



BermanGroup

Statistic Identification of Clusters

National Report

Summary of Key Findings

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Foreword

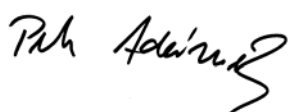
The Czech Republic strives to develop a high-performance national economy based on skills and knowledge, creation of high added value, and positive business environment supporting competitive companies involved in global value chains. This effort complies with the Lisbon strategy, adopted by the EU member states; with the Government's program priorities; it is confirmed by the Economic growth strategy of the Czech Republic, by scope of the operational programmes (namely OPIE and OPHRD) that make use of EU Structural Funds, and by the new priorities and structure of institutions for economic development. CzechInvest – the Investment and Business Development Agency, a client of this project, is the key institution for implementation of these efforts in the Czech Republic.

Current good performance of the Czech Republic's economy has been influenced to a large extent by the inflow of foreign direct investment since the second half of 1990s. Apart from the growth of productivity, export orientation and creation of new jobs FDI have contributed to modernization and higher competitiveness of the national economy. The success of FDI attraction has come due to the factors based on "natural" or "traditional" strengths of the business environment in the Czech Republic, but it would not have been as significant without systematic application of intelligent public intervention policies in the field of economic development at both national and local / regional levels.

Future prosperity of the Czech Republic considerably depends on a more evident growth of economic activities based on knowledge and skills. Our competitive strengths in the labor intensive industries have already started to decrease, and this (basically positive) trend will logically continue, being compensated for by the growth of economic activities of higher value added. Smartly formulated and efficiently implemented policies of public intervention may become a decisive stimulus for the development of advanced economic activities, which are competitive in the long run. The initiation and support of industrial clusters orchestrated by CzechInvest and its regional partners belong to such modern techniques of economic development promotion.

The outputs of this project should become an important source material for CzechInvest, Ministry of Industry and Trade, and other public institutions to inform further decision-making related to the focus of industry and trade support programmes in the Czech Republic, regional competitiveness, and preparation of future development initiatives and programmes to be implemented in the Czech Republic.

Our ambitions are two-fold: (1) to create basic data and knowledge-base for private businesses and extra-government institutions that will decide to work together on the development and implementation of competitiveness projects, and at the same time (2) to contribute to CzechInvest's efforts to enlarge and train a pool of regional specialists to perform activities strengthening international economic competitiveness of the Czech Republic.



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Berman Group
Project Manager

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Exhibits

The exhibits are data summaries of regional reports:

- Hlavní město Praha (PRAGUE)
- Jihočeský kraj
- Jihomoravský kraj
- Karlovarský kraj
- Královéhradecký kraj
- Liberecký kraj
- Moravskoslezský kraj
- Olomoucký kraj
- Pardubický kraj
- Plzeňský kraj
- Středočeský kraj
- Ústecký kraj
- Vysočina
- Zlínský kraj

and include information on:

- i. *Complete export structure* for each NUTS 3 region on 2-digit level as classified by SITC rev 3
- ii. *Regional export profiles* listing top 20 commodities for each NUTS 3 region on 3-digit level as classified by SITC rev 3
- iii. *Commodity export profiles* of top 5 commodities in each region
- iv. *Average Location Quotients* (with and without Prague) and separate figures for value added, sales and employment for each region
- v. *Regional manufacturing industry positioning charts* presenting average LQs vs productivity.

1 Introduction

The project of "Regional and national economic analysis of the Czech Republic, aimed at identification of the existing and potentially competitive clusters" (here "Statistic Identification of Clusters") commenced on 20 September, after the contract was signed between the Client - Investment and Business Development Agency CzechInvest (hereinafter "CzechInvest" or "the Client"), and the Contractor – Berman Group, Economic Development Services, s.r.o. (hereinafter "Berman Group" or "the Contractor"). Signing of the contract followed after results of the public tender had been announced; the tender took place in August 2005, and Berman Group's proposal was assessed as the most convenient for the Client.

1.1 Overview of the Project's Objectives

Structure of the project's objectives is based on the project's terms of reference and includes general goal, specific goal and a number of specific objectives that determine the contents of the project's outputs. These objectives also outline the basic project's activities, their purpose and scope and suggest the the project's outputs use in the future work of the Client, as well as other institutions involved in the promotion of competitiveness using public resources in the Czech Republic, and businesses that try to cooperate among themselves and with the public sector in identifying ways to increase their individual and shared competitive abilities in global scale.

General goal:

To obtain detailed information and resources for the new programmes aimed at increasing competitiveness of key industry and service sectors, in the form of support of development and cooperation between state and private investors.

Specific goal:

- Identification of possibilities to create and develop industrial groupings – clusters in the Czech Republic.

Specific objectives:

- To describe in detail the potential of competitiveness and innovation development of all 14 Czech regions at NUTS 3 level (including Prague), which shall enable regional governments and CzechInvest to set priorities and objectives for future support programmes.
- To identify competitive and potentially competitive industries at both national and regional levels, to become the target of concentrated support from the state and EU development programmes in the next period 2007 – 2013.
- To define the existing and potential clusters at national, regional and sub-regional levels that are or could be competitive in an international scale. This data shall be used in the follow-up in-depth study aimed at analysis of the identified clusters.
- To identify sources of data from EU, Czech government, public institutions and private sector providers that can be used to identify competitive clusters at national, regional and sub-regional levels.

1.2 Overview of Methodological Procedures

To achieve the project's objectives the Contractor has chosen top-down analytical method, based mostly on the foreign trade data serving the purpose of calculation of the Czech Republic's share in global trading in specific commodity groups / industries. Products with an above-average share in CR export had established a starting point for the subsequent analytical work, the objective of which was to identify and roughly define the key industries in individual regions (at NUTS 3 level) that may represent a potential for establishment of globally competitive clusters.

National level – the “long-list”. The principle of top-down analysis is based on statistically supported identification of key competitive industries for the whole state in an international context, and after cleaning any distortion effects and further stratification of the selected industries according to various criteria of "national importance" it is followed by compilation of a long-list of industries that might create a base for internationally competitive clusters.

National level – the "short-list”. The long-list has been an input of next works, where experts take irrelevant industries (commodity categories) out of the list, and add the industries that were not included previously, but their potential as a base for competitive clusters is assumed.

Regional level – long-lists. Next step of top-down analysis is the geographical localization of sources of international competitive advantage within the Czech Republic, i.e. analysis has been performed for each industry from the identified national long-list, concerning the density of occurrence of the selected indicators at lower territorial levels – for the purpose of this study NUTS 3 level. Specialized sub-delivery from CzSO has been used; the office had prepared export data according to standard classification SITC rev. 3 at 2-digit level (or 3 digit for selected industries from the long-list).

Regional selections and characteristics. Selection of an industry for further research in regions, and for determination of potential of clusters establishment was based on the available results of previous project stages compiled by the Contractor's team of experts, representatives of the Client and regional specialists. This is an expert selection, i.e. it does not necessarily correspond to the current political priorities of support of economic development in individual regions.

Research and interviews in regions. There was an additional analysis conducted directly in regions for the purpose of more accurate characteristics of conditions in the already selected industries. This analysis was focused on: geographical scope, density, depth and scope of the cluster, or its activities, innovation capacity and summary of present forms of cooperation. The analysis has been conducted on the basis of surveys performed by regional experts in interviews with the representatives of relevant institutions and companies in the regions. Conclusions from the surveys are included in the individual regional reports [in Czech language only].

1.3 Ten Key Findings of the Statistic Identification of Clusters Project

First, key value chains of the Czech Republic with proven connection to global trade and exchange of goods with comparably high export power can be found in the following areas of economic activities and products: cars and their components, electrical engineering, machine engineering, chemistry and beer.

Second, key industries can be identified at regional level in all regions. There are also industries that function as parts of super-regional competence groups connected to world trade through export. Export level varies in regions, nevertheless we have identified above-average concentration for at least 20 commodities from the complete list of 97 internationally competitive foreign trade items of the Czech Republic in each of the regions.

Third, we have found numerous common features of the identified (by combination of top-down and bottom-up methods) regional concentrations of economic activities at the super-regional level, which provides us with the opportunity to foresee the following geographical super-regional distribution: Labe river belt – chemistry, Southwest and North-western Moravia – lumber / wood, South (Vysočina, Southern Bohemia) – healthy foodstuffs, Northern Bohemia – glass, North-eastern Bohemia – technical fabrics, packaging materials, South-western Moravia – airplanes.

Fourth, Prague and Central Bohemia (not the whole area of the region) creates the strongest "natural" region within the regional framework of the Czech Republic, being one of the drivers of the Czech economy, and a centre for the most important industrial group – automotive industry.

Fifth, services are natural component of each identified cluster, supporting their competitiveness and influencing productivity. We propose a concept of assessment of possible cluster initiatives in services of strategic importance for the Czech Republic. These activities have already been localized in many documented cases, and they keep arriving in the Czech Republic, attracted by incentives in the field, and even more by favourable factors and other parameters of macro- and micro-business environment. So far they have been localizing mostly in Prague, with a potential to move to large population centres. We haven't found any pattern that would support the idea that in some of the strategic service activities there are emerging Porterian clusters.

Sixth, within the fieldwork we have identified number of interrelated areas with a long-term potential to contribute to international competitive advantage of the Czech Republic. These areas concentrate mostly around the interaction of individual industries of key importance for the Czech Republic with modern science branches – biology-electronics and engineering, environmental technologies and alternative sources of energy, information and communication technologies, intelligent management systems and components and the like.

Seventh, the available statistics for measuring competitiveness is improving, but it is not sufficient. We have compiled a list of quality factors, and identified possible corresponding data sources that could help the regions to get the information essential for measuring competitiveness of their cluster groupings in the future.

Eighth, international competitiveness and clusters as a concept, and their importance for regional economic development have not yet been widely understood in public and private sectors, and they have not become a priority of public policies at lower than national level.

Ninth, we recommend to continue in the analysis of key value chains after the statistic identification by an intensive field research, and to verify strategic connections of individual industries with institutions

and among themselves in order to describe sources and possibilities of development of competitive advantages of individual clusters.

And finally tenth, we propose to make use of the new programming period to stimulate the processes leading to global competitive advantage at both national and regional levels, not only through the new "Clusters" programme, basic changes of which we suggest in this report, but also via inter-department cooperation, and incorporation of competitiveness improvement principles as the central point of public sector intervention to support economic development, and activities of private companies.

2 Performance of the Czech Economy

Competitiveness is still quite a new concept in the Czech environment, only slowly catching the attention of public policy makers. Numerous leading academics and research institutions have been active in the field of competitiveness research and estimating its effects on prosperity, raising standards of living and economic development of countries and regions. National governments nowadays build their priorities and programmes around the concept of international competitiveness. Multinational communities are not exempt from this trend. European Union, OECD and the World Bank perceive competitiveness as a tool to sustain the standard of living in the developed world, and at the same time a means to reduce poverty and secure basic living conditions in regions immune to technological progress.

To understand competitiveness at the national level one has to be aware of the sources of national prosperity. Quality of life in a country is determined by the **productivity of its economy**, measured by the value of goods and services produced per unit of the country's human, capital and natural resources. The productivity does not depend just on the **value** of created products and services, measured by the prices they can be sold for in open markets, but also on the **efficiency** with which these products and services are being created.

According to the results of world research in this field competitiveness has to be understood, measured and conditioned on the basis of productivity. Productivity allows a nation (region, group of countries) to support high wages, strong currency and to provide attractive returns on investments (capital), and indirectly raise standards of living. These findings apply to any country involved in open free trade under international competition.

Recent performance of the Czech economy can be described as *good*, over the last five years gross domestic product in constant prices has been rising steadily, in all cases faster than EU-25 or EU-15 average. In this respect, year-on-year GDP growth rate is a fair comparative indicator, as it does not consider the size or level of development of the analyzed economy. Another comparative indicator of prosperity and standard of living is the GDP per capita measured in purchasing power parity.

2.1 Prosperity

The Czech position is not as good when we compare **GDP growth** only among countries that go or went through the process of economic transition; in particular all three Baltic economies (Lithuania, Latvia and Estonia) have kept high GDP growth in the last five years, as well as the countries scheduled to join the EU in the next wave (Bulgaria and Romania), or countries with pending applications (Turkey).

Close competition for the Czech Republic is represented mainly by its neighbours, which had similar starting conditions in 1990s regarding the world market opportunities and the need to cope with economic transition. Concerning the average growth of mid-European post-transition economies the Czech Republic's performance is comparable with Poland, but we are slightly worse off when compared to Slovakia, Slovenia, or Hungary. The average growth of the three economies of the member countries who have joined the EU before us was faster than the Czech one. These are Ireland, Greece and slightly even Spain.

The following table presents an overview of GDP growth in the last five years (2000 – 2004) calculated on the basis of constant prices of 1995. All EU member states plus other selected countries are included.

Table 1: Real year-on-year GDP growth of selected economies

	2000	2001	2002	2003	2004	Average
Latvia	6.9	8.0	6.4	7.2	8.3	7.36
Estonia	7.9	6.5	7.2	6.7	7.8	7.22
Lithuania	3.9	6.4	6.7	10.4	7.0	6.88
Ireland	9.2	6.2	6.1	4.4	4.5	6.08
Romania	2.1	5.7	5.0	4.9	8.3	5.20
Bulgaria	5.4	4.1	4.9	4.5	5.6	4.90
Greece	4.5	4.6	3.8	4.6	4.7	4.44
Hungary	5.2	3.8	5.1	3.4	4.6	4.42
Turkey	7.4	-7.5	7.9	5.8	7.7	4.26
Slovakia	2.0	3.8	4.6	4.5	5.5	4.08
Slovenia	4.1	2.7	3.5	2.7	4.2	3.44
Spain	4.4	3.5	2.7	2.9	3.1	3.32
Czech Republic	3.9	2.6	1.5	3.2	4.4	3.12
Poland	4.0	1.0	1.4	3.8	5.3	3.10
Canada	5.3	1.7	3.2	2	2.8	3.00
Finland	5.0	1.0	2.2	2.4	3.6	2.84
The United Kingdom	4.0	2.2	2.0	2.5	3.2	2.78
The United States	3.7	0.8	1.6	2.7	4.2	2.60
Sweden	4.3	1.0	2.0	1.5	3.6	2.48
France	4.1	2.1	1.2	0.8	2.3	2.10
EU25	3.7	1.8	1.1	1.1	2.4	2.02
Norway	2.8	2.7	1.1	0.4	2.9	1.98
EU15	3.7	1.8	1.0	1.0	2.3	1.96
Belgium	3.9	0.7	0.9	1.3	2.9	1.94
Austria	3.4	0.8	1.0	1.4	2.4	1.80
Denmark	3.5	0.7	0.5	0.6	2.1	1.48
Italy	3	1.8	0.4	0.3	1.2	1.34
Netherlands	3.5	1.4	0.1	-0.1	1.7	1.32
Japan	2.4	0.2	-0.3	1.4	2.7	1.28
Portugal	3.8	2.0	0.5	-1.2	1.2	1.26
Germany	3.2	1.2	0.1	-0.2	1.6	1.18

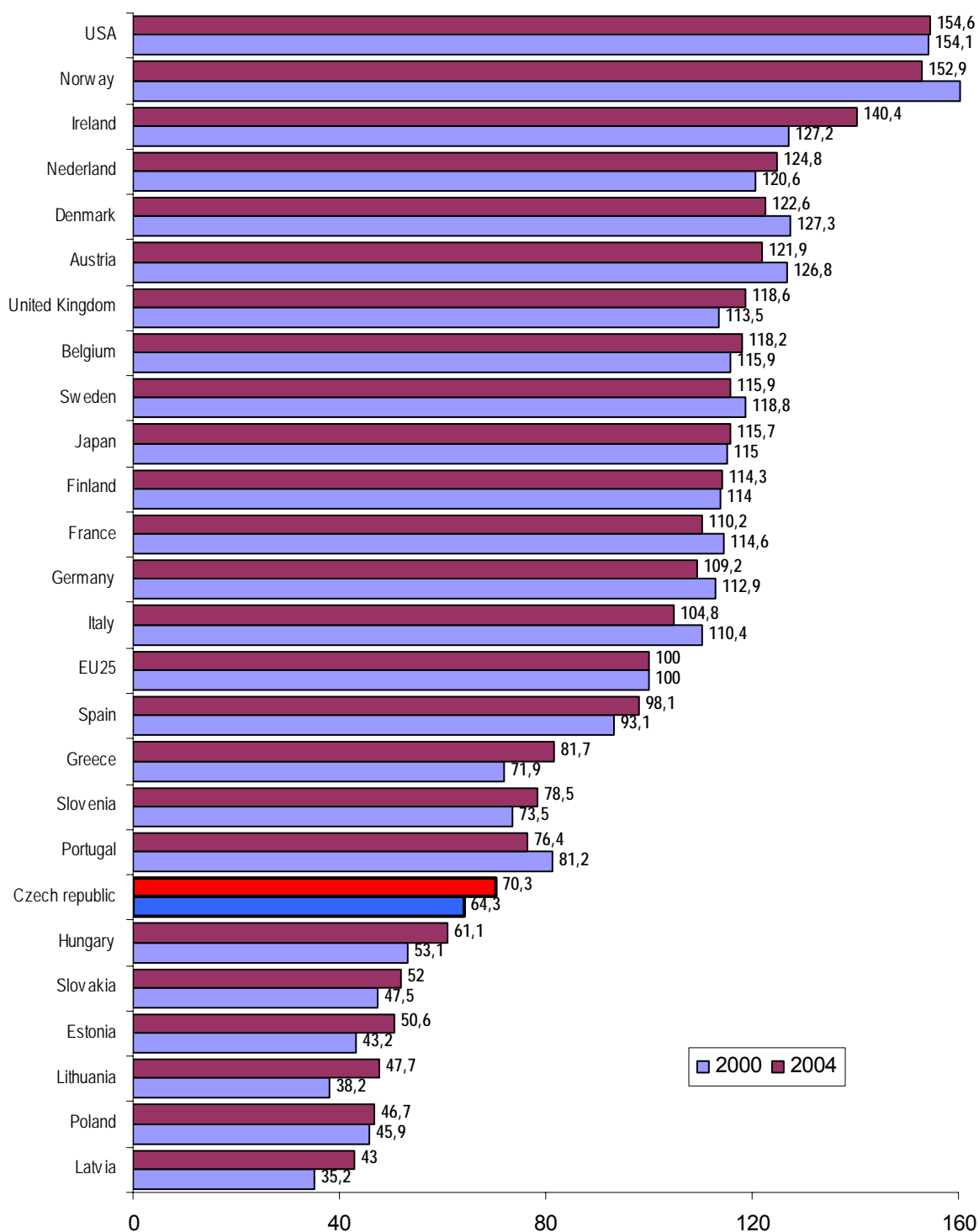
Source: Eurostat, New Cronnos database, October 2005, from CSO

GDP per capita

Despite the high pace of growth in the last five years, real GDP per capita in the Czech Republic is deep below the average of countries we compete with, and the economic level of which we aspire to achieve. The volume of GDP per capita produced in the most powerful world economy – the USA – was twice the volume produced in the Czech Republic in 2005. The Czech Republic registered in 2004 GDP per capita at the level of 70.3% of EU average, and though we remain richer country than our neighbours and close competitors (Slovakia 52% of EU25, Hungary 61.1% and Poland 46.7%), we produce (and consume) per capita less than the Slovenians (78.5%).

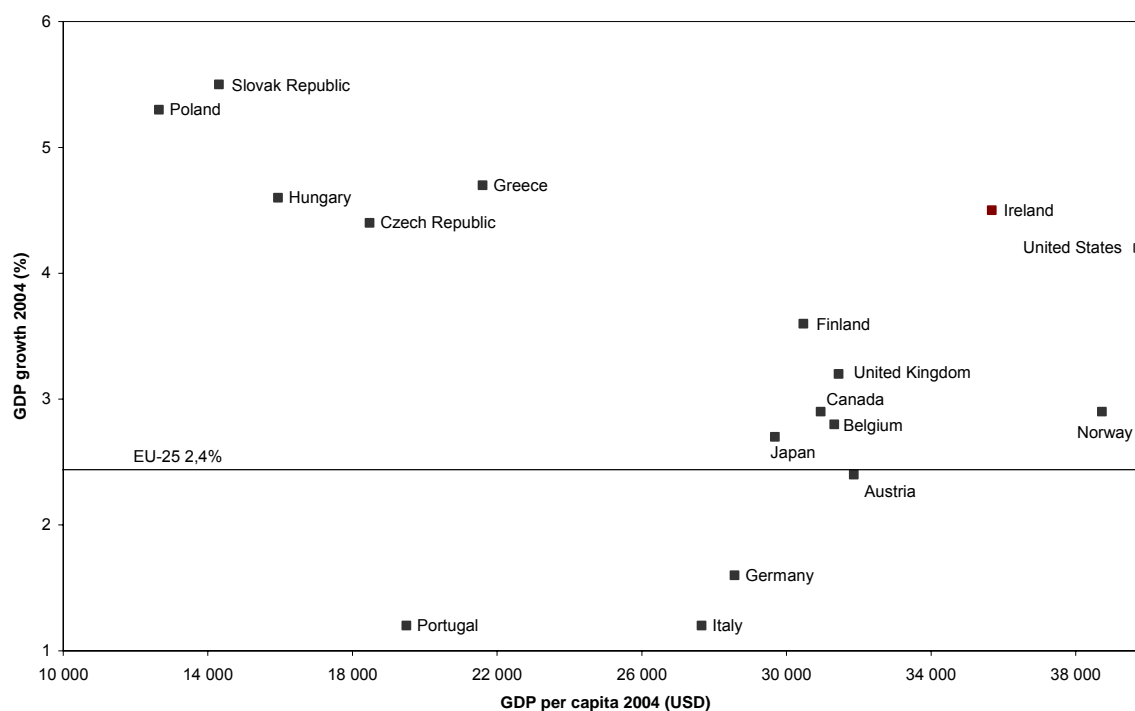
As far as dynamics is concerned we are catching up with Europe (EU25) – we were experiencing 64.3% GDP per capita in 2000, and 70.3% in 2004. However, this progress (by 6 percentage points) is slower than in Hungary (7 per cent), or Baltic countries (Lithuania 9.5%, Latvia 7.8% and Estonia 7.4%).

Graph 1: Gross domestic product per capita by purchasing power parity (PPP) compared to EU-25 (EU-25 = 100), 2000 and 2004 (%)



Source: Eurostat, New Cronnos, October 2005, from CSO

Combination of both indicators of national prosperity (GDP and GDP per capita growth) in one Graph for selected countries EU-25 (2004) on the following page displays our position compared to close competitors.

Graph 2: GDP (%) and GDP per capita (USD) growth for selected countries (2004)

2.2 Productivity

GDP per capita in the Czech Republic in 2004 was USD 18,472. Though this indicator can be used to estimate productivity of the Czech economy in an international comparison, it is useful to consider other factors: number of hours worked in the economy in the year, labour force in the population, and employment rate. According to OECD the Czech GDP per hour worked was USD 20.7 in 2004, which represents lower productivity than that of Hungary (USD 21.5) and Slovakia (USD 21.6). The highest productivity per hour worked was registered in Belgium, France and Ireland, outside the EU it was Norway (USD 56.6) and traditionally the most developed world economy – the USA. Low Czech productivity per hour worked results from the very high number of hours worked per year by average Czech employee – according to OECD data Czechs are second only to Koreans (1,986 hours in 2004) in the world in terms of time spent working.

Another significant indicator is the level of labour force participation in economic activities, and overall employment, as these are very important economic and social parameters. Labour force represents 70.1% of Czech productive-age population, for example in Switzerland it is 81%, and taking unemployment rate into account, there are only 64.2% of productive-age people who worked in 2004, which is by 13 per cent less than in the Swiss economically active segment of population. Concerning these parameters we are better off than the Hungarians, Poles and Slovaks, which explains our higher GDP per capita, and lower GDP per hour worked.

Unlike the above-mentioned parameters of Czech productivity that can't be perceived too positively, Czechs take one interesting first place in Europe according to OECD – change of productivity per worked hour. It rose by 8.3% in 2004, which is remarkably more than in case of our main competitors (second was Iceland with 5.5%). At the same time it is not just a momentary change related to e.g. administration of labour registeries, as the change index (2000 = 100) for this indicator is 122 in 2004, which can be compared only to Slovakia (123). In our mid-European economies this indicates positive impact of structural changes we have gone through in the last years.

Ireland's index is quite interesting, too, as it belongs to world economic leaders, and still it succeeded in reaching productivity growth between 2000 and 2004 of 14% (index 114). Norway achieved its USD 56.6 per worked hour after four years of growing productivity (by 8.7%).

Portugal, Greece, Korea and New Zealand (considered to be another very successful small country, the economy of which has been successful in coping with the handicap of remoteness) demonstrate surprisingly only slightly better results than the Czech Republic in productivity indicators. These countries are our major rivals and benchmarking models in the race for economic performance, growth and sustained competitiveness. Koreans have lower productivity per hour worked than the Czechs or Slovaks, yet Korean companies aggressively enter our markets through foreign direct investments, and belong to the dominant investors in key industries that drive Central European economies (automotive, consumer electronics).

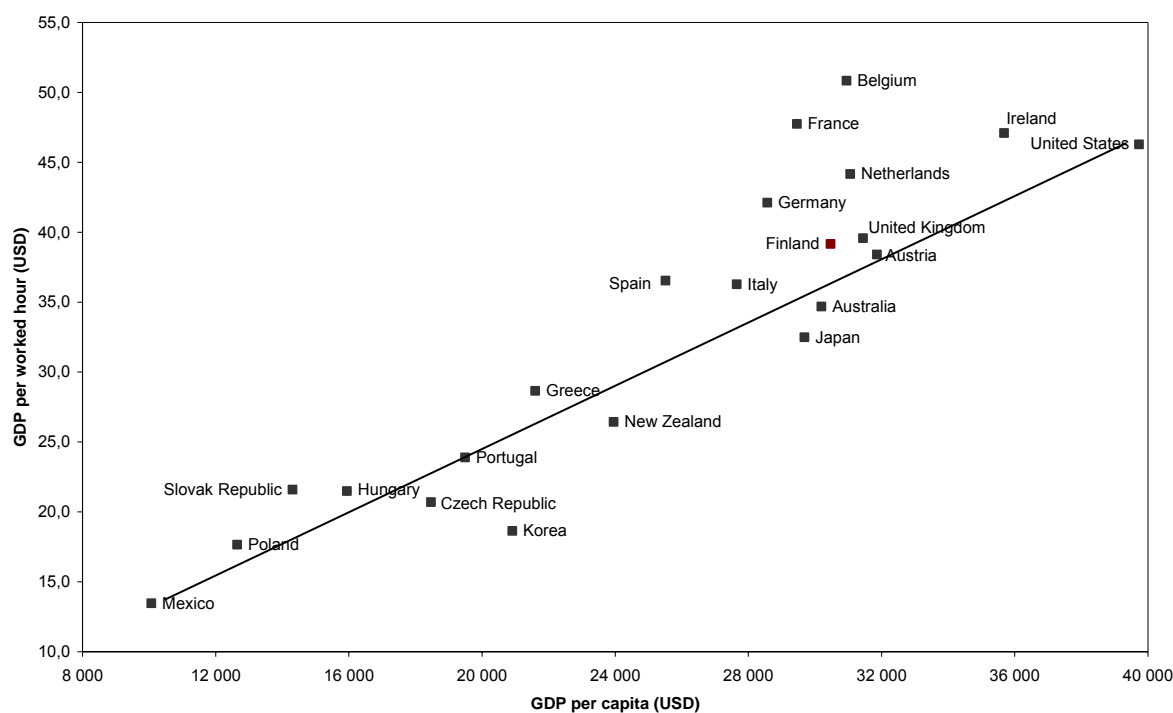
Table 2: Overview of productivity parameters in selected OECD countries

<i>Productivity parameter</i>	<i>Multiple-year productivity growth</i>	<i>Change GDP/WH</i>	<i>GDP/head</i>	<i>GDP/WH</i>	<i>Employment in act. age population</i>	<i>Labour force participation</i>
<i>Countries / units</i>	<i>2004 2000=100</i>	<i>2004/2003 %</i>	<i>2004 USD</i>	<i>2004 USD</i>	<i>2004 %</i>	<i>2004 %</i>
Australia	108.7	0.9	30 193	34.7	69.5	73.6
Belgium	105.5	3.6	30 951	50.8	60.5	65.3
Czech Republic	122.0	8.3	18 472	20.7	64.2	70.1
Denmark	106.5	2.3	31 645	40.9	76	80.2
Finland	107.7	2.5	30 471	39.2	67.2	73.8
France	107.4	1.6	29 456	47.7	62.8	69.5
Ireland	114.2	2.1	35 680	47.1	65.5	68.6
Iceland	114.8	5.5	32 589	33.7	82.8	85.5
Italy	99.6	0.7	27 655	36.3	57.4	62.5
Japan	108.0	3.2	29 684	32.5	68.7	72.2
Canada	104.2	0.0	31 321	35.2	72.6	78.2
Korea	116.9	3.2	20 907	18.6	63.6	66
Luxembourg	103.8	4.3	57 938	55.9	61.6	64.7
Hungary	112.7	3.1	15 946	21.5	56.8	60.5
Mexico	101.8	0.9	10 070	13.5	60.8	62.8
Germany	105.3	1.2	28 570	42.1	65.5	72.7
Netherlands	102.0	2.0	31 060	44.2	73.1	76.6
Norway	108.7	0.8	38 728	56.6	75.6	79.1
New Zealand	104.5	0.2	23 953	26.4	73.5	76.6
Poland	118.3	4.0	12 647	17.7	51.9	64.2
Portugal	99.1	-0.9	19 490	23.9	67.8	72.9
Austria	105.5	1.2	31 864	38.4	66.5	70.2
Greece	113.5	1.9	21 599	28.6	59.6	66.5
Slovakia	123.0	3.5	14 309	21.6	57	69.7
The United States	109.9	3.2	39 732	46.3	71.2	75.4
Spain	105.7	1.0	25 510	36.5	62	69.7
Sweden	109.6	2.7	30 370	39.9	73.5	78.7
Switzerland	103.9	1.5	33 668	36.7	77.4	81
Great Britain	109.6	2.5	31 444	39.6	72.7	76.2

Source: OECD Productivity Database, July 2005

All the presented indicators describe productivity, but they should be treated carefully, as government policies in the labour market can influence results of individual comparisons considerably. Regulatory restriction of working week works in favour of France compared to Great Britain regarding GDP per worked hour parameter, but it can have other effects, such as higher unemployment, which is not displayed in the Graph below.

Graph 3: Productivity per capita and hour worked (selected countries 2004)



Source: OECD Productivity Database, July 2005

2.3 Internationalisation

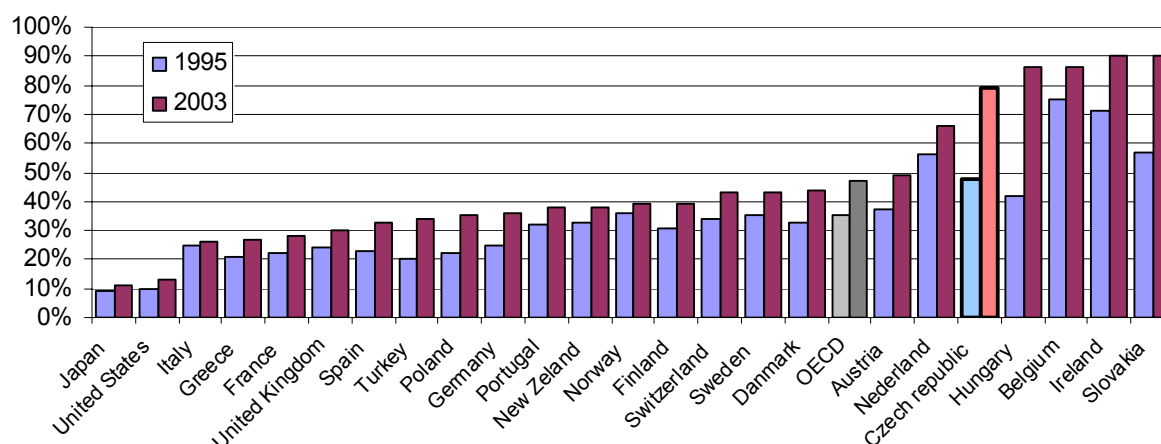
Growth of productivity and competitiveness in a small Central European country is based on the success of its participation in the global economy. This thesis obviously applies to the large overseas economy as well, however, in case of the Czech Republic the level of our economic self-sufficiency is considerably lower. The success of participation in global economy depends on the success of foreign trade activities, foreign direct investments and innovation activities that enable national resources to develop (sustain / catch up with) technological advantage.

2.3.1 Export

According to A. Smith international trade is a way of increasing performance of domestic economy through concentration on the production and trade of goods in which the country has comparable production advantage. Ability of a country to trade products and services in exchange for other products and services at the same time ensures access to better and more efficient production technologies. The fact that export exceeds import is an evidence of ability of domestic (producing in their countries) companies in the industry to produce values and trade them in international markets, and it indicates the existence of competitive advantage. Stable and growing share of a nation's export in the international trade (not caused by devaluation or dumping) leads to growing productivity.

Czech economy is highly export-oriented, it is open to the international trade, and the products and services produced in the Czech Republic are successful in international markets.

Graph 4: Share of average total export and import in GDP %



Source: OECD Science, Technology and Industry Scoreboard 2005, from CSO

Foreign trade of the CR in 1995 made up 48% of GDP, and in 2003 it was already 79%. These values were even higher in Slovakia – 57%, or 90%. Naturally, smaller countries experience higher shares, but another factor is the technological level. Japan and the USA are at the virtual end of the above comparison. In the case of the USA it is the size of their economy which relies heavily on consumption, in the case of Japan it is the level of openness of the economy to imports, but also it is a result of the high level of competitiveness and technological advantage that is capitalised through FDI implemented abroad, thus participating by their production and export in other countries' indicators of foreign trade (which is also the case of the Czech Republic).

Structure of Czech export measured by standard international trade classification (SITC) in 2004 is evident from the following table, which shows the Czech export total and trade with OECD countries and world in thousands of USD.

c.	Commodity	Export to OECD	Total export	OECD / world	World trade	Czech share
0	Food and live animals	1 515 418	1 802 525	84%	439 565 679	0.410%
1	Beverages and tobacco	309 025	339 898	91%	73 915 126	0.460%
2	Crude materials. inedible. except fuels	1 698 130	1 809 472	94%	263 495 836	0.687%
3	Mineral fuels. lubricants and related mat.	1 772 100	1 819 113	97%	651 123 072	0.279%
4	Animal and vegetable oils. fats and waxes	36 737	39 010	94%	34 999 862	0.111%
5	Chemicals and related products. n.e.s.	3 163 173	3 838 697	82%	931 576 281	0.412%
6	Manufactured goods classified chiefly by material	12 810 870	14 830 395	86%	1 188 138 472	1.248%
7	Machinery and transport equipment	30 981 575	33 784 845	92%	3 340 365 394	1.011%
8	Miscellaneous manufactured articles	6 950 606	7 454 874	93%	1 002 432 296	0.744%
9	Commodities and transactions n.e.s.	52 546	52 706	100%	280 258 683	0.019%
	TOTAL	59 290 179	65 771 534	90%	8 205 870 700	0.802%

Source: UNSTATs, Comtrade Database, c = classification code SITC(1) rev. 3

Czech Republic trades mostly with OECD countries, the share of export to these countries makes for 90% of total Czech exports. Outside the OECD we export especially chemicals (8%) and related products. In 2004 the Czech share of export in the world foreign trade was 0.8% according to Comtrade database. The analysis of the dynamics of the Czech export indicates that our share in the

world foreign trade is increasing. While average year-on-year growth of total Czech export between 2002 and 2004 was 35%, the world trade in the same period grew "only" by 19%. The trend of share of Czech export in the world foreign trade in the last 3 years is as follows: 2002 (0.647 %), 2003 (0.701 %) and 2004 (0.802 %).

Foreign trade of high-tech products

Other important parameters of foreign trade statistics from the viewpoint of competitiveness are: (1) foreign trade balance, which is positive in case export exceeds import, and indicates ability of the economy to produce goods and services that can succeed in international markets at higher level, than it absorbs them (consumption vs. production economy). This data also indicates the volume of financial resources that remains available in the domestic economy after net exchange. From the viewpoint of sustainable competitiveness and its growth it is essential whether (2) technological level of exported goods does not go down, and technological level of imported goods does not go up (the second half of this statement must be applied with caution because in developing world technological advances can be achieved through growing technological level of imports). This could be an evidence of slower growth of skills and innovations that directly influence productivity and competitiveness of the economy.

Table 3: Excess of export and market shares of selected countries by commodity, 2004

	<i>Excess of export (%; 100%: export = import)</i>		<i>Market shares of countries in cross-border trade within OECD (%)</i>	
	'High-tech' industries	Middle 'High-tech' industries	All production	'High-tech' production
Australia	22.98	24.52	0.97	0.47
Austria	85.58	103.95	2.07	1.26
Belgium	101.43	117.29	5.56	4.4
Canada	61.31	86.79	4.97	2.46
Czech Republic	70.85	111.61	1.13	0.68
Denmark	123.65	98.74	1.36	1.2
Finland	153.26	92.95	1.24	1.21
France	108.92	117.16	8.19	7.51
Germany	106.59	200.7	16.75	13.05
Greece	20.17	16.43	0.28	0.14
Hungary	109.53	93.88	1.00	1.31
Iceland	28.73	8.53	0.05	0.01
Ireland	232.48	199.57	2.12	4.64
Italy	70.27	115.47	6.76	3.04
Japan	150.17	383.93	10.88	12.84
Korea	156.42	144.23	4.66	6.85
Mexico	102.83	100.64	3.44	3.98
Netherlands	107.23	117.41	5.17	6.56
New Zealand	22.6	27.15	0.34	0.07
Norway	48.69	60.06	0.68	0.31
Poland	35.51	71.9	1.23	0.33
Portugal	49.25	63.59	0.75	0.36
Slovakia	43.36	117.93	0.52	0.12
Spain	49.82	82.75	3.43	1.51
Sweden	138.45	127.99	2.27	2.04
Switzerland	163.7	117.77	2.35	3.75
Turkey	34.32	43.77	1.07	0.28
Great Britain	92.93	85.37	7	9.9
The United States	81.04	64.24	15.73	22.97

Source: Main Science and Technology Indicators, OECD, Paris, May 2005.

In the above-mentioned overview published by OECD we may see that the Czech Republic imports by about 30% more technologically demanding products than it exports, which is "worse" result than for example that of Hungary, which keeps 9% excess in the same category. Slightly better results (excess by 11%) are experienced in the middle-high-tech segment, though Germany exports twice the volume it imports in this category. The 232.48 figure for Irish high-tech export excess does not leave any doubt concerning the technological level of this country.

High-tech products are divided in nine basic groups: aircraft equipment (planes and their accessories, plane engines, other navigation systems), computer technologies (computers and their accessories, copying machines etc.), electronics and telecommunications (video, telecommunication equipment, printed circuits, optic fibres, microwave tubes, semiconductors, integrated circuits and micro-accessories, piezzo-electric crystals, numeric record devices etc.), pharmacy (antibiotics, hormones, glycosides, glands, anti-serums and vaccines), scientific equipment (measuring devices except compasses and devices to measure surface and length, optical devices and machines, electro-diagnostic medical devices, dental drills, cameras and video-cameras, contact lenses, optical fibres not included in group 3), electro-technical equipment (condensers, machines of individual features, sound or light signal devices), chemistry (elements Se, Te, P, As and B, Si, Ca, Sr, Ba, radioactive materials, synthetic organic paints and varnishes, insecticides, disinfectants etc.), non-electric machines (numerically controlled machine tools, laser and other light and photon beam and ultrasound and electro-chemical process tools, fully or partially automatic facilities of resistance and arch welding of metals, gas turbines and their parts, nuclear reactors and their parts, nuclear fuel elements, machines and devices for isotopic separation etc.), and other high-tech.

Table 4: Czech high-tech export trends (CZK million standard prices)

CZK million standard prices	1995	2000	2001	2002	2003	2004
High-tech products total	36 204	89 523	116 841	155 638	170 617	206 241
by product groups						
Aircraft equipment	4 759	2 462	3 538	3 727	4 702	4 298
Data-processing equipment	4 656	18 718	38 479	76 970	86 040	103 400
Electronics and telecommunications	7 208	20 652	35 119	40 221	45 757	53 775
Pharmacy	1 203	2 067	2 249	2 152	2 043	2 540
Scientific equipment	3 522	5 919	8 107	8 400	10 169	13 821
Electric engineering	5 482	22 334	13 344	9 599	8 162	13 287
Chemistry	2 183	3 825	2 821	3 014	2 988	3 032
Non-electric machines	4 789	9 784	10 650	9 129	8 547	9 889
Other high-tech	2 402	3 764	2 535	2 425	2 209	2 199

Source: CzSO Technological yearbook CR

Despite the standard prices we may see high growth of high-tech export and change of portfolio; electronics, telecommunication and electric engineering prevailed in 1995, while in 2004 half of the export was formed by data-processing equipment. These parameters are influenced considerably by foreign investors in the Czech Republic, who export close to 100% of their production, and are able to cause a rapid change of CR export in this field after launching their manufacturing.

Foreign trade of high-tech services and knowledge (TBP)

Czech National Bank is responsible for surveying and publishing statistics related to the export and import of services in the Czech Republic. The method of surveying the service foreign trade data changed in 2005, but the public presentation of results remains the same, and is a part of the balance of payments published by CNB as part of the current balance of payments account. Part of the methodologies related to balance of payments is also the technological balance of payments, which follows data on income, or payments from trading with industrial property and knowledge connected with advanced technologies.

We may assess the level of technological independence of a country from TBP, as well as origin of technologies used in its economy, and relation between the country's expenses in research, development and innovation, and revenues from transfer of technologies. At the same time the balance indicates the scope of technologies the country is able to develop itself, and those transferred from abroad, or those developed in cooperation with other countries.

The rate of trade with immaterial products and technologies indicates technological level of companies in the country, and the level of penetration of economy through foreign direct investments of multinational, technologically advanced companies that transfer technologies between their HQs and branches. Technological balance of payments provides the evidence of:

- Technological transfers: patents, inventions, trade marks, industrial models and designs – measured by licence fees and purchase / sales of ownership rights;
- Provision of technical services, including: technical and engineering studies, and technical assistance;
- Industrial research and development (funded in / from foreign country).

Table 5: Technological balance of payments trend in CR

Revenues (CZK million)	1995	2000	2001	2002	2003	2004
TOTAL	-	9621	11101	10015	5368	5773
Licence fees and trademarks	349	1 712	1 392	1 475	1 421	1 458
Copyrights	-	118	81	159	67	194
Data processing services	136	3 676	4 471	4 477	1 997	2 604
Technical services	-	3 307	3 427	2 542	1 568	1 185
Research and development	241	808	1 730	1 362	315	332

Payments (CZK million)	1995	2000	2001	2002	2003	2004
TOTAL (CZK million)	-	16 807	19 193	18 269	15 688	16 743
Licence fees and trademarks	1 414	3 142	3 535	3 920	4 937	4 412
Copyrights	-	344	160	179	209	489
Data processing services	291	3 197	3 869	3 723	3 888	4 862
Technical services	-	5 095	4 563	6 198	6 053	6 028
Research and development	277	5 029	7 066	4 249	602	952

Source: CSO Statistic yearbook Science and technology, November 2005

Complete data for all categories is available for 200 – 2004, and the Czech Statistical Office (CzSO) newly presents it in their Science and technology statistic yearbook. Total balance of payments of high-tech services and knowledge trade is negative, whereas payments are approximately three times higher than revenues. It means the Czech economy is mostly a consumer of knowledge and know-how created elsewhere, and the status and change of technological balance of payments will be an important indicator of success of strategies implemented with the objective to convert the Czech economy from manufacturing to the knowledge-based one in the future.

2.3.2 Foreign Investments

Comparative indicators of foreign direct investments (FDI)¹ are *flow* (in and out) of FDI in certain period, and *stock* of investments in the economy as of certain date. Inflow is a total volume of

¹ Foreign direct investment (FDI) can be defined on the basis of execution of managerial control over business due to ownership of stock, or voting rights. We speak of FDI in case foreign investor owns 10 and more per cent of the equity, or voting rights.

investment projects implemented in a specific year – newcomers (FDI basic capital) or expansion (reinvested profit), outflow means FDI leaving the country (minus). FDI come to host country mostly for four reasons: markets (market led), resources (asset seeking), factor productivity (efficiency seeking) a knowledge (knowledge seeking). It is no secret that the manufacturing investments coming to the Czech Republic in the last decade were mostly efficiency seeking mobile contestible investments and market-led.

The inflow of FDI into an economy responds to the quality of its business environment, and at the same time it improves it by increasing the intensity of domestic competition, creates pressure on the quality of local supplier chains by introducing higher quality standards shared by the MNE around the world. FDIs bring in the target economy new technologies, operating processes, procedures and knowledge created and tested elsewhere. Thus they bring abilities and capacities otherwise unavailable to the domestic environment (labour force, companies and institutions). This influence of FDI is proved by higher productivity of companies with foreign owners, which is true in most target economies, including the Czech Republic.

Outward FDI flow indicates the ability of domestic companies to succeed in foreign markets and further develop their international competitive advantages by means of higher quality than “mere” foreign trade. Also Czech companies who act as foreign investors in other economies are motivated by demand, access to resources, prices of inputs and access to knowledge. Ability of companies to invest abroad has direct and fast impact on the economies of countries that are hosts, and those that are the sources of the investments. At the same time this ability once again indicates technological level of companies, success of business strategies in source countries, or unbearable parameters of domestic macro-environment, making it difficult for companies to operate profitably in the source country. These aspects have direct relationship with competitiveness of economies, and the flow and stock of FDI are therefore significant indicators of development of national competitiveness.

Table 6: Inflow, outflow (2004) and status of FDI in European economies, USD million

Country	FDI inflow	Position	Inward FDI stock	Place	FDI outflow	Place	Outward FDI stock	Position
Great Britain	78 399	1	771 658	1	65 391	1	1 378 130	1
Luxembourg	57 000	2	182 894	9	59 008	2	176 499	9
Belgium	34 366	3	258 875	6	26 125	5	248 367	7
France	24 318	4	535 201	2	47 802	4	769 353	3
Spain	18 361	5	346 676	5	54 246	3	332 655	5
Italy	16 815	6	220 720	8	19 262	6	280 481	6
Ireland	9 120	7	229 241	7	-7 400	24	95 955	11
Poland	6 159	8	61 427	14	806	11	2 661	19
Austria	4 865	9	62 657	13	7 164	8	67 424	13
Finland	4 648	10	55 946	17	-1 028	22	80 936	12
CR	4 463	11	56 415	16	546	14	3 061	17
Hungary	4 167	12	60 328	15	538	15	4 472	16
Greece	1 351	13	27 213	18	607	13	13 056	15
Cyprus	1 146	14	8 132	21	630	12	2 684	18
Slovakia	1 122	15	14 501	19	-155	21	618	22
Portugal	1 112	16	65 213	12	6 178	9	45 555	14
Estonia	926	17	9 530	20	257	18	1 398	21
Lithuania	773	18	6 389	22	263	17	423	23
Latvia	647	19	4 493	24	109	19	226	25
Slovenia	516	20	4 962	23	498	16	2 450	20
Malta	421	21	3 557	25	9	20	361	24
Sweden	-371	22	162 973	10	15 147	7	203 943	8
Netherlands	-4 605	23	428 803	3	1 458	10	545 808	4
Denmark	-10 722	24	98 172	11	-10 363	25	99 570	10
Germany	-38 557	25	347 957	4	-7 267	23	833 651	2

Source: UNCTAD, FDI Database

The above-mentioned comparison of main FDI indicators in EU-25 provides the evidence of the United Kingdom's success in FDI. UK is the largest source and recipient of FDI as measured by both flow in 2004 (inflow, outflow), accumulated FDI in the country and the volume of FDI conducted by British companies abroad. The data is absolute, i.e. not calculated per capita, which means the comparison is influenced by the level of development and general strength / attractiveness of the source / target economy.

The situation of our strongest foreign-trade partner, and one of the major FDI partners – Germany is interesting, as it reached negative figures in both inward and outward FDI in 2004. This means (1) the value of FDI coming to Germany in 2004 was lower than the value of capital positions withdrawn by foreign companies from Germany, and (2) the value of direct investments from Germany abroad was lower than the value of capital positions withdrawn by German companies from firms in foreign countries. At the same time Germany remains the second strongest country as measured by outward FDI stock within EU-25 with USD 833 billion, and concerning the value of FDI accumulated in Germany it takes 4th place (USD 348 billion).

FDI in CR at the end of 2004 reached USD 56.4 billion, which is slightly less than in Hungary (USD 60.3 billion), and Poland *USD 61.4 billion), but twice the volume of e.g. Greece. At the same time outward FDI are stronger, Czech companies invested abroad more than twice the volume of 2003 in 2004, and total Czech investment abroad rose between 2000 and 2004 more than four times. With regards to inward FDI to the Czech Republic, 2002 was the most significant year, when Czech economy attracted foreign investment of more than USD 8.4 billion, i.e. more than Hungary and Poland together.

Table 7: Structure of inward FDI by sectors in 2004

OKEC	Sectors and industries	Basic capital Thousand USD	Reinv. profit Thousand USD	Other capital Thousand USD	Total Thousand USD
01-05	AGRICULTURE, FORESTRY, FISHING	21 132.1	4 073.3	0.0	25 205.4
10-14	MINING	404.3	47 910.0	-1 013.1	47 301.2
15-37	PROCESSING of which:	669 545.2	1 271 182.4	203 371.7	2 144 099.3
15-16	Manufacture of food and beverages, tobacco processing	-51 322.9	108 782.5	146.0	57 605.7
17-18	Textiles, clothing	557.8	27 586.6	-27 193.3	951.1
19	Leather processing, luggage and shoe making	286.8	-1 335.3	46.9	-1 001.6
20-22	Wood processing, paper production, publishing and printing	54 314.9	88 597.7	-292.5	142 620.1
23	Coking, oil processing, nuclear fuel production...	0.0	6 313.4	0.0	6 313.4
24	Chemical products manufacture	93 817.8	65 003.3	92 558.1	251 379.3
25	Rubber and plastic products manufacture	25 609.9	151 670.2	60 832.1	238 112.2
26	Manufacture of other non-metallic products	31 003.5	131 499.1	-6 499.9	156 002.6
27-28	Metals, metal products	145 992.3	322 943.3	-274.8	468 660.8
29	Manufacture of machines and devices	113 531.1	50 161.9	1 996.4	165 689.4
30	Manufacture of office equipment and computers	784.9	11 555.6	-3 255.2	9 085.3
31	Manufacture of electric machines and devices n.e.s.	74 353.3	153 038.9	21 950.0	249 342.2
32	Manufacture of radio, TV and telecommunication machines and devices	2 590.2	-50 718.6	51 343.6	3 215.3
33	Manufacture of medical, optical and time-measuring devices	12 003.8	29 218.2	8 772.7	49 994.8
34	Manufacture of double-track vehicles and trailers	144 040.8	127 150.9	-2 834.0	268 357.7
35	Manufacture of other means of transport	17 805.0	37 387.7	-1 353.8	53 838.9
36	Manufacture of furniture; other processing industry	4 747.3	9 101.9	7 429.3	21 278.5
37	Secondary raw material processing	-571.5	3 225.1	0.0	2 653.6
40-41	ELECTRICITY, GAS, WATER	167 282.9	92 157.2	8 012.6	267 452.6
45	CONSTRUCTION	15 360.3	111 329.0	-23 080.6	103 608.6
50-52	TRADE AND REPAIRS	441 152.0	267 838.9	59 620.2	768 611.1
55	CATERING AND LODGING	-22 960.2	13 601.3	-18 121.8	-27 480.7
60-64	TRANSPORT AND TELECOMMUNICATIONS	-101 697.8	137 879.3	-16 352.3	19 829.2
65-67	FINANCIAL MEDIATION	40 487.2	415 170.8	58 839.2	514 497.2

OKEC	Sectors and industries	Basic capital Thousand USD	Reinv. profit Thousand USD	Other capital Thousand USD	Total Thousand USD
70-74	REAL ESTATES AND BUSINESS SERVICES	425 641.8	-7 022.5	130 472.2	549 091.5
75-99	OTHER SERVICES	12 455.6	40 433.3	-1 755.5	51 133.4
01-99	TOTAL	1 668 803.4	2 394 552.9	399 992.6	4 463 348.8

From the viewpoint of inward FDI structure, the processing industry is the most significant recipient and it accounts for almost half of the inward FDI. Reinvested capital plays an important role, i.e. expansion of existing foreign firms who further invest in the development of manufacturing in the CR. Reinvested capital was twice higher than investments in the basic capital. Reinvested profit made more than half of the inward FDI balance in 2004.

Table 8: Structure of outward FDI by sectors in 2004

OKEC	Sectors and industries	Basic capital Thousand USD	Reinv. profit Thousand USD	Other capital Thousand USD	Total Thousand USD
01-05	AGRICULTURE. FORESTRY. FISHING	0.0	0.0	0.0	0.0
10-14	MINING	2 687.9	1 503.1	240.7	4 431.8
15-37	PROCESSING of which:	28 652.8	30 778.8	-417.8	59 013.8
15-16	Manufacture of food and beverages. tobacco processing	4 047.8	13 001.8	872.1	17 921.7
17-18	Textiles. clothing	0.0	-175.4	967.5	792.1
19	Leather processing. luggage and shoe making	0.0	116.0	0.0	116.0
20-22	Wood processing. paper production. publishing and printing	9.3	2 229.4	0.0	2 238.6
23	Coking. oil processing. nuclear fuel production...	0.0	0.0	0.0	0.0
24	Chemical products manufacture	3 580.8	2 641.5	-1 563.8	4 658.5
25	Rubber and plastic products manufacture	8 662.5	1 502.7	-65.9	10 099.3
26	Manufacture of other non-metallic products	-1 295.9	5 180.4	698.2	4 582.7
27-28	Metals. metal products	204.5	1 595.2	-1 294.9	504.8
29	Manufacture of machines and devices	-1 579.0	-178.9	-26.0	-1 783.9
30	Manufacture of office equipment and computers	2 970.7	242.6	0.0	3 213.3
31	Manufacture of electric machines and devices n.e.s.	0.0	451.4	0.0	451.4
32	Manufacture of radio. TV and telecommunication machines and devices	194.5	491.9	0.0	686.5
33	Manufacture of medical. optical and time-measuring devices	218.5	3 020.7	-5.1	3 234.1
34	Manufacture of double-track vehicles and trailers	11 638.8	875.4	0.0	12 514.3
35	Manufacture of other means of transport	0.3	20.8	0.0	21.1
36	Manufacture of furniture; other processing industry	0.0	-242.5	0.0	-242.5
37	Secondary raw material processing	0.0	5.8	0.0	5.8
40-41	ELECTRICITY. GAS. WATER	337 098.9	28 325.8	0.0	365 424.6
45	CONSTRUCTION	756.1	2 248.2	0.0	3 004.3
50-52	TRADE AND REPAIRS	14 394.7	-4 549.1	48 768.3	58 613.9
55	CATERING AND LODGING	0.0	2.4	1 600.5	1 602.9
60-64	TRANSPORT AND TELECOMMUNICATIONS	665.6	-8 286.2	119.9	-7 500.7
65-67	FINANCIAL MEDIATION	11 773.8	3 389.0	151.2	15 314.1
70-74	REAL ESTATES AND BUSINESS SERVICES	23 827.3	19 146.2	322.4	43 295.9
75-99	OTHER SERVICES	31.6	2 953.1	54.2	3 038.8
01-99	TOTAL	419 888.7	75 511.2	50 839.4	546 239.4

Source: CNB

Structure of outward FDI from the Czech Republic shows domination of electric power industry, which made for 66% of total FDI outflow in 2004. As the Czech Republic is a major actor in the international trade of electric energy, with more than 3% of world share, we may assume an international competitive advantage in this field. The second position belongs to Czech repair and service companies (more than 10% of the outflow); in processing industry it is NACE 15-16 food and tobacco.

2.4 Knowledge

With the new, knowledge-based economy another important parameter of international competitiveness (apart from prosperity, productivity and internationalisation) comes into play. It is the capacity of the domestic environment to stimulate key success factor in the New economy, which is the creation and commercialisation of knowledge.

According to the conclusions of the National innovation policy (2005) one of the most critical reasons for the CR falling behind in innovation capacities is the erratic approach to the role of research in society, and lack of utilisation of its potential for innovations. A model based on exclusivity of science, that isolated R&D results from practice has prevailed for many years. Functional inter-connection of basic and applied research, financial resources and development of cooperation in R&D should be the key objectives of modern development policies in the field of innovation.

Regions with none or underdeveloped R&D base are typically economically stagnant, and experience little innovative activities. However, development of R&D institutions in a region should not be perceived as an objective itself. The long-term vision is the development of innovative businesses, and involvement of local companies in the innovative process. That is why the progress of R&D has to be part of comprehensive policy (innovation strategy), where development of local research institutions is just one cornerstone of the strategy.

Advanced countries, such as Great Britain, use the number of registered patents at the US Patent Office as their "innovative ability" parameter to measure performance and for international benchmarking purposes. We believe that this parameter is not so much valid for the Czech economy yet, as the number of such activities is insignificant, but we may use several proxy indicators developed by CzSO based on recommendations from OECD.

These are namely public spending in R&D and education, and their share of GDP in an international comparison. Other indicators include the above-mentioned foreign trade of intellectual property (see chapter 2.3 Internationalisation – table TBP trend). These indicators can be used for international benchmarking of the Czech Republic, but they should be interpreted with caution, as the volume (even relative) of resources in education, science, research, development and innovations are not as important as well designed policy driven by results, quality and relevance of R&D and education.

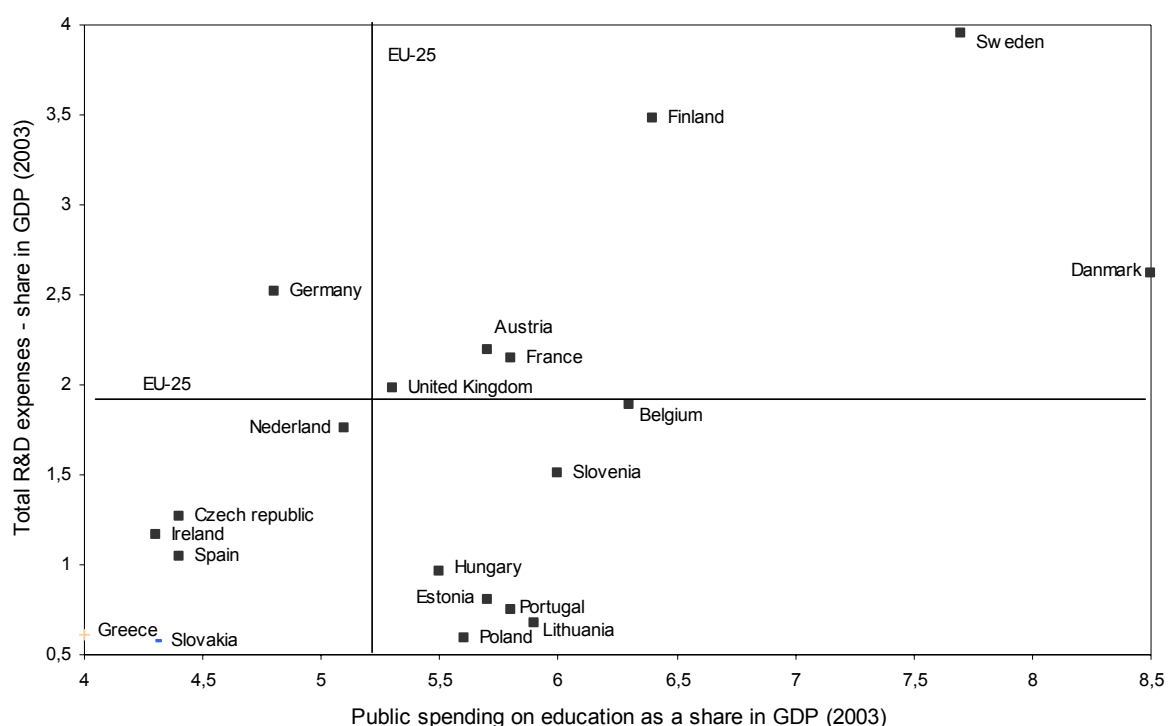
Table 9: Public expenditure on education and total R&D expenses (as % of GDP)

	<i>Public educational expenditure</i>		<i>Total R&D expenditures</i>	
	2002	2003	2002	2003
Belgium	6.1	6.3	1.96 e	1.89 e
Czech Republic	4.2	4.4	1.22	1.27
Denmark	8.5	8.5	2.53 r	2.62
Estonia	5.5	5.7	0.75	0.81
Finland	6.2	6.4	3.43	3.48
France	5.8	5.8	2.23	2.15
Ireland	4.3	4.3	1.10 r	1.17 p
Italy	5	4.7	1.16	.
Lithuania	5.9	5.9	0.67	0.68
Latvia	5.7	5.8	0.42	0.39
Hungary	5.1	5.5	1.01 i	0.96
Germany	4.6	4.8	2.49	2.52
Netherlands	5	5.1	1.72	1.76
Poland	5.6	5.6	0.59	0.59
Portugal	5.9	5.8	0.77 e	0.75
Austria	5.7	5.7	2.12	2.19 e
Greece	3.9	4	.	0.61
Slovakia	4	4.3	0.58	0.57

	<i>Public educational expenditure</i>		<i>Total R&D expenditures</i>	
	2002	2003	2002	2003
Slovenia	6.1	6	1.52	1.51 e
The United Kingdom	4.7	5.3	1.89	1.98
Spain	4.4	4.4	0.99	1.05
Sweden	7.3	7.7	.	3.95
EU15	5.1 e	5.2 e	1.98 e	1.97 e
EU25	5.1 e	5.2 e	1.93 e	1.92 e

Source: OECD, MSTI 2005/1, Eurostat, September 2005, from CzSO (e – estimate, r – revised value, p – preliminary data)

Graph 5: Position of the CR in EU-25 in relative expenditures on R&D and education



Source: OECD, MSTI 2005/1, Eurostat, September 2005, from CSO

In the field of public spending on education and total R&D expenditures first places are clearly occupied by Scandinavian countries (Denmark, Sweden, Finland), while Austria, France and Great Britain are above the average. The data is from 2003, when CR surprisingly invested comparably more than e.g. Ireland, and the Czech intensity of R&D spending was higher than in Portugal. However, regarding both parameters we fall behind Slovenia, and regarding educational expenditure also behind Hungary, Poland and the Baltic states.

When we take into account the fact relative values are displayed in the Graph, i.e. expenses relative to the wealth produced by the country, it is not difficult to imagine that the gap between us and the countries that systematically invest in their competitiveness is even wider.

3 Competitiveness and Business Environment

As we have already said, high and growing rates of productivity (proved by high ratio of output / input in economic activities, openness of economy and participation in global markets through export and foreign direct investments), and innovation activities (proved by intensity of R&D support, and level of commercialisation of knowledge) in international comparison demonstrate the level of international competitiveness.

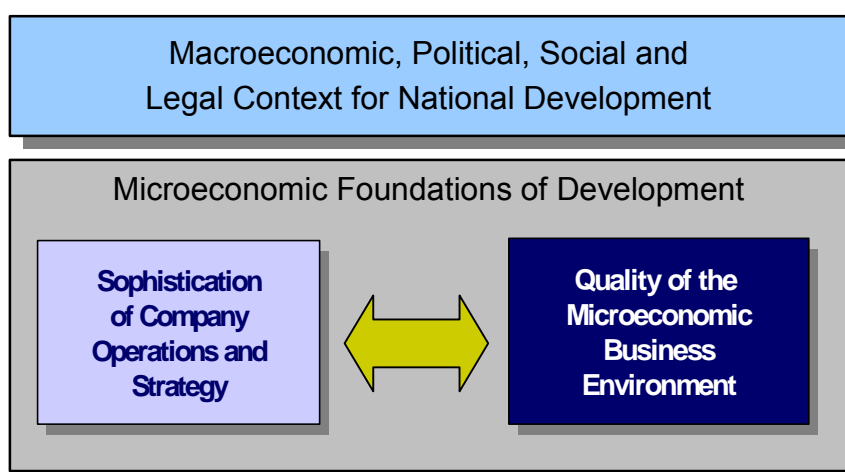
However, it is important to note that these parameters of international competitiveness, although impacted by external factors, international development and economic cycles, are also considerably influenced at the local level, i.e. nationally, regionally and in individual companies. Thus we can divide the context of causes (influences, sources) of international competitiveness in two levels: macroeconomic conditions of international competitiveness, and microeconomic foundations of competitiveness.

The objective of any public policy that aspires to smartly nurture competitiveness is to create conditions and environment at both national and regional levels that would allow private businesses the most efficient improvement of their productivity rates, and increase their success in the international competition.

3.1 Macroeconomic Environment

Stable, growth-oriented macroeconomic policy, together with easily understood, fairly and effectively enforced legislation, and institutions that efficiently operate public administration system and social services determine the nation's capacity to increase its prosperity. Over several past decades, competitiveness has become one of the fundamental concepts and a driving principle of public policies in advanced countries around the world.

Figure 1: The determinants of national prosperity (M. Porter):



Macroeconomic environment is a necessary but not sufficient condition of international competitiveness (M. Porter). Most governments understand their position at the macro-level in creating a favourable and predictable business environment, setting-up a motivating tax system that allows efficient operations of necessary institutions and services. The immediate micro-environment and local context in which companies operate are the essential components for competitiveness.

The macroeconomic environment in the Czech Republic is influenced by the course and results of the transition process. Economic, political, legislative and social transition that has been taking place in the last 16 years has established the Czech Republic as an open market economy, that interacts well with other world economies. This is proved mainly by the considerable and growing share of foreign trade in GDP, enormous inflow of foreign direct investments into the country, and the rising volume of outward foreign investments.

The Czech Republic's public policy has started to concentrate on the development of international competitiveness in recent years, and established conditions for achievement of this objective in the form of public institutions and programmes that support productivity and competitiveness of companies.

However, this does not mean the macroeconomic environment for development of competitiveness should not be further developed. Recent measures aimed at elimination of barriers for start-ups, plans to decrease corporate tax burden and simplify tax legislation are necessary activities that help to keep the business environment at macro-level competitive in the international context. In this respect, the Czech Republic has to be careful because if the neighbouring countries that offer similar conditions and technological level, provide better macro-parameters it could motivate many business activities presently located in the Czech Republic to move to a more attractive (competitive) environment. This applies namely to Slovakia, but we should realise that the Czech Republic makes use of similar (competitive) advantages for example in relation to Germany.

3.2 Microeconomic Conditions of Competitiveness

Prosperity and wealth are created at microeconomic level, as a result of companies' abilities to create values efficiently and trade them as products and services in international markets. Growth of efficiency of the creation allows to keep / increase wages paid, and increase the return on investment.

Microeconomic foundations of prosperity can be seen in two interrelated areas according to M. Porter: (1) level of sophistication with which domestic or foreign businesses located in the country participate in global competition, and (2) quality of microeconomic business environment. By microeconomic environment we mean the immediate vicinity of individual companies, where the businesses produce values traded as goods and services.

These above-mentioned areas influence one another, as improving microeconomic conditions enable locally producing companies to better compete globally, and at the same time invention and new ways of global competition bring higher requirements for specific parameters of business micro-environment.

Michael Porter has dealt with the question of which parameters create internationally competitive microenvironment on the basis of years of studying competitiveness², and he defined co-called diamond of competitive advantage.

The diamond has four essential productivity (competitiveness) vertexes:

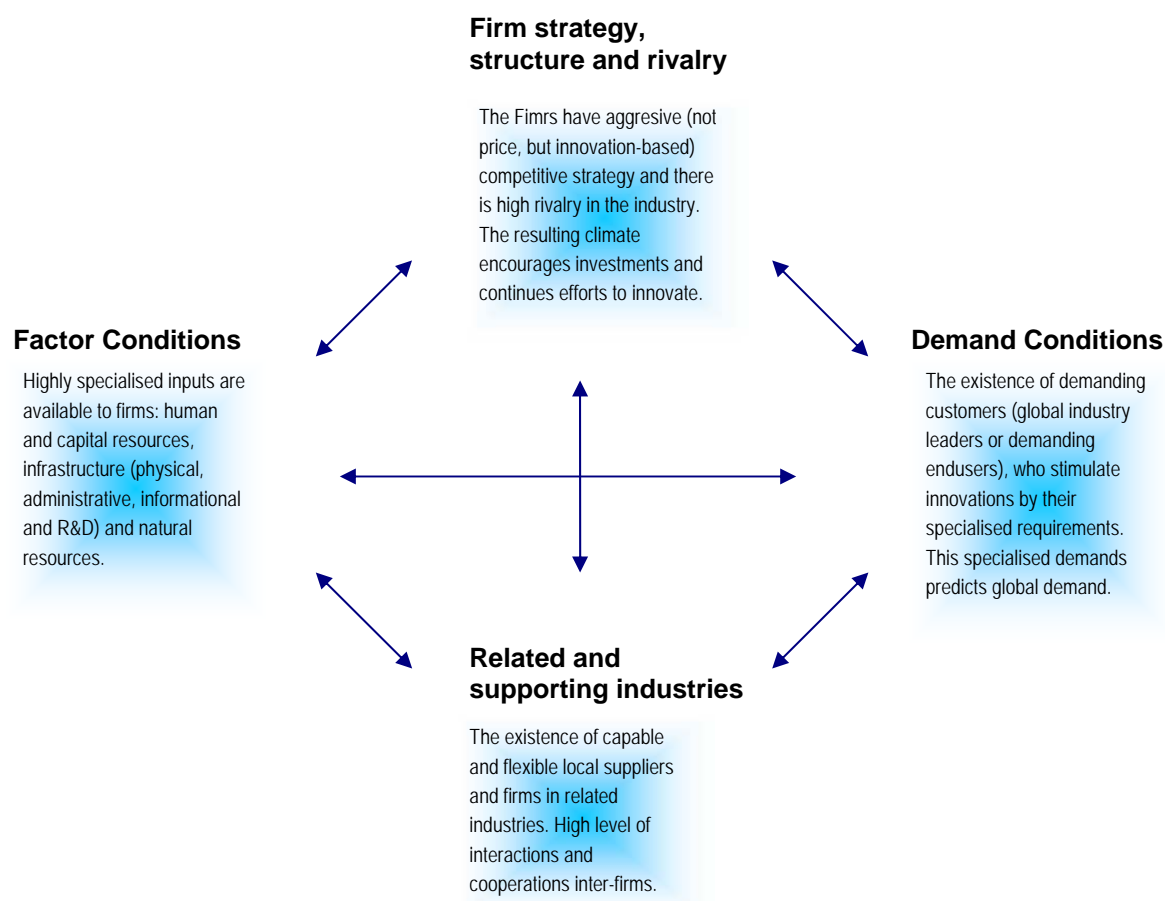
- Factor (input) conditions
- Context for firm strategy and rivalry
- Demand conditions

² M. Porter: *The Competitive Advantage of Nations*, 1990

- Related and supporting industries

Presence of these conditions in high-level intensity and quality according to Porter is common for all internationally competitive regional group of firms that are world-class in a specific industry. Interaction of individual elements of an internationally competitive environment can be described by the following diagram.

Figure 2: Porter's diamond of competitive advantage



Viewing the Czech Republic's business environment through Porter's diamond is not new, but the level of understanding of this concept by elected and appointed public officials and manager at national and regional level, and at the level of individual companies in production industries is not very high, as proved by field research performed as a part of this study.

We are going to outline basic situation for existence of these competitiveness parameters at national level in the following section of the Report; at regional level we have studied the presence of individual facets of Porter's diamond for each identified industry with the potential to become an internationally competitive cluster. There has never been a similar research conducted in the Czech Republic in this scale (over 100 potential cluster analyzed), and we assume that results of this analysis will inform the process of formulating national and regional policies of promotion of competitiveness.

3.2.1 Factor (input) conditions

The importance of input factors of production (and economic development) changes in time. Starting from the productive function - economic production of society³ depends on available natural resources (not just raw materials), labour force, available capital⁴ and available technologies. Technology in this respect is understood in a very general sense. It is not only technology in purely technical sense, in fact it is the methods of organisation of economic activity.

Until the second half of 20th century economic development of individual areas was predominantly influenced by "material" factors – i.e. available natural resources, volume of labour force and available capital (buildings, machines, facilities, transport infrastructure etc.). In the second half of 20th century, however, there was a significant shift – fast increase of importance of "non-material" factors of production, namely the ability to generate and use innovations, quality and adaptability of human resources and ability of economic entities to cooperate in a way that brings added value for all involved parties (synergies). Traditional factors are still necessary, but not anymore sufficient for economic competitiveness, or economic growth of states, regions and cities.

Essential causes of this shift can be seen in technological development. Dramatic development of the information and communication technologies leads to fundamental changes of organisation of economic activities. One of the results of the changes is the fact that localisation of production is less and less dependent on the localisation of core company activities (strategic management, research and development, marketing, financial management etc.).

The shift described above should be reflected in a corresponding shift in the economic development policies of the public sector. Human resources should not be assessed just by their overall capacity, but also by their relevance in the new economy (numbers of students in natural and technical sciences); basic infrastructure is necessary, but lack of attention paid to information and communication infrastructure leads directly to loss of competitiveness. Functional banking systems that allow private businesses in typical size categories and stages of development to seamlessly access growth financing is a necessary condition, but without smart venture capital the economy may ignore many new impulses that could improve its competitive advantage and productivity in the long run.

Human Resources and Skills for the New Economy

Human resources are key factor of competitiveness. They have the ability to purposely influence all the other factors and facets of Porter's diamond of competitive advantage.

Human resources were and still are evaluated by the level of achieved education. Educational level represents a competitive advantage, as qualified and skilled labour force is a necessary precondition for any society to create and utilise new knowledge. Experience shows that people with high level of theoretical education combined with the ability to process information are not endangered by unemployment, and have the highest wages.

The educational level of human resources remains to be a major factor. It is one of the characteristics that describe quality of human resources, or contribution of human resources in the resulting

³ For example national or regional economies.

⁴ The term "capital" has multiple uses. In this case we mean productive capital – machines, buildings, facilities etc., not the financial resources.

adaptability of individual regions to ever-changing internal and external conditions, and to prospective development potential. The very education level can be in certain sense evaluated as a quantity characteristics.

Important aspect of human resources quality is the sectoral structure of education and its relation to demand for labour force in the market. This determines the immediate value of labour force for investors, without retraining that increases their start-up costs. Apart from this – quality of human resources currently includes the ability of fast and efficient adaptation to permanent changes taking place in the world economy. General skills, or sectoral knowledge gained through "traditional education" become obsolete and of no use even faster due to increasing pace of technological progress. That is why other skills and knowledge matter at present. These are practical, widely used skill competences (information literacy, language skills, analytical problem solving skills etc.) that increase flexibility of labour force.

The following table demonstrates student enrolment trends in natural and technical studies, that document gradual shift towards the knowledge society.

Table 10: Students in tertiary education – natural and technical specialisations

Number of students	ISCED	2000	2001	2002	2003	2004
By natural and technical specialisation groups - total	4+5	75394	80193	85463	93026	98375
Natural sciences, mathematics and informatics	4	21321	23517	26189	28559	31121
Live nature sciences (biolog. sciences)	42	4584	5022	5737	6207	6697
Non-live nature sciences (phys. and chem. sciences)	44	5259	5760	6309	6707	7255
Mathematic sciences and statistics	46	2628	2725	2935	3146	3246
Informatics and data processing	48	8850	10010	11208	12499	13923
Technical sciences; manufacture and construction	5	54073	56676	59274	64467	67254
Technical sciences and crafts	52	34473	36529	38055	41799	42942
Manufacture and processing	54	5409	5467	5699	6329	7509
Architecture and construction	58	14191	14680	15520	16339	16803
By tertiary education level in natural and technical spec.						
Higher specialised colleges	5B	3702	3881	4070	4698	4351
Bachelor's and magisterial degree at colleges	5A	63034	66969	70984	76995	81948
Doctor's degree at colleges	6	8658	9343	10409	11333	12076

Source: Institute for information in education (2005)

Table 11: Graduates of tertiary education – natural and technical specialisations

<i>Number of graduates</i>	<i>ISCED</i>	<i>2000</i>	<i>2001</i>	<i>2002</i>	<i>2003</i>	<i>2004</i>
By natural and technical specialisation groups – total	4+5	8855	9351	9850	10286	11782
Natural sciences, mathematics and informatics	4	2656	2772	2979	3167	3967
Live nature sciences (biolog. sciences)	42	612	569	686	736	921
Non-live nature sciences (phys. and chem. sciences)	44	559	584	666	783	916
Mathematic sciences and statistics	46	304	283	361	324	376
Informatics and data processing	48	1181	1336	1266	1324	1754
Technical sciences; manufacture and construction	5	6199	6579	6871	7119	7815
Technical sciences and crafts	52	3943	4299	4354	4542	5000
Manufacture and processing	54	792	800	885	854	994
Architecture and construction	58	1464	1480	1632	1723	1821
By tertiary education level	Level					
Higher specialised colleges	5B	962	1023	840	650	847
Bachelor's and magisterial degree at colleges	5A	7433	7784	8369	8875	10076
Doctor's degree at colleges	6	460	544	641	761	859

Source: Institute for information in education (2005)

Availability of Venture Capital for High-tech industries

Another highly specialised input is the availability of venture capital. Venture capital includes the seed and start up capital investment, and expansion capital investment. Venture capital investments create and promote business activities that make a new segment of the business sector, and accelerate production of new knowledge, competitiveness and economic growth. In a more specific sense we distinguish three major stages of venture capital funding most important for development of company, creating basis for venture capital evaluation⁵:

- At the start-up stage, research, evaluation and development of original concept of a new business plan are funded.
- At the launch stage, development of product and initial marketing are funded, or financial resources are used for initial production and sales without generated profit.
- At the expansion stage the capital is used to expand production capacities, market or development of product that succeeded in the market and generates commercial profit.

Overview of members of the Czech Venture Capital Association and venture capital funds, including the information on volume of administered resources is provided in the following table.

Table 12: CVCA members

Name	Volume
3TS Capital Partners	
Technologieholding Central and Eastern European Fund N.V.	CZK 1,315 mil
Technologieholding Central and Eastern European Parallel Fund B.V.	CZK 732 mil
ARGUS Capital Group Ltd.	
ARGUS Capital Partners L.P.	CZK 5,160 mil
Boot Gijs M. Honorary member	
CASH REFORM	
Cash Reform Investment Fund	CZK 1,350 mil
Czech Venture Partners	
Czech Top Venture Fund B.V.	CZK 331.2 mil
Regional business fund	CZK 306 mil
Czech-Moravian business fund	CZK 306 mil
DBG Eastern Europe, s.r.o.	
DBG Osteuropa-Holding GmbH	CZK 1,380 mil
Genesis Capital, s.r.o.	
CSPEF	CZK 670 mil
Genesis Private Equity Fund	CZK 900 mil
KBC Private Equity N.V.	
MCI Management S.A.	
Nosek Michal (Honorary Member)	
O'Neill James M. Honorary member	
Riverside s.r.o.	
Riverside s.r.o.	CZK 838 mil
SGrow Venture Partners	

⁵ Venture capital is usually defined as total of the capital invested in the initial stages (start-up and launch), and expansion. In a wider sense capital investments of smaller importance for the overall evaluation of the effects of venture capital on the development of new technologies are included; these are further capital investments during the life cycle - replacement, buy-out or buy-in.

GIMV Czech and Slovak SME Fund	CZK 370 mil
GIMV Czech Ventures	CZK 447 mil
<hr/>	
Strnad Alois J. Honorary member	
<hr/>	
Winslow Partners	
Charles Investment Partners, L.P.	CZK 1,005 mil
<hr/>	

Source: CVCA

3.2.2 Demand Conditions

As far as outputs of companies are concerned, the structure and intensity of demand directly influence firm productivity level and competitiveness. Globally competitive companies obviously meet the demand (and competition) in global context, i.e. worldwide. On the other hand it has been proved that the existence of demanding customers (leaders in their industries) in the areas where new products and interactions emerge (exchange of demand parameters and needs of such customers with suppliers, joint research and development of products along the value chain) leads to unique knowledge and procedures that ensure (strengthen) international competitiveness of these "partnerships".

Foreign Investments

There are demanding customers mostly among foreign investors in the Czech Republic, who started to come to the country in mid 1990s. These customers create pressure on local suppliers with regards to quality, flexibility of supplies (and price), and force our companies to restructure and rationalise their production and services (increase productivity). The reward for these highly positive changes in individual companies, regional economies and in total in the national economy is the access to global value chains complemented by growing sales and development of these suppliers.

Public Contracts

In some economies even the government can be a "sophisticated buyer" through its public contracts. We haven't noticed any evidence of the impact of public contracts on productivity of Czech companies in the course of this study, though we admit that international public tenders sometimes encourage establishment of ad-hoc or even permanent alliances and cooperative relations, and motivate quality adjustments of outputs of Czech companies involved due to fierce competition at national and international levels.

Demand conditions are naturally influenced by the opposite facet of the Porter's diamond: foreign investors come to locations attracted by factor conditions but at the same time they create demand conditions. In advanced economies and internationally competitive clusters, multinational companies come to these locations following demand conditions, i.e. presence of leaders in their industries that represent demanding customers for such a multinational.

3.2.3 Context of Firm Strategy and Rivalry

Government incentives belong to the context of firm strategy and rivalry. Despite all their proven positive impacts on economies, such as employment, growth of export etc., government incentives can lead to distortion of markets and decrease the level of competition in case they are not applied smartly. Direct subsidies for companies (more important now with availability of EU funds) and preference of local suppliers against external competition for reasons other than better value, protection of intellectual property, protection of minority shareholders' rights, regulation of capital

market, and good function of bankruptcy and insolvency legislation are also part of the context of rivalry and strategy.

Other parameters are government regulations leading to limited competition, effectiveness of control over economic competition, number of companies, level of de-centralisation of business activities (decisive competence transferred to branches), restrictions of foreign ownership and the like.

3.2.4 Related and support industries

According to Michael Porter, competitiveness of firms in a particular field and geographic location is not determined only by their interaction, rivalry and aggressive market strategies combined with suitable factor conditions and world-class demand. A key role in complementing the above mentioned parameters of any internationally competitive location is the existence and quality of strategic linkages of core cluster firms to institutions and firms that are present in the support (ring) environment of the cluster. These linkages are represented by the interaction of firms with specialized strategic infrastructure and institutions that can positively influence productivity levels of the cluster's value chain(s). The ring of the cluster comprises of universities and other tertiary level educational institutions, financial services, consulting firms, HR agencies and consultancies, media and advertising agencies with global out-reach, etc. The important feature of the related and support industries/ organizations is their flexibility around the key activities and outputs of the cluster enabling them to provide innovative solutions to support productivity gains of the core cluster firms.

The evaluation of these activities, their presence and extent to which they upgrade competitiveness of key value chains on regional level in the Czech Republic was not subject of this study, however, the identification of their main representatives was. For each existing or potential cluster a basic list of entities was identified related to the above described strategic linkages framework:

- Educational institutions – Universities, tertiary educational institutions with linkages to private sector, private educational and training institutions with direct impact on factor conditions – e.g. workforce training and consulting centers, management institutes, etc.
- Research and development firms/institutions
- Public Administration – state and self-government on regional and local level and their agencies (only those with competencies to provide support and their specific departments)
- Business representation - alliances, associations, chambers, industry organizations, and international networks generally relevant to the key output / activities of the cluster
- Development and consulting agencies/ firms providing consulting services related to financing, outsourcing, marketing, management, etc.
- Other business infrastructure – technology transfer centers, industrial design centers, export promotion centers, innovation centers, public or PPP-based institutions dedicated to support of competitiveness.

4 Potential of Clusters

4.1 Analysis of Globally Competitive Foreign Trade Items at National Level

The methodology of this analysis builds on Michael Porter's hypothesis that was tested during the study that led to *The Competitive Advantage of Nations, 1990*:

A nation has global competitive advantage in manufacture of a product provided its share of the world trade of the item is *relatively high*.

The term relatively high means higher export power in the commodity than average export power of the nation in total international trade.

The level of detail in this analysis

The finer the structure of foreign trade data, the better the quality and relevance of the research results. This is due to several factors, mostly related to specialisation and product innovations, and their importance for efficiency of production (productivity) and international competitiveness. It is the perfect and detailed data which are necessary in order to identify embryonic industries and new products, where *new* competitive advantage of global scale may emerge.

Statistic data sources

There is a clear conflict between the above notion, and the optimisation of statistic data, as the latter strives to establish such a structure and classes that would best suit current and former situation. New products have to be classified in old categories, and quite a long time passes before the structure of comparable information in international context is modified accordingly to accommodate introduction of new product categories.

We have used the same structure and data sources as Michael Porter when analysing global competitiveness of the Czech Republic based on international trade, i.e. UNCTAD (COMTRADE database) trade data for global aggregates, and national statistics (CzSO – foreign trade statistics) for national export data in SITC classification, version 3, at 5-, 4- and 3- digit levels.

Methodology

We have conducted the analysis in two parallel versions – 5-digits (the finest available detail), and 3-digit levels. The reason for this two-way procedure was (1) availability of the data at regional level (2 or 3 digits), and (2) at 3-digit-level the *relevance* of foreign trade items for standard economic activities is clearer than at 2-digit-level.

In both cases data for last complete 3 years was acquired: i.e. 2002, 2003, 2004. The commodities were ranked according to share of CR in world trade in the given commodity in 2004. Average export power of CR in the world trade has been calculated. It is 0.8%, in other words the Czech Republic's export accounted for 0.8% of total international exports in 2004.

Rough analysis (3 digit level)

We have further decomposed regionally all commodities at 3-digit level of SITC, where the CR experienced above average export performance in 2004. Apart from this we have added calculations of year-to-year rates of world trade growth, or Czech export growth in a specific item, and created summaries for all items that make an exhibit to this Report, and can be easily updated and used for example by cluster initiatives emerging around the product / industry in regions to benchmark one of the most significant parameters of performance, i.e. position in international trade.

Result: 97 items

Fine analysis (5 digits SITC)

The procedure at 5-digit-analysis was more difficult, as the first sorting had produced list of more than 2,000 items, which was too much for further research.

Step 1: National cut-off rate

National cut-off rate was set to 2.60%. It is an average share of the country in EU-15 (the old Europe) in the world foreign trade. The original Porter's criterion of national cut-off rate in the value of the average share of the country's trade in the world foreign trade (i.e. 0.8% for CR) was made stricter at this first step of the finest level of analysis. The Czech Republic aspires to become a significant player in terms of its export power, at least on the level played by average country in Western Europe. The resulting list offers commodities where this already is true.

Step 2: Effects of high import

The items with strong import levels were removed in this step. It can be assumed that strong import, or import higher than export decreases relative competitive advantage of the country in production of a specific item, as the country has to purchase it at the same time. This step has been applied at two stages just for the purpose of careful investigation of the items that are being removed from the list. The items with negative trade balance were removed first. It is interesting – despite the share of Czech export in the world trade was so high for these items (more than three times the average), there were still items in the list, where share of purchase in the world trade was even higher. The second sub-step of the import effect elimination, items where import was higher than 2/3rds of export were removed. The 2/3 level was set by the experts arbitrarily.

Step 3: Export dynamics

The items where average change of CR share in the world has not been positive in the last 3 years, i.e. Czech share stagnates or falls, were removed. Stagnating or negative trend does not indicate a good perspective for development of global competitive advantage of the Czech Republic in production and application of the commodity in the world markets. In other words: the whole world's average growth is faster, or the same when compared to the dynamics of the Czech export.

Step 4: Direction of trade

The impact of trade almost exclusively with neighbour countries was eliminated at this step. The limit of 50% of export directed to Austria, Germany, Slovakia and Poland was set as a criterion. In these cases geographical advantage (proximity benefits) rather than competitive advantage can be the reason of export success. In other words – if there is any competitive advantage, it failed to succeed globally.

Step 5: Demand conditions

At this step, the role of Germany as a globally important market was considered, where there are world-class leaders in various modern industries, and their requirements for supplies from Czech companies, or companies producing in Czechia meet the parameters of demanding customers (see Porter's diamond - demand conditions). In this case proximity is an advantage, as it strengthens the presence of a given facet and its effects on competitiveness of "our" exporters. Thus the items were added where the share of neighbours is between 50 and 75% (i.e. the condition of the step 5 was softened to 75%), and at the same time export to Germany prevails (joint share of Slovakia, Poland and Austria as foreign trade's destination is lower than 25%).

Step 6: Small and non-prospective markets

The items were removed where total world trade is either under USD 50 million, or between USD 50 and 100 million, and at the same time the market grows at a below-average rate. In these cases we may assume non-prospective markets from the viewpoint of public support policy, as their growth potential is limited by either insignificant volume of total trade, or by slowly growing small markets.

Step 7: Strategic importance

This is a corrective step, and we considered three criteria when applying it: (1) important markets with (2) significant share of Czech export, and (3) strategic importance for the Czech Republic. "Another chance" was given to the items where CR has at least 3% share in a market bigger than USD 500 million, and the commodities correspond to CzechInvest strategy (automotive, electronics, ICT...). In case some of the conditions of steps 1-3 were not met just "slightly", and the item was strategic, it was added back on the list (for example CR grows by just 1% less than the world, or export-import gap is up to 40%).

Criteria were applied as follows:

Step	Name	Input number	Operation	Resulting number
1	National cut-off rate	> 2400 ⁶	cut-off	257
2	Effects of high import	257	-16 -85	156
3	Export dynamics	156	-34	122
4	Direction of trade	122	-58	64
5	Demand conditions	64	+23	87
6	Small and non-prospective markets	87	-7	80
7	Strategic importance	80	+19	99

Source: Berman Group, EP Associates, 2005

⁶ In each of the observed years the number of items was different, some items had to be removed some included, some residua had to be calculated. Foreign trade application of CzSO was used for this exercise.

4.2 Fine National Long-list

National long-list includes commodity items where CR has international competitive advantage. It was compiled on the basis of complete data about the Czech export and world foreign trade of the period from 2002 to 2004.

Table 13: National long-list in the finest structure (5 digits SITC)

Code	Name	Share CR	World 2004	BFT growth	Export from CR (2004)
7522	Comprehensive digital data processing system	3.6%	\$52 961 111 672	37.5%	\$1 905 818 229
78432	Other parts and body accessories	4.3%	\$41 376 133 222	12.4%	\$1 760 861 265
7523	Digital processor units	2.9%	\$36 852 048 839	14.7%	\$1 064 409 364
82119	Parts of seats adjustable to beds	6.0%	\$15 793 714 722	19.1%	\$955 328 792
71631	Alternating current motors	3.7%	\$10 015 505 623	21.3%	\$373 918 050
77611	Cathode coloured TV screens	6.4%	\$7 829 514 939	-2.9%	\$503 402 674
55422	Washing, cleaning agents with active surface n.e.s. for retail	4.5%	\$7 229 885 212	13.9%	\$326 726 243
7422	Fuel and oil pumps for cylinder engines	13.4%	\$6 805 811 013	23.0%	\$910 256 326
77834	El. lighting and signal equipment, wipers, demisters etc.	7.6%	\$6 700 021 938	21.0%	\$510 298 625
74159	Air-conditioning equipment arts under 741.5	5.8%	\$6 599 870 789	13.8%	\$382 197 751
67682	U. I. H. L. T shape profiles height over 800 mm made of iron, steel	3.4%	\$6 205 457 768	44.0%	\$212 143 761
79199	Railway and tram engine parts under 86.07.791.1.791.82	5.6%	\$6 193 072 147	20.2%	\$345 368 145
74174	Heat exchangers	3.2%	\$4 249 964 090	24.6%	\$133 954 608
77845	Other tools	4.1%	\$3 759 658 788	16.2%	\$155 970 352
54191	Cotton wool, gauze, dressing and other materials, impregnated for retail n.e.s.	3.4%	\$3 358 565 486	10.6%	\$113 705 870
77841	Drills of all kinds	3.7%	\$3 300 368 425	16.4%	\$121 805 091
66472	Laboratory, chemical, industrial goods made of ceramics	4.8%	\$3 264 518 733	16.1%	\$155 072 055
51454	Aromatic simple amin compounds, their derivates, salts	3.6%	\$3 025 582 173	20.1%	\$108 404 122
74143	Cooling and freezing desks, boxes, and the like	4.2%	\$2 958 562 923	21.3%	\$123 293 687
67914	Other tubes, pipes of circular section, made of iron, unalloyed steel	6.1%	\$2 955 893 219	27.8%	\$179 637 665
74492	Parts suitable for machines under 744.11 to 744.13	3.0%	\$2 812 329 678	22.0%	\$85 258 719
69962	Cast articles of non-malleable cast iron, n.e.s.	8.4%	\$2 553 481 152	27.2%	\$213 463 586
69242	Aluminium casks, drums, cans, boxes and similar containers up to 300 L	3.9%	\$2 420 223 737	10.7%	\$94 242 132
71632	Generators, alternating current	3.4%	\$2 212 787 637	3.9%	\$75 593 996
7128	Parts for the turbines	4.6%	\$2 199 081 727	5.9%	\$101 514 417
66522	Drinking glasses other than of glass-ceramics	7.1%	\$2 195 875 859	19.0%	\$156 909 727
65195	Slivers, rovings, yarn and chopped strands, of glass fibres	3.3%	\$2 182 291 256	12.5%	\$71 145 141
69963	Cast articles of other iron or steel, n.e.s.	7.2%	\$2 140 680 037	24.2%	\$153 627 173
77281	Boards, panels, consoles, desks, cabinets and other bases for the goods of subgroup 772.6	4.3%	\$2 022 693 329	23.2%	\$87 985 132
72443	Textile-spinning, doubling or twisting machines; textile-winding or reeling machines	2.8%	\$2 015 280 887	22.6%	\$55 590 524
81211	Radiators, and parts thereof	7.8%	\$2 011 589 586	27.4%	\$157 013 330
66523	Glassware of a kind used for table (other than drinking glasses) or kitchen purposes	5.5%	\$1 878 283 912	9.3%	\$103 677 516
77862	Tantalum fixed capacitors	12.2%	\$1 798 619 497	11.5%	\$219 247 695
69967	Articles of iron or steel wire, n.e.s.	4.2%	\$1 796 453 733	23.2%	\$76 329 163
69732	Domestic stoves (other than cooking appliances), grates and similar non-electric space heaters	3.7%	\$1 759 823 920	36.7%	\$64 585 596

Code	Name	Share CR	World 2004	BFT growth	Export from CR (2004)
	(including those with subsidiary boilers for central heating). of iron or steel				
65793	Tyre cord fabric of high tenacity yarn of nylon or other polyamides. polyesters or viscose rayon	3.3%	\$1 678 707 001	15.6%	\$56 052 491
69211	Reservoirs. tanks. vats and similar containers. for any material (other than compressed or liquefied gas). of iron. steel	3.6%	\$1 673 362 538	22.2%	\$59 476 158
66529	Other glassware. other than of glass-ceramics	5.4%	\$1 581 710 912	15.4%	\$84 685 488
78421	Bodies for the motor vehicles of group 781	4.6%	\$1 564 703 860	92.4%	\$71 500 633
66593	Glass beads. imitation pearls. imitation precious or semiprecious stones	25.1%	\$1 521 820 070	21.8%	\$382 188 634
63512	Pallets. box pallets and other load boards	6.8%	\$1 478 135 382	11.6%	\$100 359 889
62551	New pneumatic tyres having a "herring-bone" or similar tread	10.6%	\$1 474 501 367	16.7%	\$156 405 653
8724	Medical. dental. surgical or veterinary furniture	3.0%	\$1 462 619 525	12.3%	\$43 784 149
6546	Fabrics. woven. of glass fibres	6.8%	\$1 419 580 061	18.5%	\$95 894 615
65813	Sacks and bags of man-made textile materials	2.8%	\$1 408 902 140	12.7%	\$39 332 414
69243	Containers of iron or steel for compressed or liquefied gas	6.5%	\$1 402 139 547	22.0%	\$91 063 829
65113	Yarn of combed wool. containing 85% or more by weight of wool. not put up for retail sale	3.6%	\$1 356 248 647	9.1%	\$49 383 950
64142	Sack kraft paper	5.8%	\$1 293 234 254	14.7%	\$74 789 144
6637	Refractory ceramic goods (e.g.. retorts. crucibles. muffles. nozzles. plugs. supports. cupels. tubes. pipes. sheaths and rods). n.e.s.	5.5%	\$1 269 600 821	16.0%	\$69 587 418
67701	Rails (including check rails and rack-rails). of iron or steel	7.8%	\$1 183 857 028	22.9%	\$92 643 799
67282	Semi-finished products of other alloy steel	3.5%	\$1 117 268 282	24.6%	\$39 364 474
72333	Tamping machines and roadrollers	3.4%	\$1 115 779 355	18.1%	\$38 357 811
65751	Twine. cordage. ropes and cables. whether or not plaited or braided and whether or not impregnated. coated. covered or sheathed with rubber or plastics	3.1%	\$1 109 125 206	15.6%	\$33 928 972
77866	Paper or plastics dielectric fixed capacitors	5.3%	\$1 107 045 134	14.4%	\$58 541 290
65441	Fabrics. woven. of flax containing 85% or more by weight of flax	3.0%	\$1 106 251 647	13.3%	\$33 201 131
03411	Fish. live	3.4%	\$1 044 897 960	11.3%	\$35 384 168
87315	Electricity meters	12.2%	\$1 028 076 216	16.8%	\$125 931 075
66489	Other glass mirrors. whether or not framed	6.3%	\$1 009 401 430	18.4%	\$63 346 225
67681	U, I, H, L, T shape profiles height over 800 mm made of iron. steel	5.1%	\$965 455 780	34.8%	\$49 113 781
72439	Sewing-machine needles; furniture. bases and covers specially designed for sewing-machines	3.9%	\$953 459 187	12.4%	\$36 825 140
66382	Friction material and articles thereof not mounted. for brakes. for clutches or the like	3.8%	\$938 957 529	9.1%	\$35 626 865
71219	Steam turbines and other vapour turbines	3.5%	\$857 094 709	-1.4%	\$30 091 397
87131	Microscopes (other than optical microscopes) and diffraction apparatus	7.1%	\$847 847 071	46.5%	\$60 152 487
25162	Chemical wood pulp. sulphite. other than dissolving grades. semi-bleached or bleached	16.4%	\$708 367 931	3.1%	\$115 991 265
51383	Diocetyl orthophthalates	4.2%	\$672 430 349	13.3%	\$28 395 430
62142	Tubes. pipes and hoses. of unhardened vulcanized rubber. with or without their fittings	3.9%	\$651 308 178	29.8%	\$25 491 434
72471	Household or laundry-type washing-machines (including machines which both wash and dry). each of a dry linen capacity exceeding 10 kg	4.3%	\$636 450 467	32.0%	\$27 528 341
5932	Safety fuses; detonating fuses; percussion or detonating caps; igniters; electric detonators	7.0%	\$613 019 727	22.9%	\$42 833 831

Code	Name	Share CR	World 2004	BFT growth	Export from CR (2004)
73177	Sawing or cutting-off machines	3.1%	\$579 014 347	17.3%	\$18 236 551
74449	Jacks; hoists of a kind used for raising vehicles other	5.7%	\$563 049 363	20.4%	\$32 134 773
7922	Aeroplanes and other aircraft. mechanically-propelled (other than helicopters). of an unladen weight not exceeding 2.000 kg	2.7%	\$535 301 407	24.1%	\$14 655 451
66183	Articles of asbestos-cement. of cellulose fibre-cement or the like	7.1%	\$500 363 528	13.6%	\$35 312 250
71878	Parts of nuclear reactors	6.9%	\$414 016 077	-1.3%	\$28 667 806
51453	Cyclanic. cyclenic or cycloterpenic mono- or polyamines. and their derivatives; salts thereof	8.2%	\$409 845 371	41.6%	\$33 786 257
66496	Paving blocks. slabs. bricks. squares. tiles and other articles of pressed or moulded glass	11.3%	\$401 698 328	23.1%	\$45 210 500
29295	Pectic substances. pectinates and pectates	6.3%	\$365 351 906	12.0%	\$23 094 036
66749	Synthetic or reconstructed precious or semiprecious stones. n.e.s.	2.9%	\$312 697 631	12.2%	\$9 013 749
64216	Box files. letter trays. storage boxes and similar articles. of a kind used in offices. shops or the like	8.4%	\$311 831 850	21.8%	\$26 074 789
62542	Tyres. pneumatic. new. of a kind used on motorcycles and bicycles	3.2%	\$291 674 419	11.9%	\$9 286 827
79129	Rail locomotives. n.e.s.; locomotive tenders	3.2%	\$275 984 538	42.9%	\$8 751 226
64125	Other paper and paperboard. weighing less than 40 g/m ²	3.2%	\$254 092 537	-1.9%	\$8 051 197
52264	Potassium hydroxide (caustic potash); peroxides of sodium or potassium	5.7%	\$233 690 177	34.6%	\$13 321 754
05484	Hop cones and lupulin	15.1%	\$228 405 747	16.3%	\$34 577 554
89871	Gramophone records	3.6%	\$216 933 864	16.9%	\$7 887 307
74913	Moulding patterns	6.5%	\$203 470 285	4.3%	\$13 183 532
52322	Calcium chloride	2.6%	\$194 044 676	9.2%	\$5 067 833
09814	Homogenized composite food preparations	4.8%	\$179 139 357	20.6%	\$8 686 075
52233	Nitric acid; sulphonitric acids	6.2%	\$172 587 972	16.9%	\$10 711 991
54146	Alkaloids of rye ergot and their derivatives; salts thereof Aromatic simple amin compounds. their derivates. salts	15.1%	\$166 517 180	-2.0%	\$25 182 766
69753	Sanitary ware. and parts thereof. of aluminium	7.1%	\$163 307 138	19.0%	\$11 534 534
89122	Cartridges for shotguns	3.4%	\$153 213 542	-9.0%	\$5 248 011
89996	Parachutes (including dirigible parachutes) and rotochutes; parts thereof and accessories thereto	4.7%	\$138 352 388	15.6%	\$6 514 471
67241	Ingots of iron (other than iron of heading 671.33) or non-alloy steel	19.4%	\$133 444 392	20.6%	\$25 828 905
65225	Other woven fabrics of cotton. unbleached. weighing not more than 200 g/m ²	5.3%	\$117 065 558	216.5 %	\$6 259 530
64152	Sulphite wrapping paper	17.1%	\$105 389 758	10.7%	\$18 070 307
27311	Slate. whether or not roughly trimmed or merely cut. by sawing or otherwise. into blocks or slabs of a rectangular (including square) shape	2.7%	\$96 585 001	20.2%	\$2 628 545
51133	Tetrachloroethylene (perchloroethylene)	2.7%	\$91 911 995	26.9%	\$2 508 720
89942	Walking-sticks. seat-sticks. whips. riding crops and the like	3.2%	\$64 856 368	40.0%	\$2 090 604
65824	Pneumatic mattresses	30.9%	\$63 375 687	18.5%	\$19 607 886

Source: UNSTAT, Comtrade, own calculations, ordered by volume of WT in USD in 2004; BFT displays average year-on-year growth in the last three years

The national long-list provides rather accurate view of which industries best represent the national economy in international markets, as it includes all important export items except "road vehicles". Passenger cars, despite being the most important export commodity of CR, have not even come close

to the cut-off rate mentioned under step 1; they remain at about 1%⁷. This fact in itself confirms huge role of automotive industry in the international trade.

The long-list includes products of traditional and new industries (electro, engineering, rubber, plastics, automotive components), as well as "raw materials and inputs for industry", such as iron, paper, fabrics, glass, ceramics and chemicals; apart from fish (Southern Bohemia) and hops (vertical relation to beer) food sector is not represented on the national long-list.

Of all the individual groups there is the strongest (ten times) representation of class 66 – Non-metallic mineral manufactures, i.e. mostly ceramics and glass. Glass beads, imitation pearls, imitation of precious or semiprecious stones and similar glass smallwares can be found here, with 25% of CR in the world trade. Class 65 - Textile yarn, fabrics, made-up articles, n.e.s., and related products takes the second place. Here we may find especially industrial fabrics proving the potential of the textile industry in special areas, as well as special items like pneumatic mattresses of more than 30%, a "winner" of this category. Metal products in class 69 are represented eight times, but by total volume of world export under USD 3 billion in 2004 they do not match with the importance of electro, machinery or automotive industry.

According to frequency the list includes seven times classes 77 - Electrical machinery, apparatus and appliances, and 74 - General industrial machinery and equipment. These are traditionally strong industries that have been attractive for investors in the recent years. Other traditional industries follow, six times class 67 – iron and steel, and six times class 71 - Power-generating machinery and equipment.

There is an interesting observation – when the list is ordered by size of world trade, the representatives of the above-mentioned groups are missing, while we may find class 75 twice - Office machines and automatic data-processing machines, a typical representative of the new industry on the basis of "old" electrical engineering, and once 78 – "car components". This is partially due to less detailed structure of class 75 compared for example to 77. In any case, it is important for the Czech economy that it plays an important role in both "large-volume" industries - 75 and 78, and those of product variety (71, 74, 77).

National long-list should be considered only as a tool to be further verified at regional level. Potentially attractive industries can be found there, but it does not include regional structures or major vertical relations between products, i.e. numerous raw materials of class "6" are used as inputs in automotive industry.

4.3 Rough National Short-list

From the viewpoint of national importance we have identified the following nationally important commodities of foreign trade, at 3 digit level of SITC according to the criterion of higher than average export power, in descending order by world trade volume of the commodity (number preceding the name is the standard international trade classification code, version 3 in 3 digit structure):

781 Motor cars and other motor vehicles principally designed for the transport of persons

752 Automatic data-processing machines and units thereof; magnetic or optical readers, machines for transcribing data onto data media in coded form and machines for processing such data

⁷ From the viewpoint of sectoral export power of CR this is a competitive industry.

784	Parts and accessories of the motor vehicles
778	electrical machinery and apparatus, n.e.s.
772	Electrical apparatus for switching or protecting electrical circuits or for making connections to or in electrical circuits and the like
821	Furniture and parts thereof; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings
699	Manufactures of base metal, n.e.s.
893	Articles, n.e.s., of plastics
743	Pumps (other than pumps for liquids), air or other gas compressors and fans
741	Heating and cooling equipment, and parts thereof
894	Baby carriages, toys, games and sporting goods
773	Equipment for distributing electricity, n.e.s.
673	Flat-rolled products of iron or non-alloy steel, not clad, plated or coated
761	TV and combined receivers
744	Mechanical handling equipment, and parts thereof, n.e.s.
716	Rotating electric plant, and parts thereof, n.e.s.
676	Iron and steel bars, rods, angles, shapes and sections (including sheet piling)
679	Tubes, pipes and hollow profiles, and tube or pipefittings, of iron or steel
771	Electric power machinery (other than rotating electric plant of group 716), and parts thereof
651	Textile yarn
...	

Following the synthesis of statistical data at national level we have identified these aggregated industries important from the viewpoint of international competitiveness **on national level**:

- **Manufacture of cars and their components**
- **Electrical engineering manufacture**
- **Machine engineering manufacture**
- **Chemistry**
- **Beer**

Specification of these industries is based on the fine and rough lists of foreign trade items, where CR achieves international competitiveness. This relates to foreign trade items identified at 3-digit level as classified by SITC.

4.4 Regional Clusters

The following is our overview of identified industries, including basic characteristics of geographical scope and age. Other parameters (statistic identification according to NACE, presence of cluster initiatives, level of vertical and horizontal cooperation, description of competitive advantage and examples of world-class excellence etc.) are part of the electronic exhibit to the Report [in Czech language only].

Regional field research helped us to identify a total of 102 industries in regions outside Prague, where there is an evidence of a cluster potential. Where we could not provide all necessary evidence, the industries are in italics and need to be further tested.

Cluster initiatives. In 35 of these regional industry groupings cluster initiatives are already emerging, in two cases they are embryonic, and in one case the cluster initiative failed. CzechInvest was aware of 43 of the total 102 industries at the time this study was being prepared in some way (OPIE project submitted, in stage of preparation, project idea discussed etc.).

Historical context of industries in regions. Most of the industries where there is an evidence of cluster potential in the regions are traditional (81), in sixteen cases these are modern industries, and in five cases we identified combination of traditional and new industries.

Table 14: Overview of identified clusters / industries with cluster potential

Region / industry with cluster potential	Tradition	Geographical scope	Note / recommendation
Karlovy Vary			
Wood processing	Traditional	Multi-regional, cross-border cluster	Not identified by LQ; consider "submersion" in other clusters (musical instruments, construction)
Musical instruments	Traditional	Multi-regional, cross-border cluster	Relevant
Textiles and other non-metallic mineral products (tableware)	Traditional	Multi-regional, cross-border cluster	Relevant
Construction (materials, recycling)	Traditional	Multi-regional, cross-border cluster	Possible to add 28 metal structures
Automotive components	Traditional	Multi-regional, cross-border cluster	Part of larger area
Coal industry	Traditional	Sub-regional	No data, single company
Machinery / engineering (metal structures and products)	Traditional	Regional, multi-regional and cross-border	Part of larger area
Food (mineral waters – packed)	Traditional	Regional, multi-regional and cross-border	Relevant
<i>Food (spa wafers from Karlovy Vary)</i>	<i>Traditional</i>	<i>Regional</i>	<i>Small, integrate with spa industry</i>
Spa industry (health care and wellness activities)	Traditional	Regional	
Hradec Králové			
Technical chemistry cluster	Traditional	Multi-regional cluster	Larger area (together with Pardubice and Liberec)
„PO – ZDRAV“ (health care services)	Traditional	Multi-regional	Without participation of producers less important from comp. viewpoint

Region / industry with cluster potential	Tradition	Geographical scope	Note / recommendation
Technical plastics – association PLASTYCOR	Traditional	Multi-regional	Possible to relate to Omnipack
Omnipack cluster	Traditional and new	Multi-regional	Possible to relate to Plastykor; should include paper
Electrical engineering	Traditional	Multi-regional	Part of larger area; add 30
Stone industry with supporting infrastructure	Traditional	Multi-regional	Larger area (together with Pardubice and Liberec)
<i>Renewable sources of energy</i>	<i>Traditional (25 years)</i>	<i>Multi-regional, international cluster</i>	In case regional authority wants to act, we recommend manufacturers' involvement
Southern Moravia			
Bio-informatics	New industry	Regional cluster	Consider if possible to include in ICT
Devices for physics	Traditional (40 years)	Sub-regional	
Manufacture of planes and their components	Traditional (50 - 70 years)	Czech Republic, multi-regional, international, sub-regional	High-tech growing market with comparably few world players
Water purification and treatment technologies	Traditional	Multi-regional	High specialisation
Manufacture of tractors and agricultural machines	Traditional	Sub-regional	
Precise machine engineering	Traditional	Multi-regional	
ICT	New	Sub-regional	
<i>Wine</i>	<i>Traditional</i>	<i>Regional</i>	<i>Low export power, more regional than international competitiveness development tool</i>
Liquid treatment machines	Traditional	Multi-regional	Falls within precise machine engineering
Biotechnologies	New	Multi-regional, cross-border cluster	We assume it includes medical products
Central Bohemia			
Automotive cluster	Traditional	Sub-regional; possible to extend to multi-regional, or even international	No comments
Brewery cluster	Traditional	Sub-regional, multi-regional, national	National cluster
Manufacturing of utility and decorative glass	Traditional	Regional, multi-regional	Part of larger area
Furniture equipment and health care accessories	Traditional	Sub-regional	
Plastics processing	New	Regional	Closely connected to automotive
Foundries	Traditional	Regional, multi-regional	Connected to automotive
<i>Welding (machine engineering)</i>	<i>Traditional</i>	<i>Sub-regional, multi-regional</i>	Not supported by data
Printers	Traditional	Regional, sub-regional, national	
Aluminium producers (secondary)	Traditional	CR	

Region / industry with cluster potential	Tradition	Geographical scope	Note / recommendation
materials recycling)			
Moravian - Silesian			
Automotive and components	Traditional	Regional national, cross-border	Strengthened by new investment
Industrial machinery / engineering	Traditional	Regional	
Chemistry and pharmaceutical cluster	Traditional	Regional	
Wood processing	Traditional	Regional	Rather 21 than 20
Manufacture of metal products / new materials	Traditional	Regional	
Information technologies	New	Sub-regional	Growing world- and nationwide
Hydrogen / alternative energy sources	New	Sub-regional	
Olomouc			
Clothing manufacture	Traditional	Regional / sub-regional	
Manufacture of optical devices	Traditional	Regional / cross-border	
Manufacture of machines and devices	Traditional	Regional	Can be included in larger group
Manufacture of other means of transport	Traditional	Multi-regional	Loose connection to automotive, so far small
Manufacture of construction materials	Medium age	Regional	
Manufacture of food products	Traditional	Regional / sub-regional	
Nanotechnologies	New	Sub-regional	Innovation potential, strong R&D participation
Information technologies	New	Sub-regional	Growing world- and nationwide
Southern Bohemia			
Wood processing	Traditional	Multi-regional	Add 36 - furniture
Intelligent components	Transform	Sub-regional	
	ation of old into new industry		Investigate – possible part of larger group (robotics in Vysocina)
Technologies for renewable resources	Transform	Regional	
	ation of old into new industry		
Spa and wellness	Traditional	Regional	
Food – functional and healthy	Traditional	Rather multi-regional	Join with "healthy meat"
Brewery (beer) cluster	Traditional	Regional	
Food - healthy meat	Traditional	Regional	Join with food
Medical equipment	New	Regional	
Liberec			
Textiles - technical	Traditional	Multi-regional	
	– textiles, new – technical fabrics		Together with HK and Pce
Artificial jewellery	Traditional	Sub-regional	
Glass works	Traditional	Sub-regional, multi-regional and cross-border	
Furniture	Traditional	Regional	Larger area
Plastics processing	Traditional	Sub-regional, multi-	Here part of automotive

Region / industry with cluster potential	Tradition	Geographical scope	Note / recommendation
Electrical machines and devices Machine engineering	New Traditional	regional and cross-border Multi-regional Cross-border, multi-regional	Whole CR
Pardubice			
Electronics	New	Sub-regional	
Electrical engineering	Traditional	Sub-regional	
Technical fabrics	Traditional	Multi-regional	Together with HK and Lib
Production of tools - Lanskrout	Traditional	Sub-regional	Very small "cluster"
Automotive	Traditional	Regional / CR	Note: - includes Kvasiny
Technological chemistry	Traditional	Part of Labe river chemical belt	
Pharmacy	New	Multi-regional	Together with HK and Lib
Zlín			
Plastics processing	Traditional	Multi-regional	Part of larger area
Precise machine engineering	Traditional	Regional / multi-regional	29 does not seem to be so strong
Tyres manufacture	Traditional	Multi-regional / cross-border	Dominating company
Comprehensive metal processing technologies	Traditional	Multi-regional	29 does not seem to be so strong
Electrical engineering	Traditional	Regional / multi-regional	Also larger area
Quality furniture for modern interior design	Traditional	Regional / multi-regional	Part of larger area
Conserved meat and vegetable products	Traditional	CR	Respond in cooperation with SMR
Vysocina			
Robotics	Traditional	National to international	Either very small, or part of large area
Car components	Traditional	Sub-regional / regional	Part of national automotive
Precise machine engineering	Traditional	Multi-regional, cross-border cluster	Respond in cooperation with SMR (and Zlin)
Glass works	Traditional	Sub-regional	Investigate whether part of national
Wood processing	Traditional	Regional / sub-regional	
Food	Traditional	Regional	Export orientation – meat and milk
Usti			
<i>Bioplastics</i>	<i>New</i>	<i>Multi-regional</i>	<i>It has export, but isn't it part of chemistry?</i>
Chemistry	Traditional	Sub-regional / regional	Can include bioplastics
Food - beverages	Traditional	Regional national	Beer part of Czech cluster
Glass works	Traditional	Sub-regional	Can be together with Lib and CBH
Machine engineering	Traditional	Sub-regional	Better name (heavy machinery?)
Paper	Traditional	Regional with cores	Verify, no initiative, but strong data evidence - export
<i>Water treatment / management</i>	<i>Traditional</i>	<i>Regional</i>	We do not recommend, no export

Region / industry with cluster potential	Tradition	Geographical scope	Note / recommendation
Pilsen			
Consumer electronics	New	Regional	Domination of one company
High performance electro-engineering	Traditional	Regional	We recommend to proceed in cooperation with SBR
Wood processing	Traditional	Regional	
Ceramics	Traditional	Regional	
Beverages	Traditional	Regional	We do not recommend – local consumption
Rail vehicles / cars	Traditional	Regional	
Mechatronics	Traditional	Regional	
Bridge structures	Traditional	Regional	
Renewable sources of heat energy	New	Regional	We do not recommend - ditto
Laser technologies	New	Regional	We do not recommend – too specialised

Source: Field research analysis, December 2005

4.5 Super-regional Clusters - National

In this category we identified the existence of clusters in three traditional industries (automotive, machine engineering, beer). While the first has a clear core in Central Bohemia (Mladá Boleslav, newly Kolín) at the moment with the highest concentration of automotive components manufacture in neighbouring regions (Liberec, Hradec, Pardubice, Pilsen...), the other two are typical for high density of companies all around the country.

Automotive cluster

Automotive industry and manufacture of automotive components is one of the drivers of Czech economy, at the same time it is an industry of high investment activity in recent years. Apart from the very manufacture of cars in Mlada Boleslav, Kvasiny, Vrchlabí and Kolín it includes hundreds of suppliers from various industries, be it steel producers and foundries, tyres, fabrics (seats), plastics, or car electronics etc. It has been identified in Central Bohemia, Moravia – Silesia, Pardubice, Karlovy Vary, Zlin (tyres) and Vysocina, whereas there is clear relevance in Hradec Kralove (Vrchlabi and Kvasiny – cars, Jicin - suppliers), Liberec (suppliers in the industrial zone), and Pilsen (suppliers around Pilsen and Rokycany) regions.

From global point of view Czech Republic is a part of Central European automotive cluster. Czech companies are connected with automotive manufacturers namely in Germany (especially those in Western Bohemia), relations with Slovakia are developing (Trnava, Bratislava, Žilina), as well as with Poland, where numerous assembly plants have been transferred in recent years.

The decision of the Korean automotive producer Hyundai to locate its investment in the region of Central and Eastern Europe enhances the European polarisation of automotive industry. 60 million cars are sold every year globally. If the plans of Hyundai, TPCA and Skoda Auto are fulfilled, within short time horizon (2010) 1.2 million cars per year should stream from the Czech Republic into the world (this is a modest estimate, as Skoda Auto itself could possibly produce 700 thousand cars in 2008). When we add the capacities of VW, Kia and Peugeot in the west of Slovakia, we can easily identify a globally competitive automotive cluster with its core in former Czechoslovakia.

Production of beer

Production of beer (lager) as a traditional Czech export commodity displays features of nationwide cluster in all the facets of Porter's diamond. Specialised sources of knowledge (schools, tradition of "brewers' associations") and materials (hops, malt) are available, supporting industries are namely manufacture of machines (ZVU Hradec Králové and its numerous successors). Rivalry in the industry is enormous, tens of breweries have disappeared in last 15 years due to competitive forces, and those who survived have been forced to come up with innovations. Thanks to highest per capita beer consumption in the world the Czech society also meets the criteria of demanding customers (demand conditions).

Relevance of beer brewing cluster has been identified in Central Bohemia, Southern Bohemia, Pilsen and Usti regions and Prague, Hradec Kralove region should be included due to manufacturers of brewery facilities, other major beer exporters are located in Moravia – Silesia and Vysocina, individual producers are scattered all around the Czech Republic (in each former district).

Machine engineering

Machine engineering is the most important export industry, employer and beneficiary of foreign investment after automotive, so there is no wonder practically in each region there was machine engineering cluster identified, though specifically oriented in many of them. Due to the vast range of products and lack of clearly unified output (such as car or beer) the relevance of national cluster is much more loose than in the two above described cases, and it is maybe even more justifiable to talk about "liquid processing machines" (Southern Moravia), or "mining machines" (Northern Bohemia) clusters. However, it is possible to speak of a nationwide cluster as a result of density of machine engineering companies and corresponding educational facilities and skills all around the CR. It is also clear that the borders between specialised machine engineering clusters will not be equal to regional borders.

4.6 Super-regional Clusters - Other

Numerous (most) identified clusters stretch over the borders of their regions. We have included only those where the importance of both (more) regions is comparable for the whole cluster. This is usually (often) the case of "former regions", where tradition of particular manufacture existed, and where close relations between companies have remained, and there is at least one college specialised in the industry.

Wood processing – Southwestern Bohemia

Relevance of clusters has been identified in regions of Pilsen, Karlovy Vary and Southern Bohemia. All three are based on wood production in borderland mountains (Šumava, Český les), and its subsequent processing in the region.

Wood processing – Northeastern Moravia

Moravia – Silesia and Zlin (Vsetin area) regions include wood production in Beskydy mountains and its subsequent processing (cellulose, furniture) in the cluster.

Technical fabrics – regions of Liberec, Hradec Kralove and Pardubice

Cluster based on the tradition of textile production in Northeastern Bohemia identified on the territory of each of the regions covers the area from Liberec to Broumov, Ústí nad Orlicí and Svitavy.

Packaging – regions of Liberec, Hradec Kralove and Pardubice

Two cluster initiatives established in fact by the same set of companies (technical plastics and packages) have counted with emergence of cluster on the territories of all three regions since the beginning.

Glass works cluster – Northern Bohemia

Another traditional production located on the territories of three regions (former Northern Bohemia and Central Bohemia) with traditional relations between manufacturers, designers and schools.

Chemical cluster – Labe river belt

One of the few clusters that can be geographically described in other than regional terms. It is more a stripe along the Labe river. Regions of Pardubice and Usti have identified the cluster on their territories, but centres are both regional cities. Kolín, Neratovice and Kralupy in Central Bohemia belong to this cluster identification as well.

Pharmaceutical cluster – Central Bohemia

Centres of the cluster are Prague and Central Bohemia (Roztoky, Kouřim), though other companies in regions of Pardubice and Hradec Kralove can be included.

Manufacture of planes – Southern Moravia

Regions of Southern Moravia and Zlin are the centres. This is a high-tech industry.

Healthy food – Southern Bohemia and Vysocina

Though both regions have identified the cluster on their territories, they are neighbours and make use of similar characteristics of healthy environment, there is only loose relevance of the cluster as defined here due to a wide range of final products.

Ceramic production – Western Bohemia

This is an example of a cluster formed by a multinational market penetration activities. As Lasselsberger has united (= made acquisitions) all producers of construction ceramics in the areas of Rakovník, Karlovy Vary and Southern Bohemia, we may conclude that a nucleus of a ceramics cluster has been formed on this territory.

4.7 Services

We have integrated the assessment of cluster establishment potential in services in the analytical tool as part of the field research, and the following service activities were identified by regional specialists most frequently:

1. tourism and spa services
2. consultancy, education and technical assistance
3. health care and services for seniors

For the most part these activities do not meet the definitions of Porterian clusters. We assume that in many cases these are efforts of private companies in specific areas to attract subsidies into their networking initiatives. These subsidies, if granted, do not necessarily have to be without positive cost-benefit ratio, and their design may lead to the support of regional development, but regarding global competitiveness it is not possible to assess their positive impact on an ex-ante basis at the moment.

On the other hand – premature refusal of support of clustering in these activities could lead to discouragement of some initiatives that may develop international competitiveness:

In the field of **tourism** this can be services for tourists who physically do not visit the Czech Republic, but the services cover their route planning, itinerary / program of their stay, bookings, information, credit services and payment management, travel insurance etc., and they can be provided from CR through modern information and communication channels.

It is similarly essential in consultancy and technical assistance, education or specialised training whether the infrastructure, skills and capacities to develop and deliver such a service that originates in the CR have the potential of successful sales in the international markets. Organisation of worldwide discussion and knowledge exchange forums may once again benefit from modern technologies, without the necessity to travel, and can be organised from the CR. Consultancy can be provided remotely or on the spot, but it is necessary to make use of the newly acquired experience and knowledge that will anchor the activities in the CR. The knowledge and skills to be exported are the results of innovation connected directly to existing globally successful value chains, where the pressure and challenge of demand create motivation impulses for productive innovations.

Based on the top-down analyses and statistics we have failed to credibly prove the existence of clustering potential in services in the Czech Republic. Moreover – Porter's clusters consider services as key attributes of interrelated industries with production, and the identification of key services is an integral component of all clusters defined by their output product portfolios.

As a contextual tool for the assessment of service clusters we recommend to use the following tested definition for future value chain mapping in the regions:

Strategic services are defined as activities of private sector performed for extra- or intra-company customers. These services create high value-added and are export oriented, service key value chains of the Czech Republic, and contribute to the upgrade of quality and capacity of skills and infrastructure necessary for success in the new economy.

-- Ewen Peters and Andrew Thorburn

(definition from Strategic services sector study, Czechinvest, 2000)

This definition had been a starting point for the design of a successful system of investment incentives in the field of strategic services that led to attraction of many foreign investments and implementation of Czech investments in this field. The service investments usually emerge in the following sub-areas (basically all these activities and functions can be implemented as in-house or can be outsourced):

Service operations / activities:

- Customer Contact Centres
- Shared Service Centres
- Data Processing Centres
- Research, Design and Development
- Expert Solution Centres
- Headquarter Operations
- Value Added Logistics

The definition of strategic services can be used for needs of strategic importance at regional level – i.e. **services that upgrade productivity of key value chains of the regional economy, with export potential (in this case from the viewpoint of regional priorities we can also include extra-**

regional export) with high added value and upgrade of skills and capacities in human resources and infrastructure that are necessary in the new economy.

Another aspect of assessment of contribution of services in the development of international competitiveness is their potential to influence the process of productivity growth in key industries. This potential is different for different service activities that impact the processes along the input / output line of a company / group of companies (purchasing, warehousing, production, sales, customer support), and strategic functions (marketing, branding, PR, media, HR management, technological support, research, development, design etc.).

4.8 Multi-modal Clusters of Interrelated Activities

As mentioned later in this material, interrelated activities come as the result of innovative interaction of existing industries, e.g. consumer electronics and automotive. This interaction, its rate and potential are difficult to measure statistically, and can be best defined by field investigation / research. New technologies in one industry of a global consumer success soon emerge in other industries, and the speed and ability of companies to adopt these new solutions influence their commercial success, productivity and competitiveness of locations where they do business. Just one example - the technology of MP3 music file data compression as a standard part of car audio equipment.

We have identified clustering opportunities in these interrelated activities within the field research:

- Information and communication technologies – widely used interrelated industry that includes internal functions across industries, and specialised services. The manufacture includes first of all computers, components, network elements and peripherals. The services can be identified in the range from low-end solutions of connecting, installations, hosting down to development of customised software, database web services connected to financial applications, or practically all fields of human activities. General definition of ICT may be put as follows: whole scale of technologies to collect, save, restore, process, analyse and transfer information.
- Optoelectronics – integration of the physics of light science with electronics. Optoelectronics in general deals with development of devices that use light.
- Intelligent components (interaction of machine engineering, electrical engineering and control technologies – mechatronics, cybernetics, robotics, artificial intelligence).
- Interaction of biotechnology with electronics and machine engineering – biocybernetics. Biotechnologies in general can be defined as practices leading to the use of living organisms or their parts to manufacture or modify products, technologically modify plants and animals, or breeding of specific micro-organisms for specific (mostly industrial) purposes.
- Interaction of biology with chemistry and pharmacy (industry of high entry barriers, difficult financing of R&D with high level of failure of research, demanding knowledge and expertise, with vast consumer market, comparably hard replication provided there is effective patent protection, and attractive profit margins and added value).
- New energies (consumption of energy brings conflict of interest of producer / distributors and consumers, in companies the price and intensity of consumption have direct impact on their competitiveness, alternative sources, drives and outputs of the research in these fields have potential of global competitive success, and have been surprisingly identified in all regions). Biotechnologies can be a solution driver in the field of new energies.

Note: some terms were invented by authors.

Sub-sets of the above-mentioned interrelated industries (incomplete list) can be seen for example in these activities:

In the field of BIOLOGY interaction – biotechnology, biomedicine, biosensorics and biotechnological equipment, molecular biology, neurobiology, biotechnology for the environment, facilities and systems for biomedicine and health care.

In the field of new ENERGIES and ENVIRONMENTAL TECHNOLOGIES – facilities for solar energy utilisation, for utilisation of other renewable sources of energy, for accumulation of energy, hydrogen technologies, for utilisation of wind energy, for protection of the environment, water treatment and purification etc.

In the field of ICT – use of computers in production, management and planning, robotics, information and telecommunication technologies, bioinformatics, broadband telecommunication, digital media, high capacity computer networks, information technology management, cybernetics, artificial intelligence, mobile telecommunications, multimedia technologies, neuroinformatics, optical high performance computers, parallel computers, simulation of processes, software technologies, data transfer safety, virtual processes.

In the field of OPTICS – photonics, optical information memories, optoelectronics, photonic digital devices and facilities etc.

In other fields mentioned in the regions – laser technologies and facilities, nanotechnologies, dispersion technologies, nanoelectronics.

It was neither our task nor ambition to describe all possible existing and emerging combinations of industries. This could be subject for academic work. We have tried to identify such interactions of companies in Czech regions in various industries that may prove to be generally applicable, and provide evidence they could potentially constitute unique, globally marketable solutions.

We propose the following procedure regarding multi-modal activities: perform identification on the basis of field research and mapping of value chains. The probability of interaction with unique results will be higher where the industries are relatively strong – *traditional* due to long-term development, *new* due to intense FDI activity and spin-offs from these activities, and university research. Results of investigation so far have not indicated strong clustering in the multi-modal industries apart from ICT and alternative energies. In all cases, however, it is necessary to verify / emphasize the potential of international competitive advantage.

5 Public support of competitiveness in the Czech Republic

5.1 Measuring competitiveness

5.1.1 National level and international benchmarking

Multi-criteria evaluation of the competitiveness of national economies is based on country ranking by internationally recognized indices that depict the position of a given country within global competition. Multi-criteria competitiveness rankings reflect the success with which countries compete for investments of economic entities (firms).

Annually, two types of competitiveness rankings are being compiled: Report on global competitiveness published by the World Economic Forum in cooperation with Harvard University and World Competitiveness Report published by International management institute (IMD) in Lausanne.

These rankings compile objective statistic data with subjective attitudes based on surveying executives and experts. The two basic indicators for international competitiveness benchmarking are: index of current competitiveness and growth competitiveness index. The composite growth competitiveness index is calculated from three partial indices: technological level of the economy, level of public institutions and macroeconomic performance.

- The partial index of technological level is composed of three sub-indices: innovations; information and communication technology (ICT); technology transfer.
- The partial index of the level of public institutions is composed of two sub-indices: legal environment and corruption.
- The partial index of macroeconomic performance is composed of two two sub-indices: macroeconomic stability and effectiveness of public expenditures.

The 2004 and 2005 results of the competitiveness ranking indicate that the Czech economy improved its position in the growth competitiveness index by 2 (as well as Slovakia) moving up from 40th to 38th position. Our position in the technological level index has the opposite direction: we dropped from 19th to 22nd place (we were outperformed by Austria and Portugal). The highest growth potential was experienced in the United States (2nd in GCI) and Scandinavian countries – all four countries among top 10 in terms of GCI in both years.

<i>Country</i>	<i>Rank</i>	<i>GCI 2005</i>	<i>Rank</i>	<i>GCI 2004</i>	<i>Rank</i>	<i>TI 2005</i>	<i>Rank</i>	<i>TI 2004</i>
Finland	1	5,94	1	5,95	2	6,02	3	5,92
United States	2	5,81	2	5,82	1	6,19	1	6,24
Sweden	3	5,65	3	5,72	4	5,78	4	5,80
Denmark	4	5,65	5	5,66	5	5,30	6	5,34
Taiwan	5	5,58	4	5,69	3	5,85	2	6,04
Singapore	6	5,48	7	5,56	10	4,93	11	5,11
Island	7	5,48	10	5,44	9	5,16	14	5,05
Switzerland	8	5,46	8	5,49	6	5,29	7	5,25
Norway	9	5,40	6	5,56	13	4,87	10	5,17
Australia	10	5,21	14	5,25	14	4,82	17	4,93
Netherlands	11	5,21	12	5,30	11	4,88	16	4,98
Japan	12	5,18	9	5,48	8	5,24	5	5,68
United Kingdom	13	5,11	11	5,30	17	4,66	18	4,92
Germany	15	5,1	13	5,28	16	4,78	12	5,08
Korea	17	5,07	29	4,90	7	5,26	9	5,18
Estonia	20	4,95	20	5,08	18	4,62	15	5,01
Austria	21	4,95	17	5,20	21	4,35	22	4,85

<i>Country</i>	<i>Rank</i>	<i>GCI 2005</i>	<i>Rank</i>	<i>GCI 2004</i>	<i>Rank</i>	<i>TI 2005</i>	<i>Rank</i>	<i>TI 2004</i>
Portugal	22	4,91	24	4,96	20	4,39	23	4,78
Luxembourg	25	4,9	26	4,95	29	4,11	41	4,28
Ireland	26	4,86	30	4,90	31	4,07	37	4,43
Israel	27	4,84	19	5,09	12	4,87	8	5,25
Spain	29	4,80	23	5,00	27	4,21	20	4,86
France	30	4,78	27	4,92	24	4,26	30	4,65
Belgium	31	4,63	25	4,95	28	4,18	31	4,59
Slovenia	32	4,59	33	4,75	32	4,07	26	4,71
Cyprus	34	4,54	38	4,56	36	3,87	39	4,36
Czech Republic	38	4,42	40	4,55	22	4,31	19	4,88
Hungary	39	4,38	39	4,56	30	4,08	29	4,66
Slovakia	41	4,31	43	4,43	34	3,99	28	4,67
Lithuania	43	4,30	36	4,57	42	3,70	33	4,51
Latvia	44	4,29	44	4,43	38	3,83	36	4,46
Greece	46	4,26	37	4,56	37	3,85	38	4,42
Italy	47	4,21	47	4,27	44	3,68	50	4,08
China	49	4,07	46	4,29	64	3,18	62	3,72
Poland	51	4,00	60	3,98	39	3,77	45	4,19
Bulgaria	58	3,83	59	3,98	61	3,31	59	3,82
Croatia	62	3,74	61	3,94	51	3,48	46	5,14
Turkey	66	3,68	66	3,82	53	3,45	52	4,01
Romania	67	3,67	63	3,86	49	3,53	47	4,13
Russia	75	3,53	70	3,68	73	3,01	67	3,65

Source: Global Economic Forum, taken from CzSO

There are several reasons why this annual international benchmarking is useful for measuring competitiveness:

- The rankings inform private investors about the development of macro-environment and investment attractiveness of locations (countries).
- The rankings stimulate competition among countries on international level in innovation support policies and creation of healthy business climate that stimulate productivity.
- And last but not least, these rankings provide a useful feedback necessary for evaluation of success with which new public policies aimed at improving competitiveness are being implemented.

5.1.2 Competitiveness on sub-national levels

On lower than international levels, competitiveness indicators are harder to follow and depend on data availability and their quality / representative level. Competitiveness can be measured by focusing on:

- Territorial statistics – cohesion regions (NUTS 2), NUTS 3 regions, municipalities of higher territorial significance or municipal levels.
- Industry statistics – manufacturing industry can be analyzed in regions up to 2 digit level for value added, employment and sales.
- Or to the level of benchmarking of individual firms if their data are public information or if they respond to disclosed surveys.

The general rule is that the availability, comparative potential and representative level of the data decreases as we go to lower geographic level. This means that on the level of cluster initiatives or

individual firms, experts must rely on tailor-made surveying mechanisms implemented via structured interviews or through focus-groups and workshops that simulate the real situations.

5.1.3 Regional level and inter-regional comparisons

On regional level only limited amount of relevant data can be gather for the purposes of measuring competitiveness. The Czech Statistical Office (CzSO) has started to alter its outputs in science and technology indicators (e.g. the November issue of Science and technology Yearbook) reflecting the need to measure international competitiveness.

The following structure reflects the ideal quality factors that can become the basis for measuring competitiveness of regions and serve as indicators for evaluating the success of cluster initiative and public policies aimed at improving competitiveness.

Most of these data can be currently located, many of them are being prepared separately but they are not being published regularly in a single document (e.g. in a compendium called Czech Republic - Regional Competitiveness Yearbook).

For each individual factor in the following framework, indicators are listed and their relevance to the vertex of the Porter diamond of competitiveness is mentioned. This is an important contextual information that might help to strengthen the understanding of the components of competitiveness.

Factors	Indicators	Related part of Porter's diamond
Business entities	Number of business entities	Strategy / rivalry
Percentage share of importance of industry	Number of local business entity units	Factor conditions
	By sales	
	By added value	
Productivity of work in the industry	By employment	Factor conditions
	Added value / average registered number of employees ratio	
Wages	Work force by wages	Factor conditions
Level of business culture	Average gross wages in the industries	Strategy / rivalry
	Presence of functional networks	
	Membership in the business networking activities (chambers, associations, unions etc.)	
Investment activity	Quality standards (ISO, EFQM etc.)	Factor conditions
	Gross formation of fixed capital	
Venture capital	Seed	Support industries
	Start-up	
	Expansion	
Foreign direct investments	Direct investments abroad	Strategy / rivalry
	Direct investments in CR	Factor conditions
Programme funding	Structure of absorption capacity by programme opportunities	Factor conditions
ICT – information and communication technologies	ICT in business sector	Factor conditions
	ICT in households	Support industries
Education	Orientation of lifelong education systems	Factor conditions
	Structure of tertiary educational programmes	
	Graduates and students by SCED codes (student's permanent address), or by educational institution)	
	Structure of educational expenses	
	Structure of educational expenses	
Science-research capacities	Number of reporting units conducting R&D activities in regions by sectors	Factor conditions
	R&D expenses by sector of use (implementation)	
	Number of research staff	
	Number of employees in R&D	

Factors	Indicators	Related part of Porter's diamond
Industrial property and license contracts	Bibliometric indicators by sciences Results of R&D activities License contracts entered in the Patent register Patent valid (as of the date) by owner's seat Protection certificates for medicals and plant protection preparations Valid utility models (by owner's seat) License contracts entered in the Utility models register Valid industrial designs National applications of trademarks Registered trademarks License contracts entered in the Trademarks register Total fees for national trademarks Certificates of origin valid in CR Number of licenses active / passive Amount of license payments active / passive	Demand conditions
Specialized innovation infrastructure	Orientation of science – technology parks, business incubators Orientation of technological centers	Support industries Factor conditions

Source: prepared in Cooperation with PS inovace, s.r.o.

5.1.4 Level of cluster initiatives

The following structure for measuring and characterizing individual clusters and cluster initiatives is based on a classification that was developed by Michael Enright in 1990, that we modified for the purposes of this study. For most of this classification, field surveying must be organized, even though the above mentioned statistic indicators can provide the researchers with useful proxies.

In the following framework we indicate how characteristics for regional industry cluster comparisons were gathered in this study. These characteristics serve for positioning the existing and/or emerging clusters that have the potential to become globally competitive.

Measure / dimension	Values / intervals			Sources of info
Geographic scope	Highly localized (sub-regional)	Regionally localized	Highly dispersed (national)	Survey – subjective Regional expert subjective LQs
Density	High density (above average number)	-	Sparse (just a few)	Albertina Czech statistical office
Breadth (horizontal definition)	Narrowly defined (5 digit level)	-	Broadly defined (2 digit level)	Survey Regional expert
Depth (level of vertical integration)	Deep (different firms along the value chain)	-	Shallow (similar / same firms with same position within value chain)	Survey / subjective Regional expert
Activity level	Activity rich	-	Activity poor	Survey / subjective
Competitive position (on international level)	High, above average Trade share - competitive	Demonstrated trade share - growth - potentially competitive	-	COMTRADE
Innovative capacity	High	Medium	Low	Survey / subjective Regional expert
Industrial organization	CORE – RING with leading/coordinating firm	ALL RING NO CORE	ALL CORE NO RING	Regional expert
Awareness	Self-aware - active	Self-aware passive	Not aware	List of projects submitted to program Clusters Survey – subjective

Coordinating mechanisms	Coalitions, alliances, short term, bilateral	Long term, multi-lateral, strategic, relationships	Hierarchies, one firm of within	Survey / subjective Regional expert
Regional industry tradition	Old / traditional	-	Young	

Source: adapted from M. Enright, 1999

5.2 Sources of data

Work with the data on regional level has its own particular limitations and risks to be taken into account when defining possible statistic assessment processes. The following issues have been identified in connection with the mandatory statistic surveys.

5.2.1 Regional competitiveness statistic data issues

Territorial identification of an entity (so-called enterprise method)

When we study certain indicators on lower regional level, we may experience considerable distortion of statistic data. This is due to the fact that all the activities of a specific entity within a research of (especially) economic indicators are registered at the entity's headquarters address, regardless of where the actual activities (business) take place. Such "distorted" data is in practical terms of no use for regional analyses.

Protection of data on regional level

The law on state statistic service stipulates the following condition – in order to be published, specific statistic data has to be a result of aggregation for more than three entities, while neither of them can represent more than 70% of the total in the given indicator. Regarding the national statistics this condition is met in most cases. However, with regards to larger territorial scale this condition becomes more important, and the publishing of some data at two-level distinction (region, NACE⁸) may represent a problem.

Major differences of territorial scale and population of individual regions (NUTS III)

Another possible issue is related to the previous clause, substantiated by large differences among individual regions of the Czech Republic. Within the scope and methodologies of regional statistic data finding it is possible that some data published without problems in one region may conflict with the condition mentioned under 3.2 in another region, and due to this fact such research cannot be included in the mandatory statistic scheme, even though the data concerned is available in certain regions.

Centralization of parallel statistic data systems

There are parallel, independent systems of statistic data collection within the organizational structures of state and public administration. Mutual exchange of information takes place at the level of central bodies; regional representations of these institutions rarely communicate. There is an aggregation within the processing of partial data for specific regions, which erases regional differences. The data available at central level does not consider regional structure.

⁸ NACE is the system of national industrial classification of economic activity

Issue of research focus in EU: NUTS II vs. NUTS III region

Regional comparisons with EU regional units represent another problem regarding the distinction between regional units NUTS III and NUTS II. NUTS II level unit is a territorial unit regarded as a region in numerous programs, and also for the purpose of calculating GDP per head as an economic indicator – for the purposes criterion of EU support (Structural Funds, EC initiatives).

5.2.2 Overview of data sources for different competitiveness characteristics

This study focused on two basic types of data: export data and employment, sales and value added data in manufacturing industries.

Export

International trade data were used on national and international level and on regional level CzSO conducted a regionalization exercise to indicate the regional origin of exports (SICT classification of 2 respectively 3-digit level were analyzed). The analysis of the export performance on national/international level was conducted using a methodology described in chapter 4.1, regional distribution of sources of export was conducted by CzSO.

Sources

- United Nations - COMTRADE database
- CzSO

Regional significance characteristics – location quotients

Location Quotients (LQ) in this study compare industry (NACE) characteristics (such as employment, sales, and value added) on regional and national levels. The resulting LQs enable us to identify and measure concentration of economic activities in regions and industries within the Czech Republic. The LQs are calculated to reflect the following relationships:

$$LQ_i = \frac{z_i / z}{Z_i / Z} \text{ where}$$

LQ_i location quotient for industry i

z_i employment in industry i in the region

z total number of employees in the region

Z_i number of employees of industry i in the Czech Republic

Z total number of employees in the Czech Republic

LQ higher than 1 indicates specialization of industry i in the region, i.e. the industry employs (produces higher sales, or higher value added) higher proportion of workforce in the region than in the Czech Republic. LQ lower than 1 indicate below average concentration of the indicator.

Because economic activity of the population (employees / total population) can be different in different regions and therefore a modified LQs can be introduced:

$$LQ_i^* = \frac{z_i / o}{Z_i / O} \text{ where}$$

LQ_i^* modified location quotient for industry i

z_i employment in industry i in the region

- o total population in the region
- Z_i number of employees of industry i in the Czech Republic
- O total population in the Czech Republic

If the economic activity of population is constant in different regions than the resulting LQs are the same.

LQ calculation for output measures (output, value added) are defined in a similar manner:

$$LQ_i^v = \frac{v_i / v}{V_i / V}$$

- LQ_i output location quotient (sales, value added) for industry i
- v_i the level of industry i output in the region
- v total value of the industry output in the region
- V_i total value of the industry i output in the Czech Republic
- V total value of industry output in the Czech Republic

Sources

- Ministry of Industry and Trade, Panorama of the Czech Industry

Apart from these data other parameters of regional competitiveness are being monitored in the Czech Republic as mentioned in sub-chapter 5.1.3 with problems described in sub-chapter 5.2.1. Within this study we analyzed different data sources and we evaluated their relevance and availability for further work on cluster initiatives and national competitiveness support policy. The results of this evaluation are summarized in the following sub-chapters.

Number of business entities

The Register of economic entities deals mostly with residential (institutional) units. However, for the purpose of identification of an industry within specific region regarding the number of active business units it is necessary to outline so-called local units. CzSO operates a database of local units but it is seldom used when looking for production values within specific surveys.

The system of regional accounts is limited to the following aggregates of regional industries of production activities:

- gross added value;
- remuneration of employees;
- employment;
- employees;
- gross formation of fixed capital;
- gross domestic product for region (GDPR);
- regional accounts of households;

Sources:

- *Register of economic entities*
the register of local units is not a public database – CSO disposes of it for its own purposes.

Percentage share of importance of industry

Regional percentage share of an industry is an indicator that describes share of the industry in total values of selected indicators in given region. As there is connection with the values leading to calculation of composite localization coefficient, we have used the values of sales, added value and employment, while respecting this formula:

$$RPP = \frac{x_i}{X_i} * 100(\%)$$

Where:

RPP_i regional percentage share of importance of industry **x** in the observed indicator **i**

x_i number of units of the observed indicator **i** of industry **x** in region

X_i number of units of the observed indicator **i** in region total

We get the importance values in:

RPP_T – regional percentage share of importance by sales

RPP_Z – regional percentage share of importance by employment

RPP_{PH} - regional percentage share of importance by added value

Data source:

- To calculate RPP the same data as for the localization coefficient calculation can be used. The data is based on the methodology applied by the Ministry of Industry and Trade in its publication "Panorama of industry in the CR".
- For total values in the formula the data leading to calculation of regional accounts in the CR have been used - *Regional national accounts*

Productivity of work

Productivity of work is a term used to describe the ratio between input and output, where the input is manpower. The productivity increases when the same volume of input produces higher volume of output. This indicator integrates the level of employment and added value (accounting added value / mean registered number of employees), and its trends compared to increase / decrease of real wages indicate long-term sustainability of specific branches of economy.

Data source:

- To calculate PP the same data as for the localization coefficient calculation and RPP can be used.

Wages

Ministry of Labor and Social Affairs provides detailed statistics of wages in specific regions via Regional statistics of price of labor (RSCP), which is an information system producing updated figures of income level, worked time and employment structure by jobs in individual regions of the Czech

Republic. RSCP is based on regular selective statistic findings named Quarterly survey of price of labor, which is included in the Statistic research program, published by CzSO in the collection of laws for respective calendar year. The survey is performed by the office of statistic service of the Ministry of Labor and Social Affairs. Ministry of Labor and Social Affairs – Employment services administration department serves as a Guarantor of RSCP information system.

Data sources:

- Registered number of employees and their wages in the Czech Republic - 1st – 2nd quarter 2005
- Employee wage structure in 2004
- Regional labor price statistics
- Average wage information system and Regional labor price statistics

Gross fixed capital formation

Gross formation of fixed capital includes the acquisition and reduction of tangible and intangible assets of the long-term consumption character, price of which exceeds CZK 40,000. Low-value tangible fixed assets, durables purchased by households, goods purchased by government for military purposes, R&D expenses, market research cost and the like are not included. This item also includes increases and decreases of valuables.

THFK values inform of the capital investment level of specific industries within the conditions of the surveyed economy.

Sources

- For the purposes of CzSO THFK values are currently collected according to the place where particular item is implemented (mainly construction), which provides for geographic localization. The question of whether these values can be specified by industry remains. Data available to general public concerns just the regionally aggregated values - *Regional national accounts*

Venture capital

Sources

- European Private Equity and Venture Capital Association (EVCA)
- Czech Venture Capital and Private Equity Association (CVCA)
- CVCA Database

Balance of payments, foreign direct investments

Direct investment = basic capital + reinvested profit + other capital

- Basic capital includes non-resident's investment in the company's basic capital, investments in subsidiaries and affiliated businesses.
- The reinvested profit is a share of direct investor (in proportion to direct investment) in the trading result not distributed in the form of dividend.

- Other capital includes received and provided loans, including debt securities and supplier loans, between the direct investors and their subsidiaries, branches and affiliated companies. These credit relations are incorporated in inter-business receivables and liabilities.

Territorial division of foreign direct investments is based in accordance with EU methodology on the country of origin of the investor. End owner of the investment can be from a different country (e.g. when parent company owns a foreign affiliation that invests in the CR, the investment is classified by the country of seat of the affiliation). Industrial division is based on Industrial classification of economic activities, which complies with the international classification NACE.

Essential means of data collection in the CNB (Czech National Bank) are electronic methods that have been developed in CNB (or SBCS) since 1991. At present the following 2 systems prevail: SDNS system ("Collection of data from non-banking entities"); and the system according to EDI (Electronical Data Interchange) concept.

These systems allow CNB to gather very significant data on the balance of payments of the CR, where technological balance of payments is included, or status of foreign direct investments and portfolio investments.

Sources:

- Balance of payments CR – publication
- Annual selective FDI survey
- Annual reports on FDI

Program funding

Methodological proposal is a background research study of absorption capacities of the regional units related to programme opportunities. A mid-step can be taken for large portfolio of programme schemes, be it within the application of structural policy according to Czech National development plan, or within the sponsorship of individual ministries, or even within the international programmes, such as 6th framework programme for research and technological development; programmes can be selected that provide the most relevant information with regards to the possibility of application of cluster schemes.

Sources and references:

- Evaluation reports of individual programmes (evaluation process)
- Information sources of individual donors (bodies responsible for administration of programmes)
- *Central register of budgetary subsidies*
- Information system of programme financing (ISPROFIN)

ICT - Information and Communication Technology (information society)

At present CzSO follows the development and use of information and communication technologies by means of two basic surveys:

- Extent and use of the information and communication technologies in households and among individuals (VSIT), which is a selective research making part of the "Selective research of work force" (VSPS).

- Statistic survey ICT 5-01 of the extent, method and level of usage of selected information and communication technologies (ICT) and systems (personal computer, e-mail, mobile phone, internet and other computer networks, websites, e-commerce, electronic data exchange and company processes related to electronic transfer of data via information and communication technologies) between economic entities of business sector and their staff in CR.
- CzSO further follows e-government, e-culture, audio-visual and theatrical areas. E-health, information and communication technologies structure, Digital Divide, e-commerce, human resources and e-skills are under preparation.

Sources

- *Information society statistics*
- *Information society statistics manual*
- <http://www.micr.cz/statistiky/default.htm>
- *Business sector ICT*
- *Selective research of IT – households*

Education

International standard classification of education ISCED 97 has been introduced in the Czech Republic, same as in all OECD countries. University and college, higher technical (in the past also post-school-leaving) studies, last two years of secondary school of arts (conservatory) studies and other similar forms of education are included in the category of tertiary education. University and college education has the form of Bachelor, Master and Doctor degree study programs. Non-university type colleges have been providing mostly bachelor degree programs since 1999. The real non-university tertiary education was established in the CR in 1996/97 in the form of new higher technical colleges (HTC). Data related to this indicator is available first of all in the database and publications of the Institute for information on education (UIV), which is an office of the Ministry of Youth, Education and Sports for education statistics.

The data on life-long education was collected on the basis of ad hoc module 2003 (AHM 2003) which had been implemented as a part of regular selective research of work force in the second quarter of 2003.

Sources:

- *Institute for information in education statistics*
- *Lifelong education - AHM module*
- *Further education information system*
- *Employment by ISCED – selective research of workforce*

Research and development

R&D indicators are followed in the CR by complete statistic surveys based on one single form: Annual report on research and development (VTR 5-01). The statistics are governed by methodological principles of EU and OECD described in the Frascati manual, and the EC Directive for the science and technology statistics No. 753/2004 of 22 April 2004. The reporting units in the field of R&D statistic

surveys are all legal and physical entities involved in R&D as the main or sideline of business regardless of the number of employees, or industry (NACE).

R&D expenses are investigated within specific R&D sectors, main fields of science, regions and size groups, further divided by:

- Financial resources (sectors of funding)
- Types of expenses (cost) – see the breakdown of internal cost to investment and non-investment expenses (cost) and their individual items as mentioned above.
- Types of R&D activities – basic and applied research, experimental development.
- Socio-economic directions – 13 main socio-economic directions are defined according to NABS classification.

Another source of information about the R&D activities is their information system. The information system of research and development is operated by public administration in order to gather, process, provide and use data on R&D supported from public resources. The Council for research and development administers R&D IS. Office of the CR Government, Department of the Council for R&D secretariat acts as its operator.

The system allows selection of the information by these areas:

- [CEP](#) (Central register of R&D projects)
- [CEZ](#) (Central register of research goals)
- [RIV](#) (Record of result information)
- [VES](#) (Register of R&D tenders)

Sources:

- *Annual statistics science and technology – timeline*
- *Science and research NACE 96*
- *R&D indicators 2004*
- *R&D IS*
- *Research organisations association's database*

Commercial rights and licences

Industrial Property Office operates the Information system of commercial rights that includes data on all kinds of protection, be it patent files and journals, utility models, industrial designs, trademarks, certificates of origin etc.

Sources:

- *Licences in 2003*
- *Industrial Property Office CR*

Specialised innovation infrastructure

The specialized innovation infrastructure (the infrastructure for industrial R&D) includes science-technology parks, business incubators, technology transfer centers, innovation centers, technological centers and parks, business innovation centers (BIC) etc.

Sources:

- *Society of science-technology parks CR – list of the accredited*
- *BIC network*

6 Conclusions and recommendations

6.1 General conclusions and recommendations

- Regional competitiveness is still relatively new in the Czech Republic as a key economic growth concept. It was the objective of this study to inform public economic policy at national and regional levels. It can be only achieved if the existing promotional and educational activities continue focusing on enhancing the common understanding of the cluster concept and the principles of global competitive advantage.
- We recommend services and related industries to be considered integral parts of production oriented industrial clusters with specific product outputs. When service clusters are being considered we recommend to inspect their potential to become internationally competitive taking into account four key criteria: export levels, value added, relationship to key strategic value chains in the Czech economy and their potential to contribute to the upgrade of skills and infrastructure that matters in the new economy.
- We recommend to policy makers to distinguish approach to traditional vs. new / emerging industries. The age of an industry has significant implications for the extent of competitive forces, intensity of knowledge utilization in the creation of the final products and the extent to which the processes can be copied / moved elsewhere. Indirect public support provided to traditional producers has only sense when it is focused on enabling them to improve their long term productivity levels. This can be expected as a result of innovative activity efforts, and knowledge sharing strategies with industries that are young and active in innovations.
- In general terms it is necessary to note that the most productive (and thus the most competitive processes) indeed do not seek public sector assistance and the public involvement should be aimed at improving quality of the environment on macro and micro levels. Integration of these principles into the program will be rather difficult but the national cluster strategy must take this context into account.

6.2 Conclusions and recommendations related to the long- and short-lists

- We recommend that these lists should not be published in the regions as the only possible competitive industries in the regions. These lists were created mostly using the top-down method that by definition does not consider any political or social priorities. The method of analysis used could be perceived by regional self-governments as central planning reminiscence and could demotivate them to nurture potentially successful activities that can not be identified using statistical methods and ex-post data.
- The same reasons lead us to the conclusion that the lists should not serve as an entry filter access of industries and products to funding of the program. We recommend that program applicants be encouraged to work with available data and information resources to identify strategic linkages enhancing their international competitive advantage by utilizing methods and resources delivered by this study.
- On the other hand we recommend that the calculations leading to findings of this study be repeated annually – especially creation of the national long-list – because these are ex-post

evaluations of the effectiveness of competitiveness policies (as long as the data reflect emerging cluster outputs).

- CzechInvest should work with the CzSO to prepare a framework of indicators for gathering and publishing regular information about regional competitiveness.
- CzechInvest should work with Ministry of education, youth and health care in encouraging university based activities and academic centers that specialize in researching and measuring national and regional competitiveness.
- CzechInvest should encourage establishment of formal and informal linkages within a **national competitiveness network** based on interactions of facilitators, consulting agencies, academics, innovation center representatives as well as representatives of centers for transfer of technologies, science and technology parks, etc. The network should serve as a vehicle for diffusion of the competitiveness concept into the activities of the public administration, private sector and other relevant institutions.

6.3 Conclusions and recommendations for the regional and local levels

- This study suggests a framework of indicators for measuring and evaluation of regional economic competitiveness. Central organization of data gathering is not necessarily a task for public administration, it can become subject of an academic or independent research (see above). Each region should have their own methods of measuring competitiveness. It is a basic pre-condition and a useful tool for evaluation of benefits resulting from implementation regional development strategies.
- Cities are natural regional centers of economic activities. Especially regional capitals can be more motivated to embrace the cluster concepts than regional self-governments because regional economic growth is typically centralized in regional centers. The program approach of unified cooperation with regions might be more simple and systemic but might not produce as good results as when major municipalities are involved.
- Regions should initiate partnerships for creating micro-environments that stimulate productivity and competitiveness. New regional strategies and programs should encourage these principles in new projects that will seek public support in the next programming period (in cooperation with Ministry of regional development).
- The interviews showed that the cluster development “hardware” exists in the regions – these are the institutions, foreign investors, high potential small and medium sized firms that export their outputs, universities, research and development activities, etc. The problem seems to be in the regional “software” – i.e. non-existent or inadequate cooperation and linkages aimed at achieving world-class excellence and international competitive advantage. Quality of these linkages determines the potential of economic utilization of the physical assets available in the region. This can have a significant impact on prosperity and standards of living for citizens.

Whenever we mention support in the above listed recommendations we do not exclusively imply financial / program support – we have in mind complex care about global competitiveness.

6.4 Conclusions and recommendations related to the program (Clusters)

- Ensure coherence of the program with related programs. This means to stimulate such activities of cluster initiatives that also implement objectives of other support programs – research and scientific infrastructure, training centers, innovations, etc.
- Apply the principles of global competitiveness and clusters also into related programs that are being implemented by other ministries. Create a general program framework that could be tailored to specific needs of the environmental improvement objectives, regional development, human resource development, etc. Ensure that the contribution to global competitiveness is taken into account as a key criteria for program support eligibility.
- De-intensify conditions that de-motivate firms from active involvement in clusters and focus instead on evaluating proposed outcomes and activities in how they are likely to contribute to international competitiveness of the industry as a whole.
- Do not restrict access to program financing on entry level but consider the outputs. Require legal form of the cluster entity to be specified in advance showing clearly no conflict with anti-trust legislature, do not restrict by listing allowed and disallowed industries but evaluate product portfolio instead and principles of cluster openness to related and support activities.
- We recommend that the public support be targeted rather than all-inclusive. The preference should be on new industries or activities related to New economy. For traditional industries we recommend that public support be organized to motivate synergies and linkages and interactions with new industries that enhance innovative capacity of the traditional industries and result in higher productivity rates. These principles should be reflected in the evaluation criteria framework, the aim of which should be to motivate rather than restrict.

The details of these recommendations as well as further context are specified in the Report on recommendations for CzechInvest and Ministry of Industry and trade.

6.5 Conclusions and recommendations related to the further research

To initiate an in-depth value chain mapping analysis in the identified industries and regions and on national level. This analysis should be based on surveying of firms in the regions and identification of their input / output productive linkages, cooperative alliances and strategic partnerships in order to:

- Create a value chain map for each industry in which potential cluster formation can enhance competitiveness of the Czech Republic.
- Identify strategic services (if any) that support regional and national value chains that have the potential to become globally competitive.
- Identify opportunities for interaction of traditional industries with new / modern activities to enhance potential for future dynamic productivity gains.

Create a concept for the development and public support of national and super-regional clusters: automotive, machinery, electronics, ICT, chemistry and beer industries.

Involve strategic infrastructure elements into the surveying activity – scientific, academic institutes, universities, development and agencies and key elements of the public administration on regional and local level.

Utilize the surveying activity in the regions not only for data gathering and analysis but also for continued diffusion of the competitiveness concept among the respondents.

Prepare industry specific information for key value chains of the Czech republic – within the CR and in international context, prepare industry specific SWOT / PEST analyses. These can serve as a resource for cluster initiatives that prepare their development strategic plans.

Promote outcomes of the activities to inform regional and national development strategic planning.

Support professional growth of cluster initiative staff via study tour programs, professional exchange on-the-job training stays, case study presentations (best practices), etc