological infrastructure in the commercial sphere and in public and state administration strengthens on the other side. The frequent problem is a disharmony of installed and used technologies and applications on the one hand and the quality of business processes and their optimization within an organization and also between an organization and its business partners or citizens on the other. The information services as a special kind of goods, resp. added value to a primary product are becoming a part of business activities in the Czech firms and state institutions. Nevertheless the trade, incl. the foreign trade with information products and services is less significant in the Czech Republic in comparison with abroad. The limited factors in companies are the level of user preparation using new information technologies, functionalities and integration of ICT applications. One of the frequent problem of effectiveness of ICT usage is the quality of IT management where there is often no process oriented approach, no metrics suitable for ICT maintenance and development and no learning and application of standards. The special character of informatics in the Czech Republic is in the area of small and middle sized companies. While the ICT equipment of these companies is on high level, the software applications are concentrated on support of regular operation based on standard transaction systems. On the other hand the usage of analytical applications, applications for effective customer relationship or other special applications with added value is limited in this category of companies.

### Quality of human resources

The results of international comparisons show that, in terms of **knowledge and skills** measured by the education struc-

ture of the population, the CR faces the challenge of a low proportion of the population with tertiary qualifications and low educational mobility. One drawback of the Czech education system is insufficient work with texts, which is reflected in a low level of reading literacy of the population. These problems are identified in the relevant policy documents, but their solution is demanding in terms of time. Increasing the number of graduates of short tertiary programmes in particular is linked to the supply of good-quality, practice-focused bachelor programmes. Improving the level of literacy of the population depends on successful curricular reform.

The low levels of occupational and geographical mobility in the CR are influenced by the fact that for some groups of the population it pays to collect welfare benefits rather than work, by housing shortages in the target regions and by an unfavourable relation between commuting costs and income from work. It is necessary to implement radical changes to the welfare benefits system, to lower taxation on work income and, to speed up liberalisation of the housing market and to set up an appropriate system to support larger distance commuting.

**The quality of human resources in terms of the needs of a knowledge-based economy** is not sufficient and its development lacks dynamics. This is true both of the existing resources, and even more of the future resources that are now being prepared in the education system. There must be measures targeted to boost the supply of the workforce with technical qualifications that will stimulate the inflow of technology-intensive investment, and to link the existing investment incentives to this type of investment.

It is necessary to expand access to tertiary studies of technology and science and to enhance their attractiveness by improving their quality, flexibility, material resources and equipment (laboratories in particular) and the links between universities and industrial business sector. Students' co-funding of their studies would certainly reinforce their responsibility for education programme choices and encourage them to complete studies with success. At higher education institutions it is necessary to enhance, above all, the scope and quality of the outcomes of research and their practical application.

The adult population in the CR shows a low rate of participation in **lifelong learning** as compared to their European counterparts. To improve this situation it is necessary to create an environment that would stimulate both the demand for continuing education and the supply of suitable programmes. Important also is the expansion and enhancement of support information and counselling services. On the supply side the challenge is the quality of the programmes which is not, with the exception of school education and retraining, subject to systematic evaluation. It is necessary to inter-link the existing activities concerned with accreditation and certification into a coherent system.

The level of investment in education is not sufficient either in initial or in continuing education. This results in disproportionately low remuneration of teachers, outdated equipment and slow implementation of reforms leading to improvements in the quality of education. Moreover, corporate investment in training in the CR is lower than the EU-15 average. Training of employees, which is an activity of key importance for maintaining the competitiveness of companies, should receive more support - particularly in small and medium-sized enterprises.







## **Centre for Economic Studies, University of Economics and Management**

[www.cesvsem.cz](http://www.cesvsem.cz)

Centre for Economic Studies is a research institute of the University of Economics and Management and operates within the framework of the UEM Grant Fund. Its team now includes 16 research workers (internal and external). Research is directed especially at the competitiveness of the Czech economy in international comparison (within the EU-25) and on the identification of related economic (particularly structural) and political implications for the support of economic convergence and transition to knowledge-based economy. The research activities, including field surveys and case studies, have been realized since 2005 within the framework of two long-term research projects (Growth performance and quality competitiveness of the Czech economy and The Centre for research on the competitiveness of the Czech economy). Thematically the research within the project is aimed at four partial components: (1) Macroeconomic performance and (external and internal) stability, real and nominal convergence, factors of long-term growth, (2) Institutional quality (governance), doing business conditions, efficiency of markets, (3) Competitive advantage (including export performance) and innovative inputs and outputs, development of information society and business application of ICT, (4) Quality of human resources (realized by National Observatory of Employment and Training). Besides national view also the regional and industry specific aspects of the competitiveness and its structural implications have been considered. CES supervises master degree program in competitiveness and management in which the results of the research activities have been exploited extensively. CES cooperates with a number of academic and governmental institutions as well as businesses, and with foreign expert bodies.

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## **National Observatory of Employment and Training, National Training Fund**

[www.nvf.cz/observatory](http://www.nvf.cz/observatory)

National Observatory of Employment and Training (NOET) is an analytical section of the National Training Fund. It was set up on the initiative of the European Training Foundation as part of a network of similar institutions in Central and Eastern European countries. Its team now includes 6 research workers. The NOET provides information about human resources development, carries out research, collects data, including field surveys, and analyses development trends in the labour market and education in connection with on-going socio-economic changes. Furthermore, it coordinates pilot projects at both national and regional level. Its research activities are focused on the following main areas: (i) analyses of mutual links between the labour market and the initial as well as continuing vocational education and training (especially access to education, role of education in increasing employability); (ii) analysis and evaluation of the human resource development as a resource and result of competitiveness of the economy; (iii) development and testing of methodology for regular forecasting of qualification needs of the labour market at the national, sectoral and regional levels; enhancing a relevant information base and an institutional background for regular forecasting. Since 2005 NOET is one of three institutions creating the Centre for Research on the Competitiveness of the Czech Economy. It co-operates closely with the European Commission, the OECD, the Cedefop (European Centre for the Development of Vocational Training) and other partner institutions. It takes part in the expert European networks: ReferNet (set up under the auspices of the Cedefop), and SkillsNet (international network for co-operation in the area of forecasting skills needs).

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