



# COUNTRY SPECIALISATION REPORT

**Country: Czech Republic**

**Date: June 2006**

**ERAWATCH Network asbl:** Project team: NIFU STEP, University of Sussex (SPRU), Joanneum Research, Logotech, FhG-ISI

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## COUNTRY SPECIALISATION REPORT – CZECH REPUBLIC

### MAIN FINDINGS

The Czech Republic is specialised in terms of value added, employment and exports in medium-low growth sectors while R&D specialisation is divided between fast growing and medium-low growth sectors. Overall R&D specialisation does not match with technological and industrial specialisation apart from the case of few sectors most of them characterised by low technological intensity. For example, the exports and employment specialisations during the 2001-03 period present negative correlations with patents for the same period.

Among new Member states (NMS) the Czech Republic has a relatively high share of R&D expenditures (1.3%) and BERD (0.8%) (see Figure 1). Moreover there has not been a significant decline of these relative expenditures since the early 1990s. Since the late 1990s, this trend has been facilitated by high growth of GDP.

There have been structural changes in shares of financing and performing sectors between 1996 and 2004 (Table1). In performing sectors, BERD remained stable while HERD increased at the expense of GOVERD. More specifically, GOVERD has significantly increased in absolute terms in all sectors except Business where there has been a decline of R&D funding. However in shares the picture is quite different as GOVERD declines from 31.1% to 23.3% of GERD, mainly due to government funding which declines from 73% to 48%. BERD increased in absolute terms more than twice, while its shares remained almost stable and HERD almost doubled from 8.9% to 15.3%.

The composition of financing sources has changed as well. In absolute terms all financing sectors but Higher Education increased their contribution. However in terms of shares business funding declined from 59.6% to 41.8% while Government funding increased from 34.7% to 41.8% and continues to be directed mainly toward the public R&D system. Funding from abroad also increased its presence from 1.9% to 4.6%.

There has been a significant change in the structure of types of R&D projects. A share of basic research has gained in relative importance as in other CEECs while experimental development and applied research have declined. This reflects a decline of demand for domestic R&D by business sectors. However, it is encouraging that the share of applied R&D has been recovering since its decline to a low 25% in 2000 (Figure 2). This trend is also reflected on the GBAORD where non-oriented research (120 M Euro) is by far the dominant orientation with GUFs to follow. However, the highest specialisation of GBAORD is observed in Civil Research during the last few years. GBAORD is also specialised on Land Use, Earth, Non-Oriented Research, Environment and Agriculture. Despite the high shares of GUFs there is no specialisation of GBAORD.

HERD is surprisingly still oriented towards engineering (approximately 41%), while medical sciences gain shares at the expense of Natural Sciences (Figure 4). The picture is quite different in GOVERD where approximately 55% of the spending goes to humanities while engineering is restricted to 15% (Figure 5).

Czech scientific specialisation is still strongly influenced by the past specialisation in areas around physics and chemistry, which is also reflected in quality of science as reflected in science citations (Figure 9). Unlike science specialisation, patents do not show a clear specialisation pattern. Also, their growth does not indicate a clear pattern; a fact that suggests that explicit

technological effort in Czech industry is still limited (Figure 12). A high share of pharmaceuticals is common across countries while a high share of automotive industry reflects technological activity of Skoda cluster and FDIs (Figure 13).

Specialisation of BERD has not changed much during the last 10 years except Community Services and Trade which gain specialisation and Furniture, Machinery nec, Plastic, Petroleum and Mining which loose their specialisation. Other sectors with specialisation in BERD are: R&D which receive 40% of Government funding of BERD; Construction Transport nec; Motor Vehicle; Metals; non-metallic products and Textiles (Figure 6 and 8).

Government funding of BERD follows the economic structure as it is directed to sectors with value added specialisation. The exception is the R&D sector which receives 40% of the funding although there is no specialisation.

In the economic structure of the Czech Republic, services such as electricity and water, telecoms, trade, and transport are important in terms of value added share and specialisation. Also the country is specialised in several nominally technologically intensive sectors such as manufacture of machinery, electrical machinery and equipment, fabricated metal products, other transport and motor vehicles. The competitive position of most of these sectors is strong as it is reflected in export specialisation (Figure 18). On the other side of the spectrum technologically non-intensive sectors such as agriculture, mining, food, textiles and wood & printing are important as well. However, all but wood & printing are not specialised in exports.

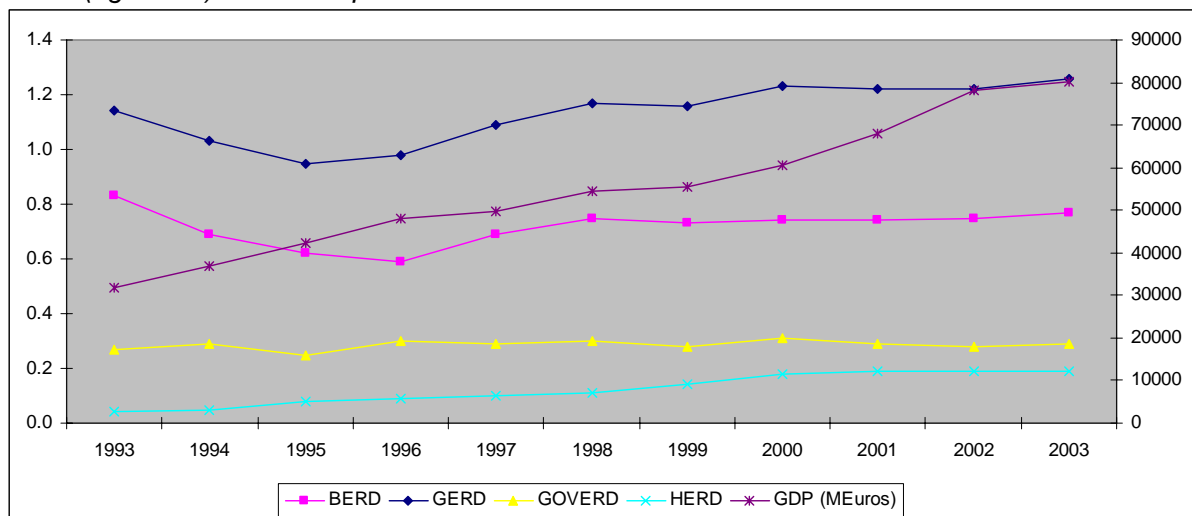
It seems that there are several mismatches between R&D, technology and industry specialisation of the Czech Republic which would be worth exploring and which does not seem to be resolved by maintaining or increasing levels of R&D in the last 10-15 years. First, there seems to be a weak correlation between orientation of R&D systems and technological specialisation (Table 2). Second, there seems to be weak link between explicit technological effort (patents) and economic value added and export primarily due to the marginal role of explicit technological activities. Despite the general picture in specific sectors, specialisation of BERD is combined with specialisation of value added and exports (Figures 20 to 23). These sectors are: Motor Vehicle; Basic and Fabricated metals; non-metallic products and textiles<sup>1</sup>. However all sectors but Motor Vehicle where operations of R&D departments and design centres of foreign OEMs and first tier suppliers has been established, are low or low-to-medium tech sectors with limited R&D intensity.

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<sup>1</sup> Textiles are marginally non-specialised in exports

**MAIN R&D FIGURES – TOTAL R&D EXPENDITURE**

Figure 1. R&D expenditure by performing sector as per cent of GDP (left axis). GDP in million Euros (right axis). Czech Republic. 1993-2003.



Source: OECD OFFBERD 2005

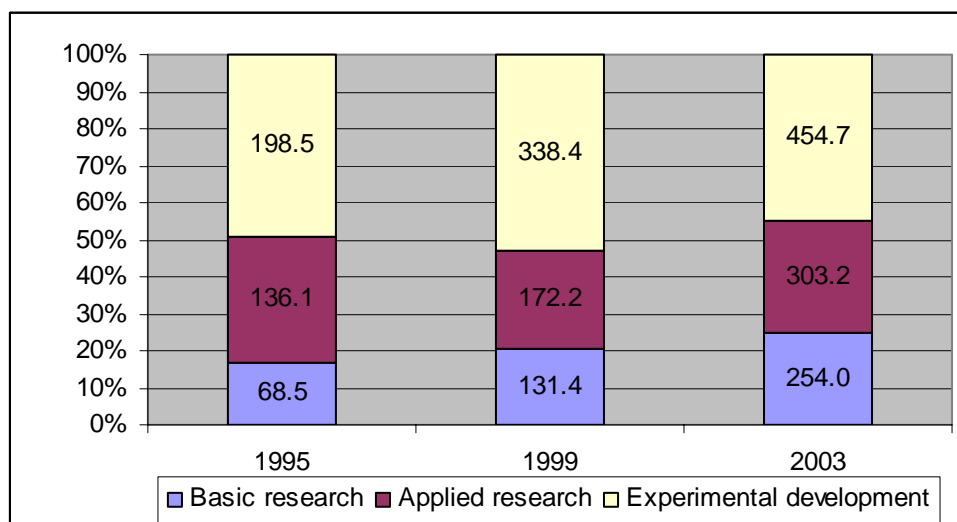
Table 1. R&D expenditure by sector of performance and source of funds .Czech Republic. 1996 and 2004. Million Euros. Current prices.

	GOVERD		BERD		HERD		Non profit		Total	
	1996	2004	1996	2004	1996	2004	1996	2004	1996	2004
Business	24.7	18.3	256.6	498.8	0.2	1.5	0.1	0.9	281.5	519.6
Government	119.2	202.6	20.7	73.9	23.8	143.1	0.3	2.8	164.0	422.4
Higher Education	0.5	7.3	0.1	0.0	15.9	4.3	0.0	0.1	16.6	11.7
Non profit	0.1	0.2	0.7	9.6	0.0	0.1	0.0	0.3	0.8	10.1
From Abroad	2.4	7.3	4.8	33.6	1.8	5.1	0.0	0.1	9.1	46.1
Total	146.9	235.7	282.9	616.0	41.8	154.1	0.4	4.1	472.0	1009.9

Pre-EMU euro and EURO

Source: OECD OFFBERD 2005

Figure 2. GERD by type of research. Czech Republic. 1995, 1999 and 2003

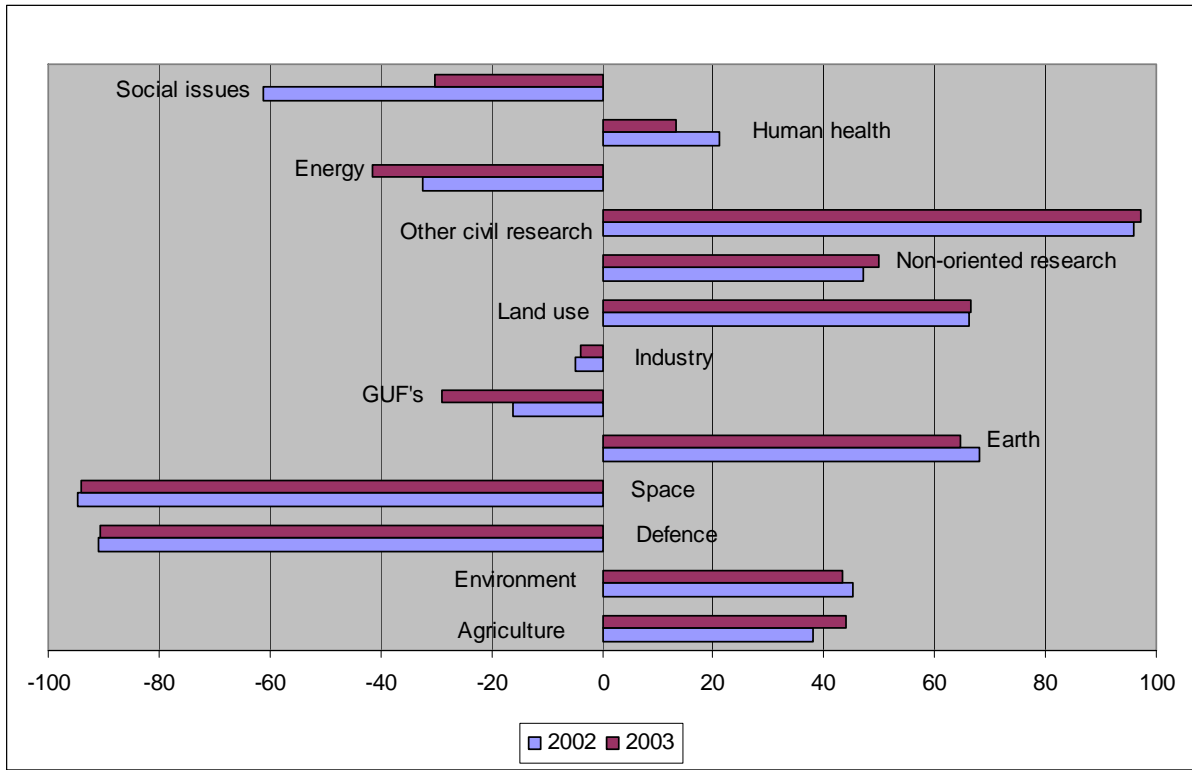


Source: OECD OFFBERD 2005

**PUBLIC R&D STATISTICS**

**GBAORD by socioeconomic objective**

Figure 3. Government Budget Appropriations or Outlays for R&D (GBAORD) by socio-economic objective. Specialisation profile. Czech Republic. 2002 and 2003.

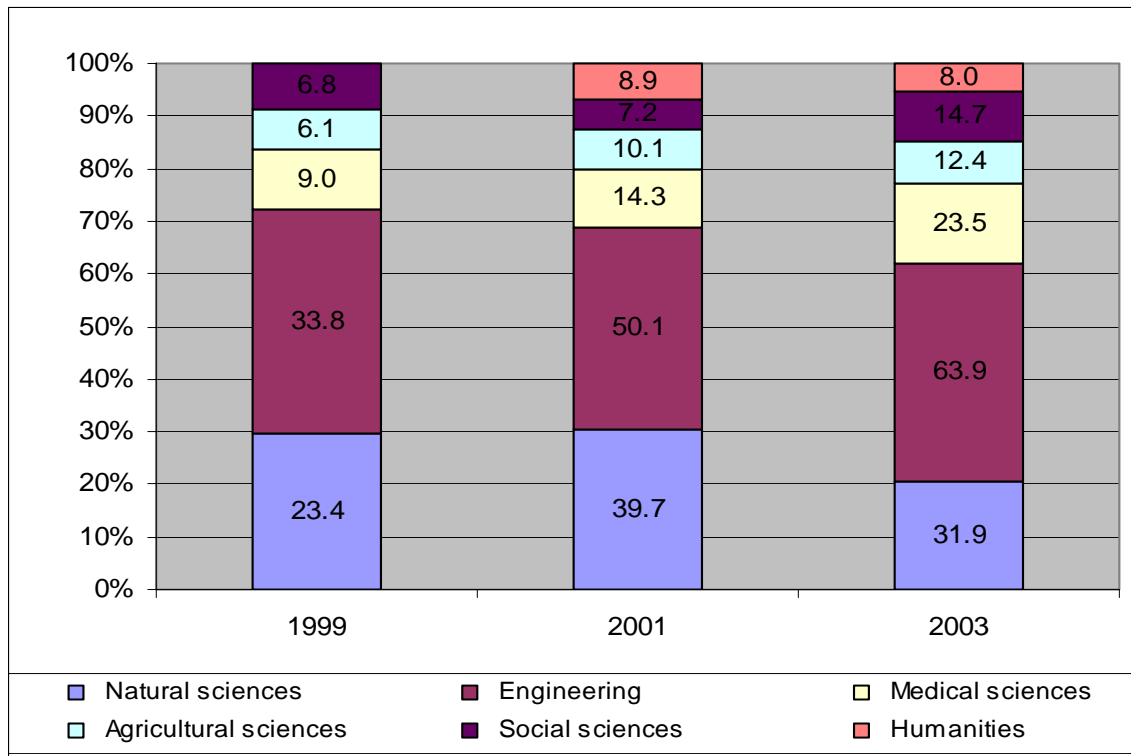


Notes: Specialisation index with EU15 as reference. Max specialisation: + 100. Min. specialisation: -100.  
 Source: OECD Basic Science and Technology Statistics 2005, own calculations.



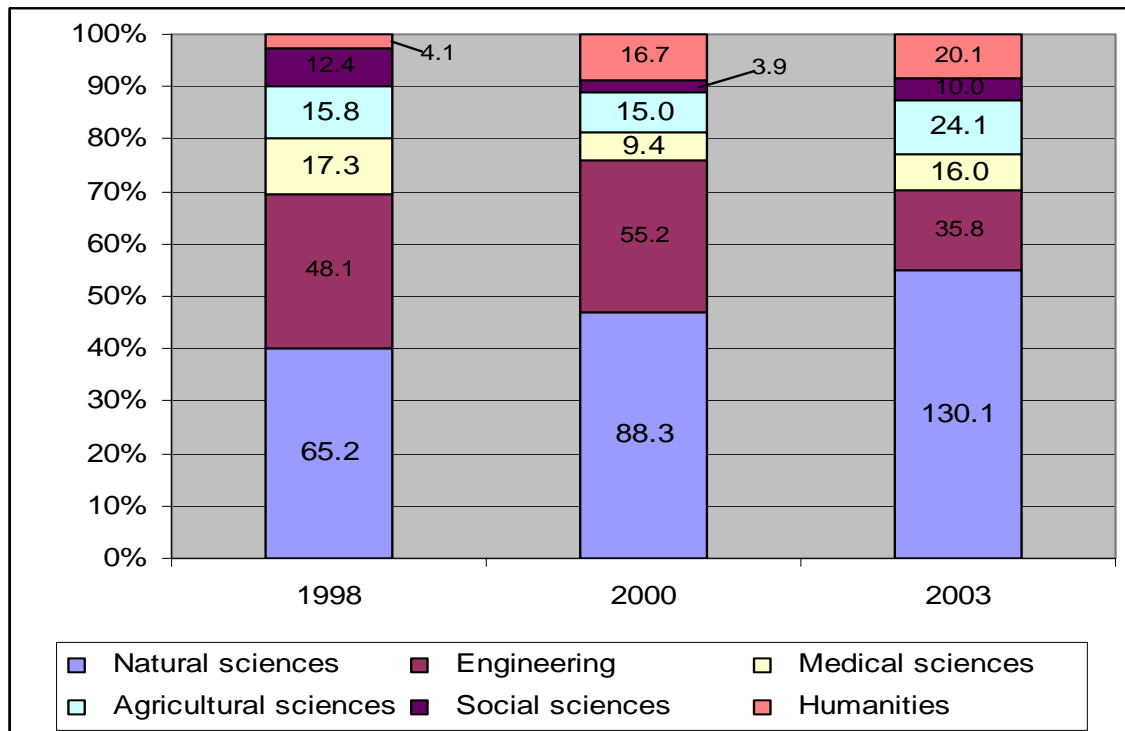
**HERD by field of science**

Figure 4. Expenditure on R&D in the Higher Education Sector (HERD) by field of science. Czech Republic 1999, 2001 and 2003. Per cent of total HERD and in million Euros.



Source: OECD Basic Science and Technology Statistics 2005.

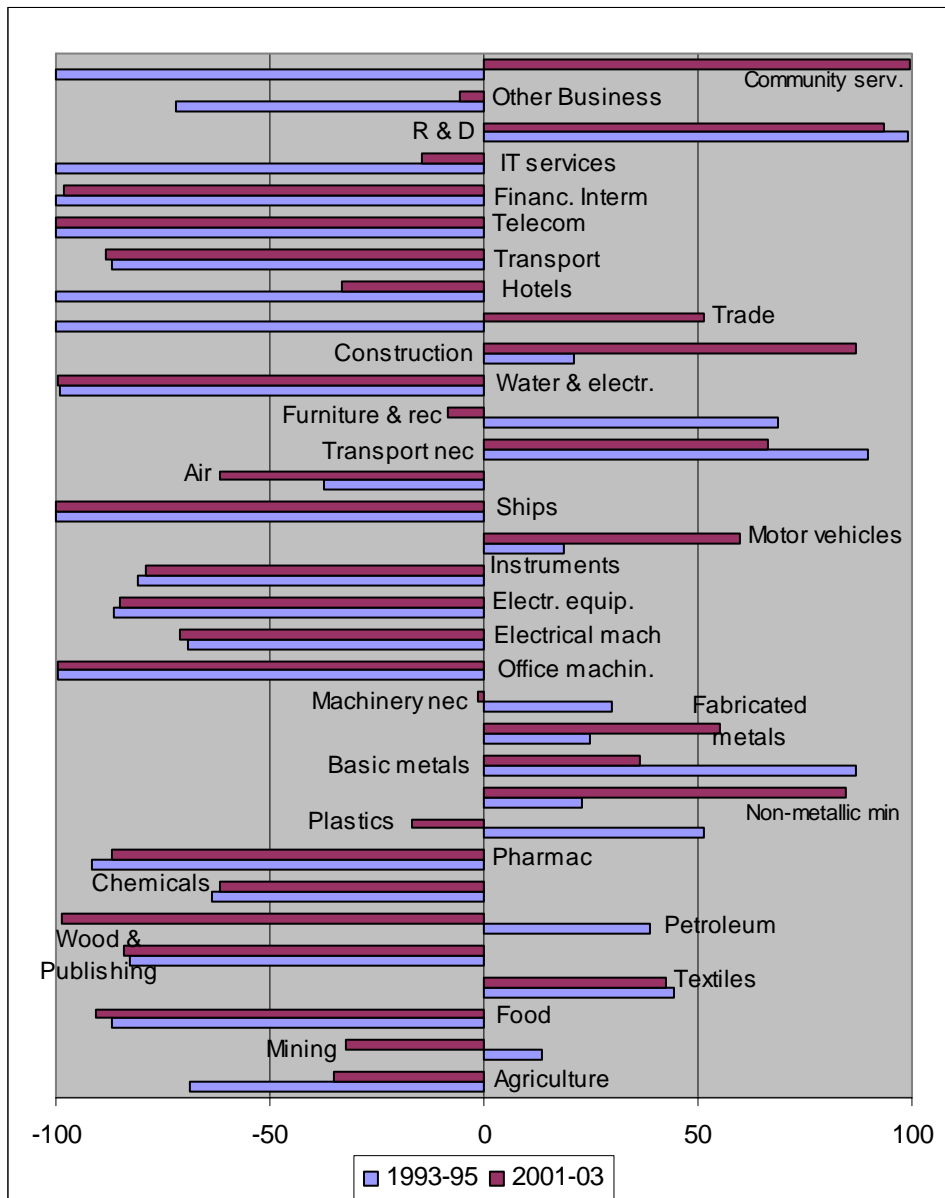
Figure 5. Expenditure on R&D in the Government sector (GOVERD) by field of science. Specialisation profile. Czech Republic. 1998, 2000 and 2003.



Source: OECD Basic Science and Technology Statistics 2005

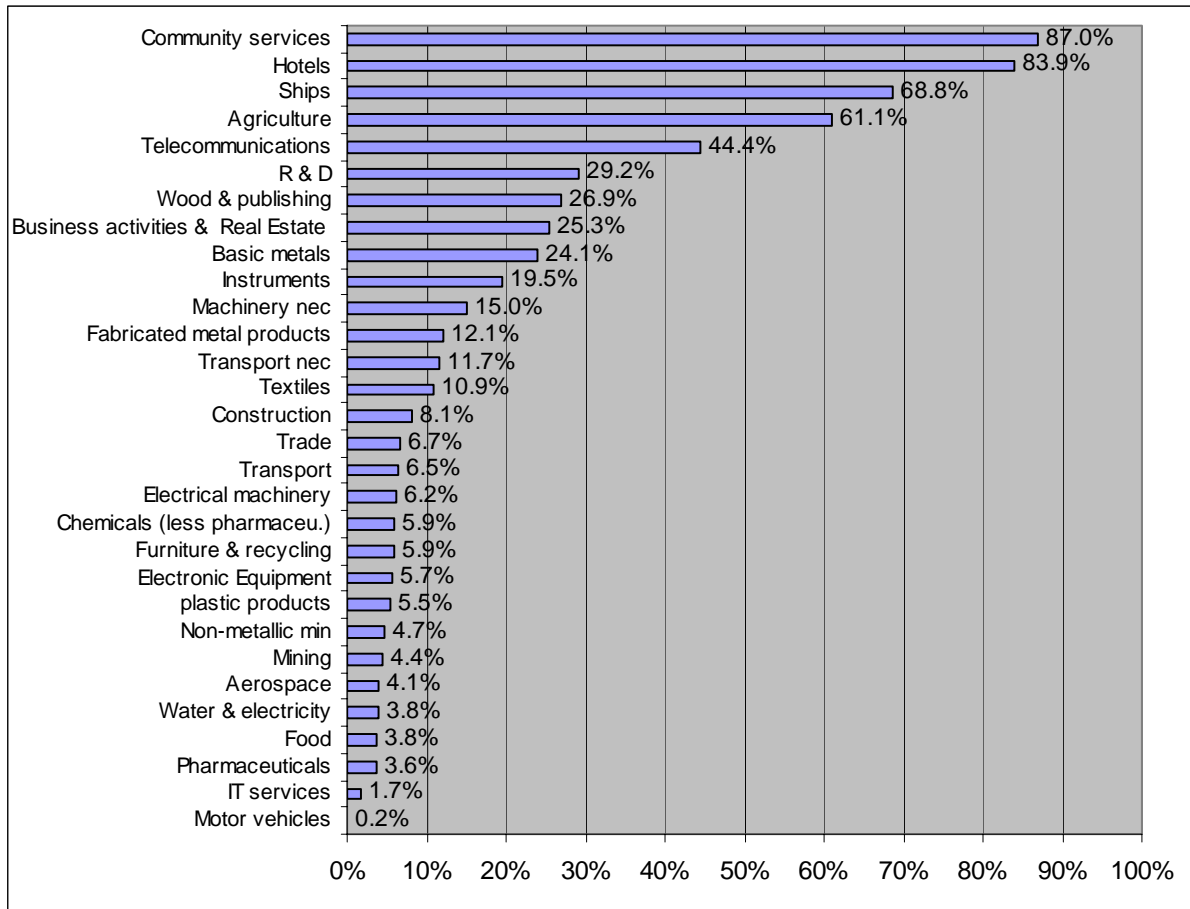
**BUSINESS ENTERPRISE INTRAMURAL EXPENDITURE ON R & D (BERD)**

Figure 6. Business enterprise intramural expenditure on R&D by industrial sector. 31 sectors. Specialisation profile. Czech Republic. Averages 1993-1995 and 2001-2003.



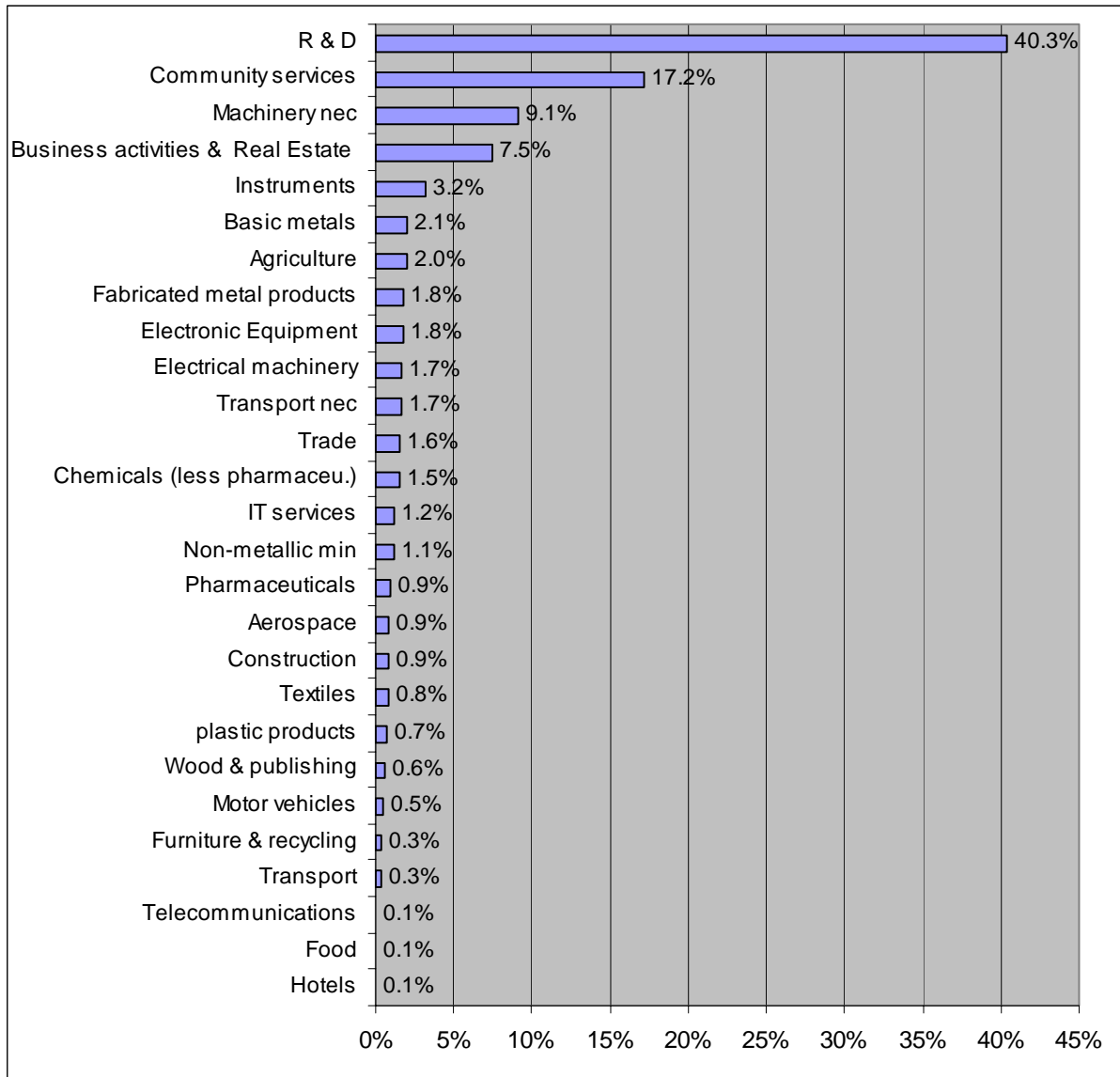
Notes: Specialisation index with EU15 as reference. Max specialisation: + 100. Min. specialisation: -100.  
 Source: OECD Basic Science and Technology Statistics 20052005, ANBERD 2005, own calculations

Figure 7. Shares of Business enterprise intramural expenditure on R&D (BERD) in the sector funded by government. 2003 last available year in OECD statistics.



Source: OECD Basic Science and Technology Statistics 2005, own calculations

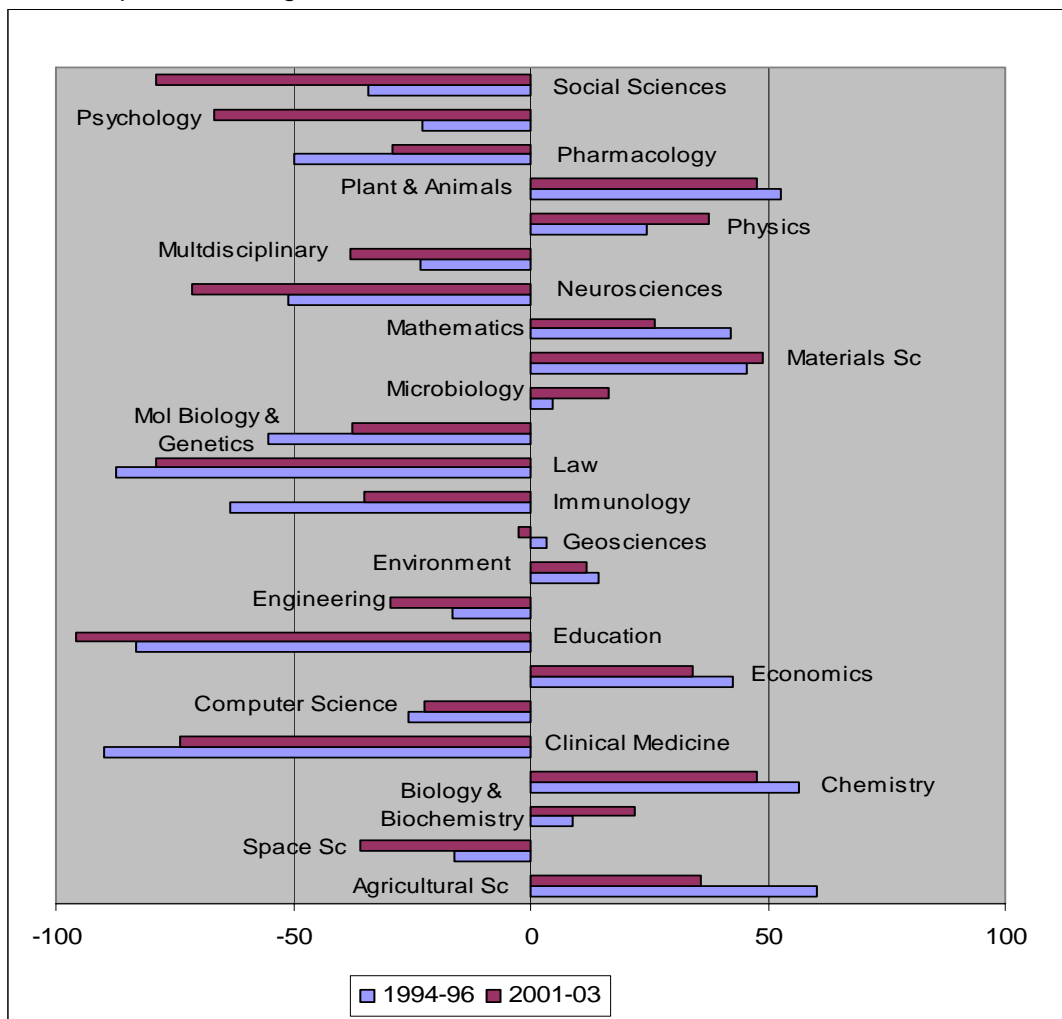
Figure 8. Shares of total government funding of Business enterprise intramural expenditure on R&D (BERD) by industrial sectors. 2003 last available year in OECD statistics.



Source: OECD Basic Science and Technology Statistics 2005, own calculations

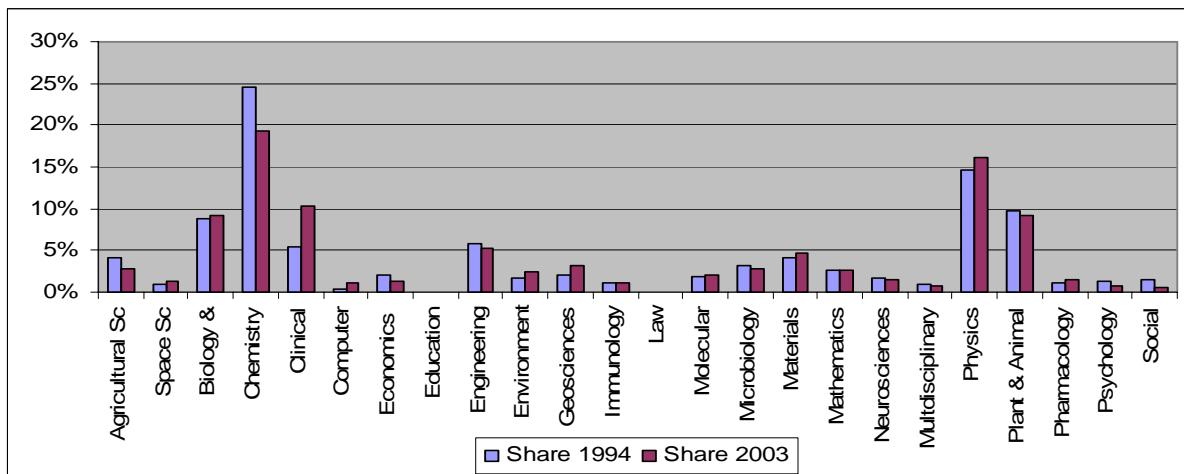
**BIBLIOMETRICS**

Figure 9. Number of publications by scientific field. 25 Scientific fields. Specialisation profile. Czech Republic. Averages 1993-1995 and 2001-2003.



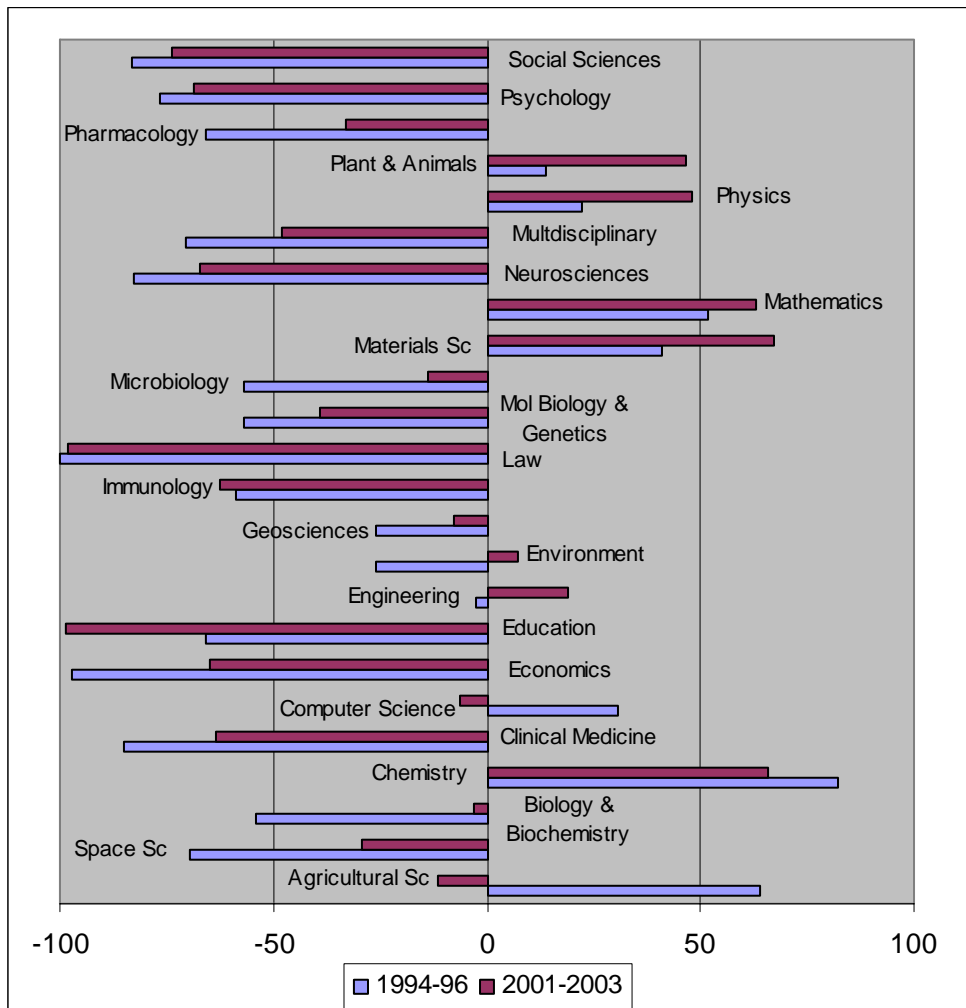
Notes: Specialisation index with EU15 as reference. Max specialisation: + 100. Min. specialisation: -100. Source: Thomson ISI, NSIODE 2005, own calculations.

Figure 10. Shares of total publications by scientific field. 25 Scientific fields. Czech Republic. 1994 and 2003.



Source: Thomson ISI, NSIODE 2005.

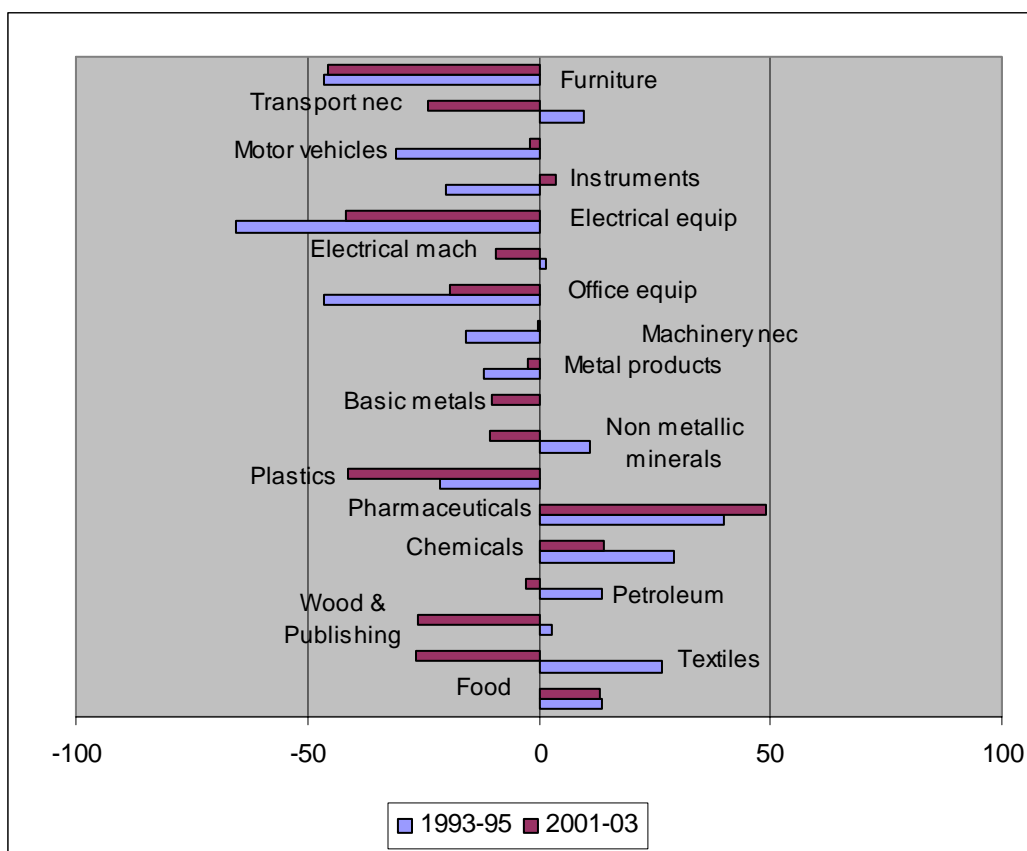
Figure 11. Number of citations by scientific field. 25 scientific fields. Specialisation profile. Czech republic. Averages 1994-1996 and 2001-2003. Five years citation window. (i.e. citations to papers published in the period 1989-1991 and in the period 1997-1999).



Notes: Specialisation index with EU15 as reference. Max specialisation: + 100. Min. specialisation: -100.  
 Source: Thomson ISI, NSIODE 2005, own calculations.

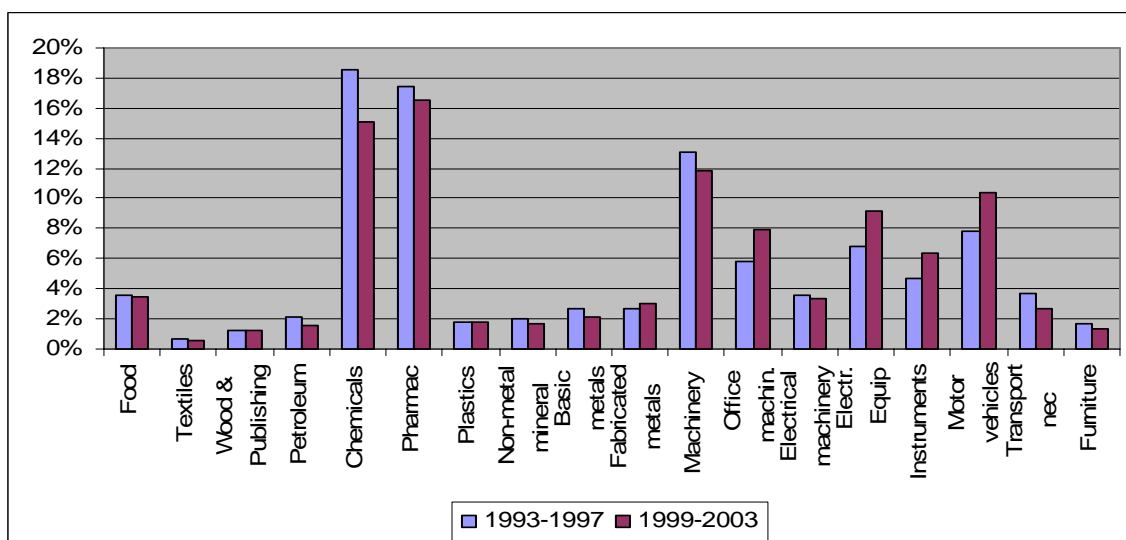
**PATENTS**

Figure 12. Number of patents by industrial sector. 18 sectors in manufacturing. Specialisation profile. Czech Republic. Averages 1993-1995 and 2001-2003. Based on correspondence matrix ISI-SPRU-OST.



Notes: Specialisation index with EU15 as reference. Max specialisation: + 100. Min. specialisation: -100. Source: European Patent Office 2005, own calculations.

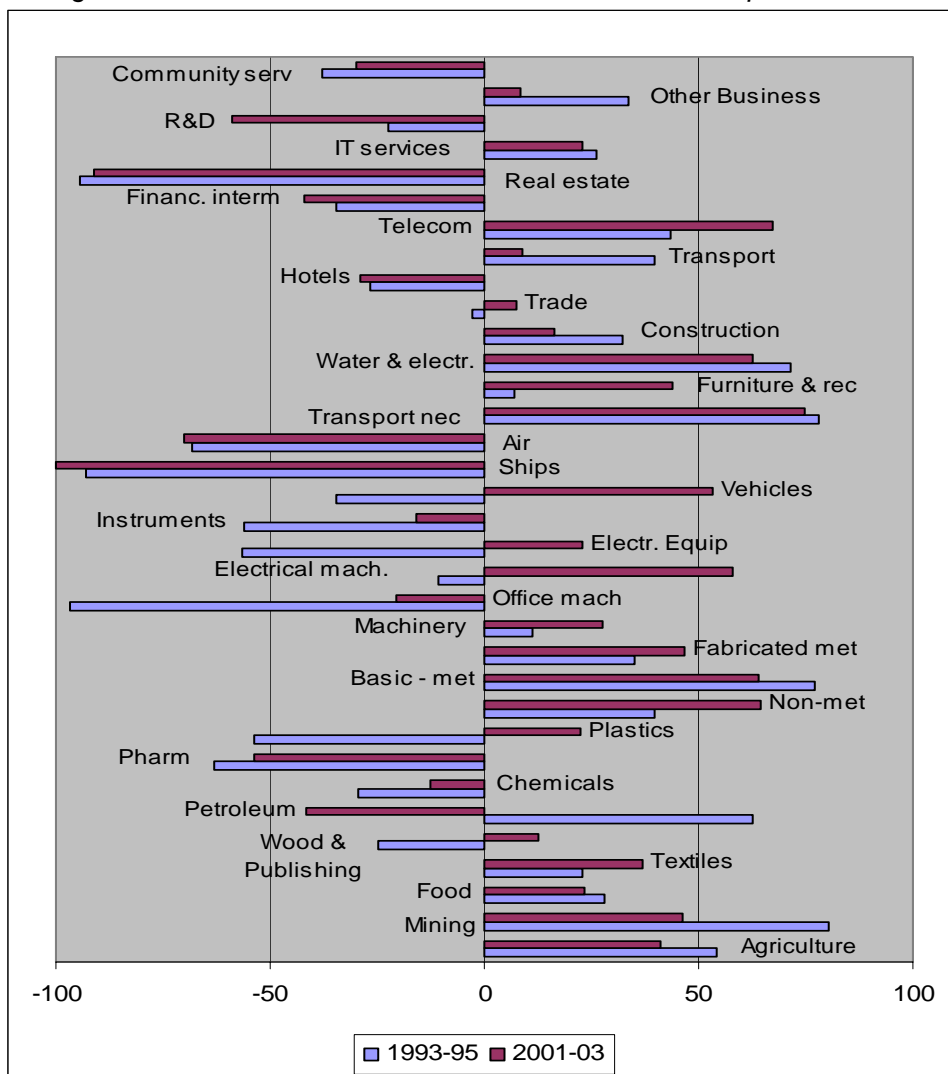
Figure 13. Shares of total patents by industrial sector. 18 sectors in manufacturing. Czech Republic. Averages 1993-1997 and 1999-2003. Based on correspondence matrix ISI-SPRU-OST.



Notes: Specialisation index with EU15 as reference. Max specialisation: + 100. Min. specialisation: -100. Source: European Patent Office 2005, own calculations.

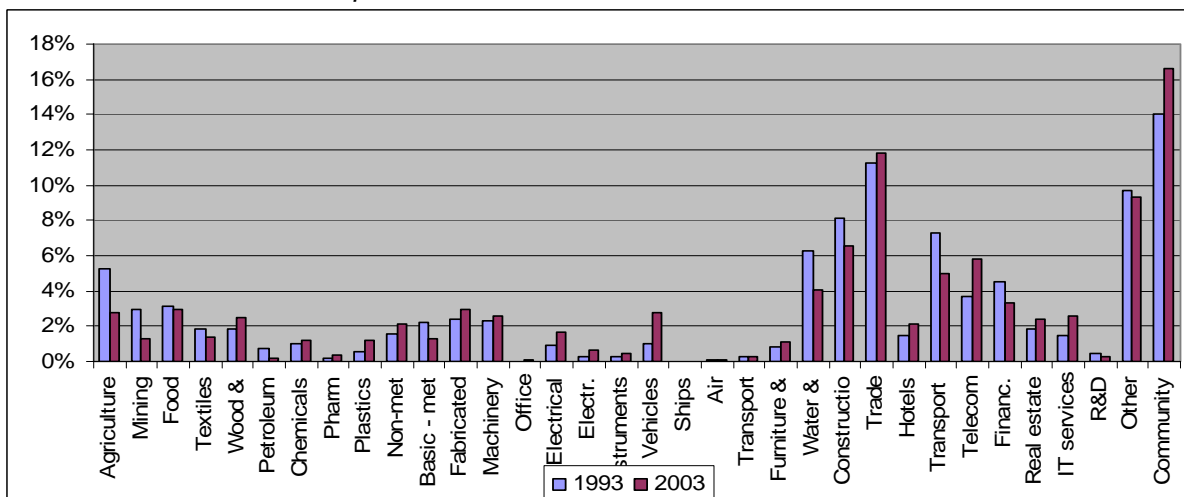
**ECONOMIC SPECIALISATION**

Figure 14. Value added by industrial sector. 34 sectors. Specialisation profile. Czech Republic. Averages 1993-1995 and 2001-2003. Million Euros. Current prices.



Notes: Specialisation index with EU15 as reference. Max specialisation: + 100. Min. specialisation: -100.  
Source: OECD, STAN 2005, own calculations.

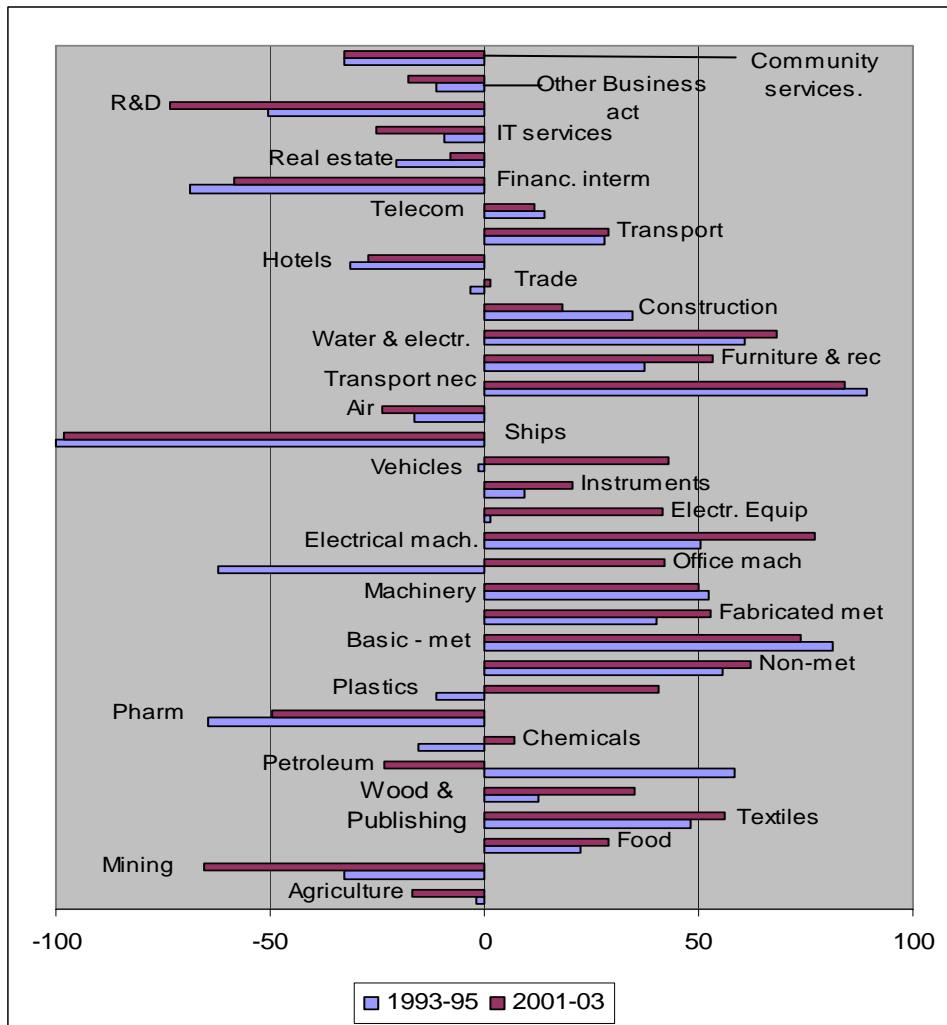
Figure 15. Shares of total value added by industrial sector. 34 sectors. Czech Republic. 1993 and 2003. Million Euros. Current prices.



Source: OECD, STAN, 2005.

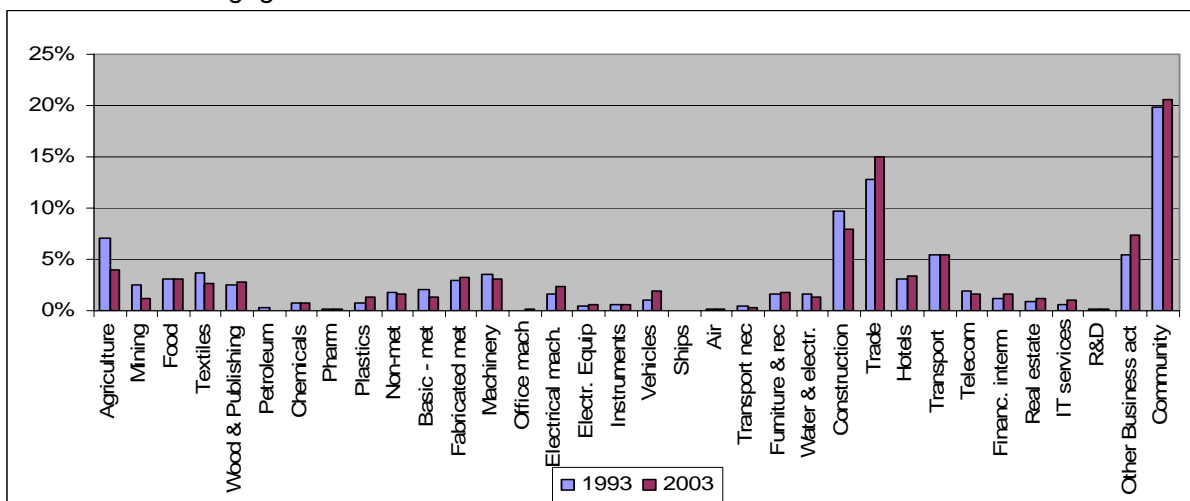


Figure 16. Employment by industrial sector. Specialisation profile. Czech Republic. 34 sectors. Averages 1993-1995 and 2001-2003. Numbers engaged – hundreds.



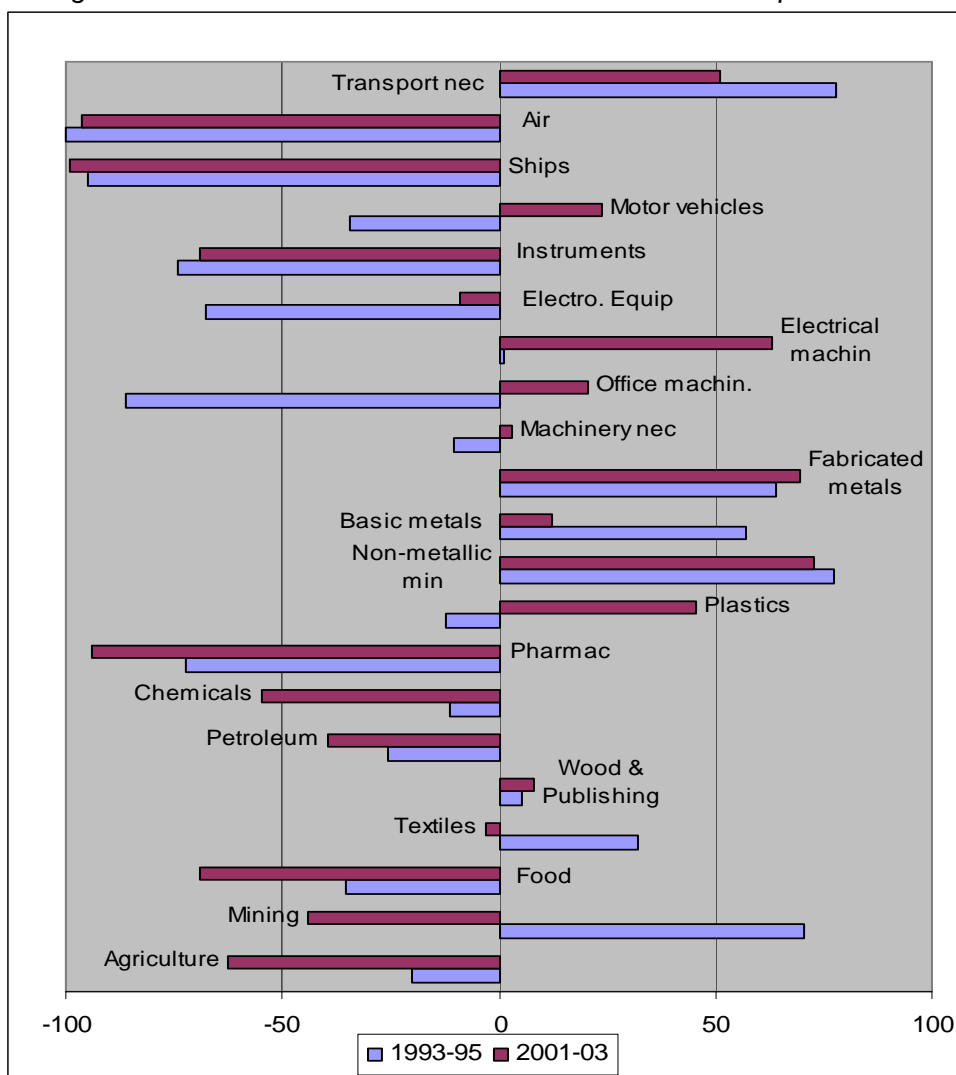
Notes: Specialisation index with EU15 as reference. Max specialisation: + 100. Min. specialisation: -100.  
Source: OECD, STAN, 2005, own calculations.

Figure 17. Shares of total employment by industrial sector. 34 sectors. Czech Republic. 1993 and 2003. Numbers engaged – hundreds.



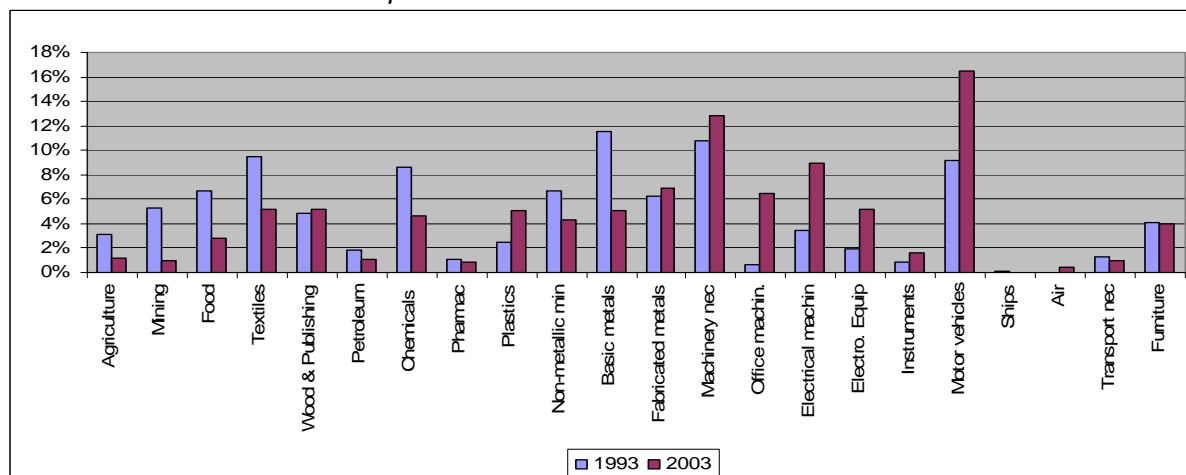
Source: OECD, STAN, 2005.

Figure 18. Exports by industrial sector. Specialisation profile. Czech Republic. 34 sectors. Averages 1993-1995 and 2001-2003. Thousand USD. Current prices.



Notes: Specialisation index with EU15 as reference. Max specialisation: + 100. Min. specialisation: -100. Source: UNIDO INDSTAT4 2005, ISIC Rev3 and COMTRADE, 2005, own calculations.

Figure 19. Shares of total exports by industrial sector. 34 sectors. Czech Republic. 1993 and 2003. Thousand USD. Current prices..



Source: UNIDO INDSTAT4 2005, ISIC Rev3 and COMTRADE, 2005, own calculations..

## CORRELATION ANALYSIS

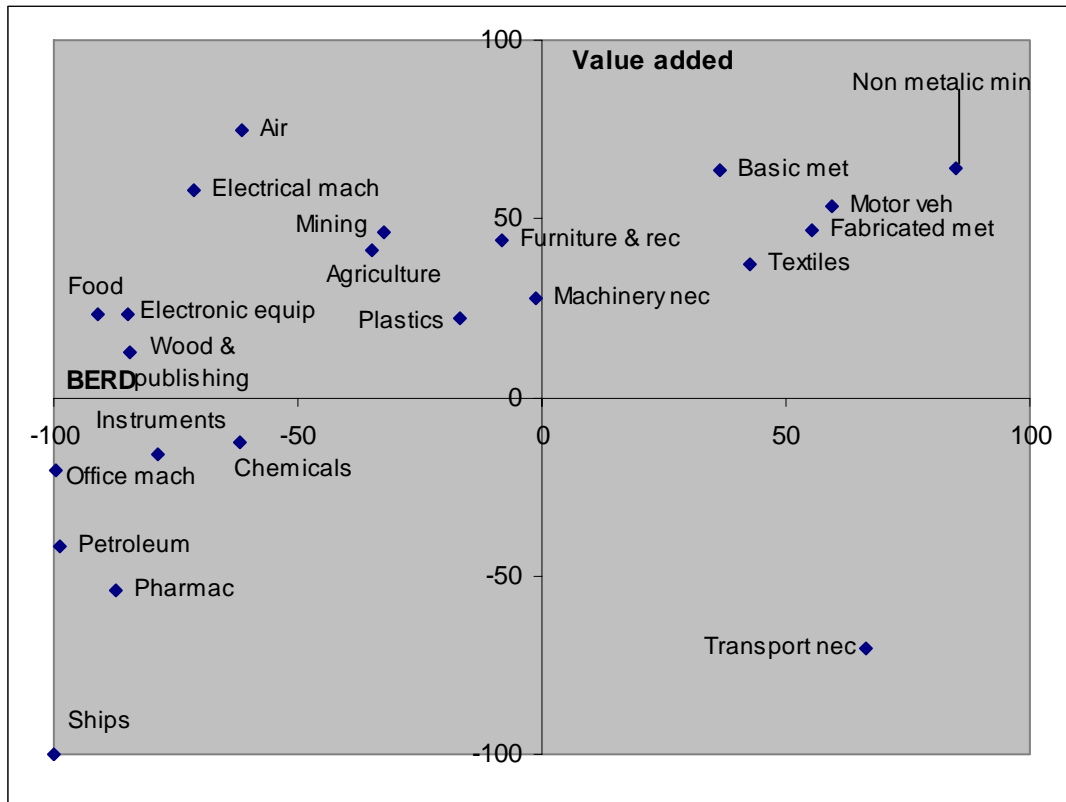
Table 2. Correlation analysis. Specialisation indexes BERD, Value added, Employment, Exports and patents. Czech Republic. Averages 1993-1995 and 2001-2003.

		CZ_BERD 9395	CZ_BERD 0103	CZ_PAT 9395	CZ_PAT 0103	CZ_VA 9395	CZ_VA 0103	CZ_EMP 9395	CZ_EMP 0103	CZ_EXP 9395	CZ_EXP 0103
CZ_BERD9395	Pearson Correlation Sig. (2-tailed)	1 .									
CZ_BERD0103	Pearson Correlation Sig. (2-tailed)	.584(**) .000	1 .								
CZ_PAT9395	Pearson Correlation Sig. (2-tailed)	-.021 .935	.013 .960	1 .							
CZ_PAT0103	Pearson Correlation Sig. (2-tailed)	-.347 .172	-.175 .502	.645(**) .005	1 .						
CZ_VA9395	Pearson Correlation Sig. (2-tailed)	.241 .185	.121 .509	.370 .144	.010 .970	1 .					
CZ_VA0103	Pearson Correlation Sig. (2-tailed)	.166 .363	.136 .459	-.233 .367	-.452 .069	.671(**) .000	1 .				
CZ_EMP9395	Pearson Correlation Sig. (2-tailed)	.492(**) .004	.274 .129	.115 .661	-.256 .321	.497(**) .003	.504(**) .003	1 .			
CZ_EMP0103	Pearson Correlation Sig. (2-tailed)	.305 .089	.165 .368	-.403 .109	-.608** .010	.103 .569	.531(**) .001	.802(**) .000	1 .		
CZ_EXP9395	Pearson Correlation Sig. (2-tailed)	.718(**) .000	.741(**) .000	.245 .343	-.255 .323	.440(*) .041	.348 .113	.676(**) .001	.473(*) .026	1 .	
CZ_EXP0103	Pearson Correlation Sig. (2-tailed)	.545(**) .009	.635(**) .002	-.381 .131	-.603* .010	-.027 .906	.366 .094	.582(**) .004	.811(**) .000	.646(**) .001	1 .

\*\* Correlation is significant at the 0.01 level (2-tailed).

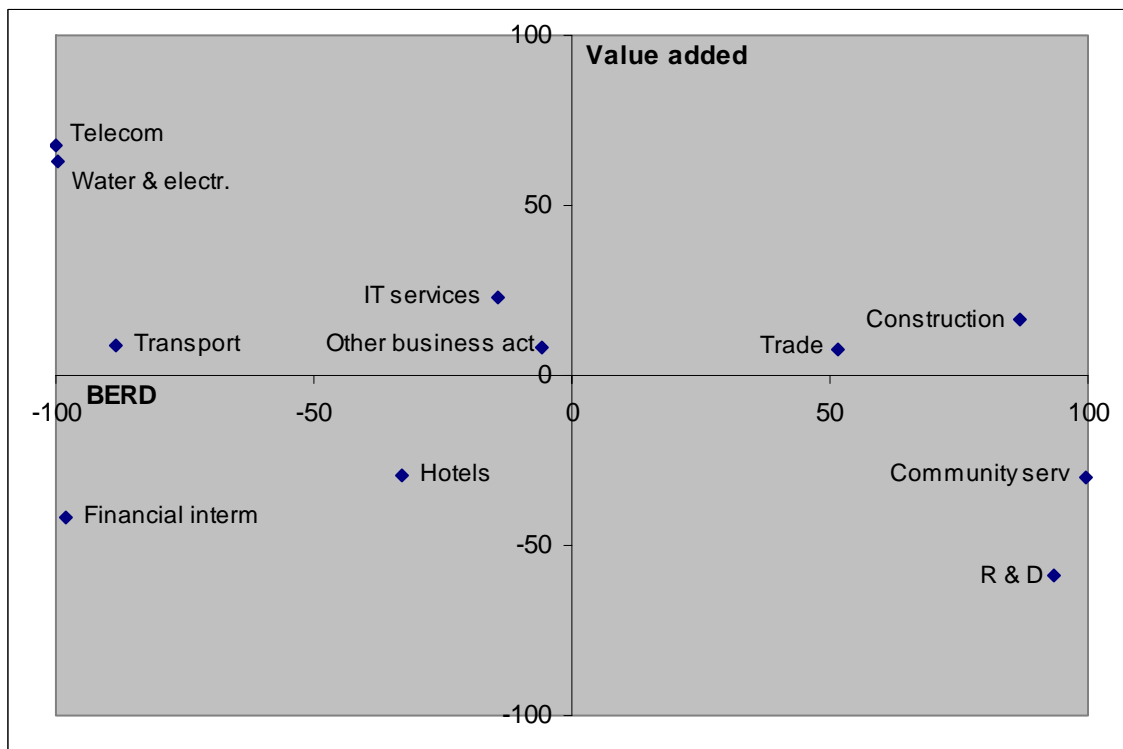
\* Correlation is significant at the 0.05 level (2-tailed).

Figure 20. BERD versus Value added specialisation in the primary and secondary industrial sectors. Czech Republic. Based on average values 2001- 2003.



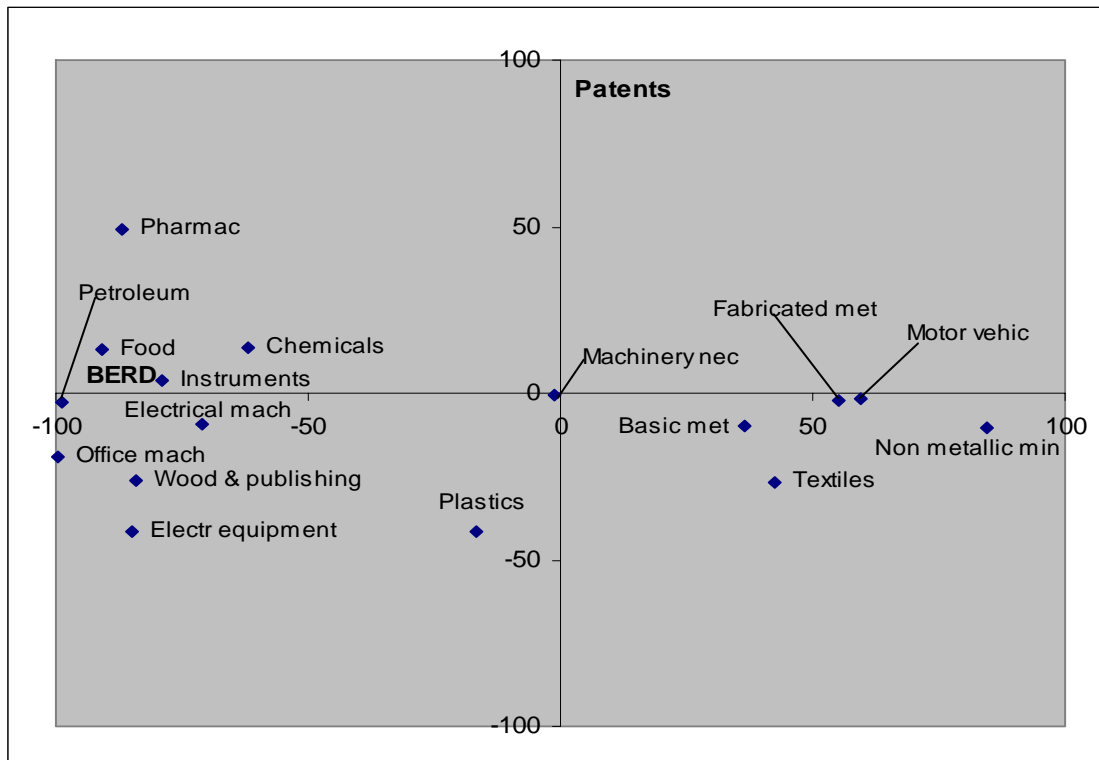
Notes: Specialisation index with EU15 as reference. Max specialisation: + 100. Min. specialisation: -100.  
Source: Own calculations

Figure 21. BERD versus Value added in the services. Specialisation indexes. Czech Republic. Based on average values 2001- 2003.



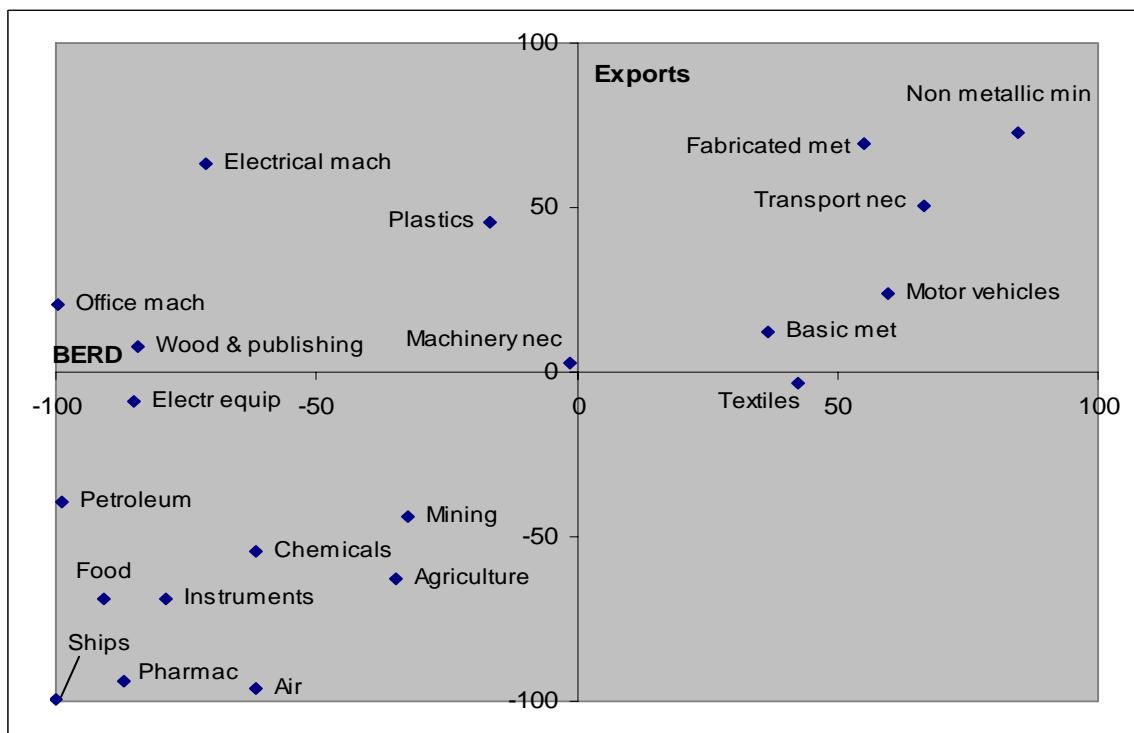
Notes: Specialisation index with EU15 as reference. Max specialisation: + 100. Min. specialisation: -100.  
Source: Own calculations

Figure 22. BERD versus patents. Specialisation indexes. Czech Republic. Based on average values 2001- 2003.



Notes: Specialisation index with EU15 as reference. Max specialisation: + 100. Min. specialisation: -100.  
Source: Own calculations

Figure 23. BERD versus exports. Specialisation indexes. Czech Republic. Based on average values 2001- 2003.



Notes: Specialisation index with EU15 as reference. Max specialisation: + 100. Min. specialisation: -100.  
Source: Own calculations

Table 3: Specialisation Profile

Areas of specialisation	Fast growing sectors >4.9%			Medium-Low growth sectors = <4.9%			Declining sectors <0		
	Increase Specialisation	Stable Specialisation	Loosing Specialisation	Increase Specialisation	Stable Specialisation	Loosing Specialisation	Increase Specialisation	Stable Specialisation	Loosing Specialisation
Specialisation BERD	45; 50-52;72 74; 75-99	352+359; 73	23	26; 28; 34		10-14;25; 27 29; 36-37			17-19
Specialisation Patents				15-16; 28 24ex2423	29	17-19; 20-22; 26;31;33			
Specialisation Value Added	50-52	352+359	23; 45; 55 60-63; 72;74	15-16;17-19; 20-22;25; 26; 28;29;31;32;34 36-37;64		01-05;10-14; 27; 40-41;45			
Specialisation Employment	50-52	352+359 60-63	23; 45	15-16;20-22 24ex2423;25 26; 28; 30; 31; 32;33;34 36-37;40-41	29	01-05; 27;64	17-19		
Specialisation Exports			352+359	20-22;25;28 29;30;31;32;34 36	26	10-14;27			17-19

Red numbers: Decrease specialisation from specialised to non specialised

Blue numbers: Increase specialisation from non specialised to specialised

**EXPLANATORY NOTES****ISIC v3 codes and sector description**

Agriculture	01-05
Mining	10-14
Food	15-16
Textiles	17-19
Wood & Publishing	20-22
Petroleum	23
Chemicals excluding pharmaceuticals	24ex2423
Pharmaceuticals	2423
Plastics	25
Non-metal minerals	26
Basic metals	27
Fabricated metals	28
Machinery nec	29
Office machinery	30
Electrical mach.	31
Electro. equip.	32
Instruments	33
Motor vehicles	34
Ships	351
Aerospace	353
Transport nec	352+359
Furniture & recycling	36-37
Water & electricity	40-41
Construction	45
Trade	50-52
Hotels	55
Transport	60-63
Telecoms	64
Financial intermediation	65-67
IT services	72
R & D	73
Other Business activities	74
Community services	75-99

**How to read specialisation profile figures**

Plotting specialisation indexes against each other is a method for visualising differences in specialisation patterns. The most interesting analytical dimension in this report is comparing business enterprise intramural R&D expenditure specialisation patterns with specialisation patterns in value added, employment, exports and technological specialisation (patents). The result of the plots is four distinct specialisation quadrants showing:

1. Sectors with **neither specialisation in BERD nor in the other analytical dimension** (lower left quadrant)
2. Sectors with **a specialisation in BERD and in the other analytical dimension** (upper right quadrant)
3. Sectors with **a specialisation in BERD but none in the other analytical dimension** (lower right quadrant)
4. Sectors that display a **specialisation in the other analytical dimension but not in BERD** (upper left quadrant)

If there is a good match between BERD and, say, value added specialisation patterns we expect to find all sectors either in the lower left or in the upper right quadrant. Sectors in the upper left or in the lower right of the graphs indicate anomalies, that is, specialisation in one dimension and non-specialisation in the other. If there are many sectors in these quadrants the graph indicates lack of correlation between BERD and, say, economic specialisation.

*BERD and Value Added specialisation – an example*

