



## COUNTRY SPECIALISATION REPORT

**Country: Poland**

**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 - POLAND

### MAIN FINDINGS

Poland presents a consistent picture in terms of economic specialisation, i.e. value added, employment and exports, particularly in the manufacturing sector. Thus, sectors such as furniture, transport equipment, shipbuilding, basic metals, plastics, textiles and agriculture are specialised in all these fields. Moreover, there exist significant correlations (Table 2) between value added with BERD for both periods, mainly again in the manufacturing sector (Figure 20).

Poland was one of the countries in which R&D intensity declined by 28.2% over the 1994 -2003 period (Figure 1). This decline can be attributed mainly to the steep reduction of BERD and secondarily to the reduction of GOVERD. Higher education expenditure on R&D was the only figure that grew slightly. This decline in business expenditure on R&D is also depicted when we examine GERD by source of funds. Thus, during 2003, the share of business funding of GERD was 30.4%, down from 39.5% during 1994. (Table 2) In contrast, the share of public funding of research grew from 57.3% in 1994 to 62.7% in 2003. In addition, funding from abroad was also tripled over the same period and during 2003 accounted for 4.6% of GERD. Despite this significant increase, funding from abroad in Poland as a share of GERD remains significantly lower than most EU15 countries.

Moreover, when we examine GERD by type of research (Figure 2) we can observe a slight increase in the share of applied research, which accounted for 38.8% of GERD during 2003. At the same time, the shares of applied research and experimental research declined over the period of reference and reached 25.7% and 35.5% respectively. One of the underlying reasons for the high shares of applied research in Poland compared to most EU countries can be attributed to the small and declining role of firms with regard to research and the dominant position of universities and research centers. Indicatively, BERD during 2003 accounted for 27.4% of GERD. In addition to that it seems that the private R&D base in Poland is relatively weak and has higher propensity to fund research in universities and PRO's than in house, compared to most EU15 countries.

Despite the dominant role of universities and public research organisations, Poland appears underspecialised in GBAORD (Figure 3) in most socioeconomic objectives, with the exception of non – oriented research and industrial research during 2003. However, due to the limited data, it is difficult to draw robust conclusions<sup>1</sup>.

As far as HERD by scientific field is concerned (Figure 4), no significant changes occurred over the 1995-2003 period with the exception of the increase of the share of social sciences from 7.5% in 1995 to 18.2% during 2003. Finally, engineering and natural sciences are still the dominant scientific fields, since together they accounted for 59.5% of HERD during 2003. A similar picture holds for GOVERD (Figure 5) by field of science, where engineering and natural sciences accounted for 38.4% and 29% of GOVERD respectively during 2003.

By looking at the BERD specialisation (Figure 6) it appears that POLAND is specialised in a small number of sectors for both periods of reference. Moreover these sectors, basic metals,

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<sup>1</sup> Data on GBAORD in Poland only for 2003.

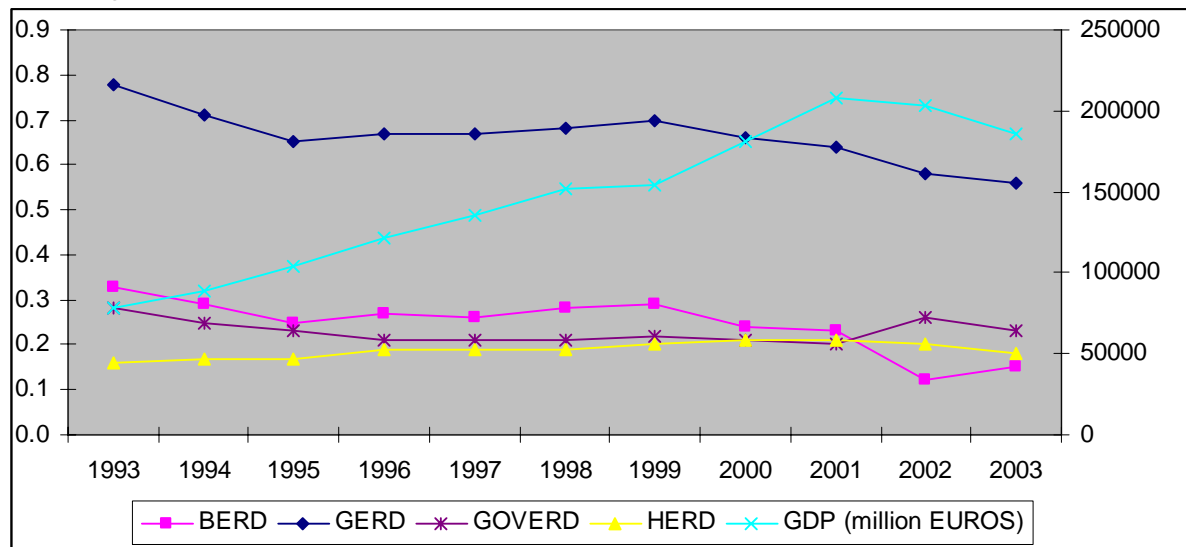
mining, agriculture, shipbuilding and community services, are of low R&D intensity with the exception of telecommunications. At the same time, it appears that the government (Figure 8) provides funding for research in sectors that are of high value added such as machinery, pharmaceuticals, electronic equipment and chemicals.

Regarding scientific specialisation, Poland appears specialised almost exclusively in the fields of natural sciences such as physics, mathematics, chemistry and material sciences. In addition, Poland over the 1993 – 2003 period lost its specialisation in the fields of engineering and exploitation of space, while it became specialised in engineering.

In terms of technological specialisation, Poland is specialised in a number of sectors such as transport equipment, basic metals, pharmaceuticals, chemicals, food and wood and publishing, that are not however related with the sectors in BERD in which it is specialised (Figure 22).

**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). Poland. 1993-2003.



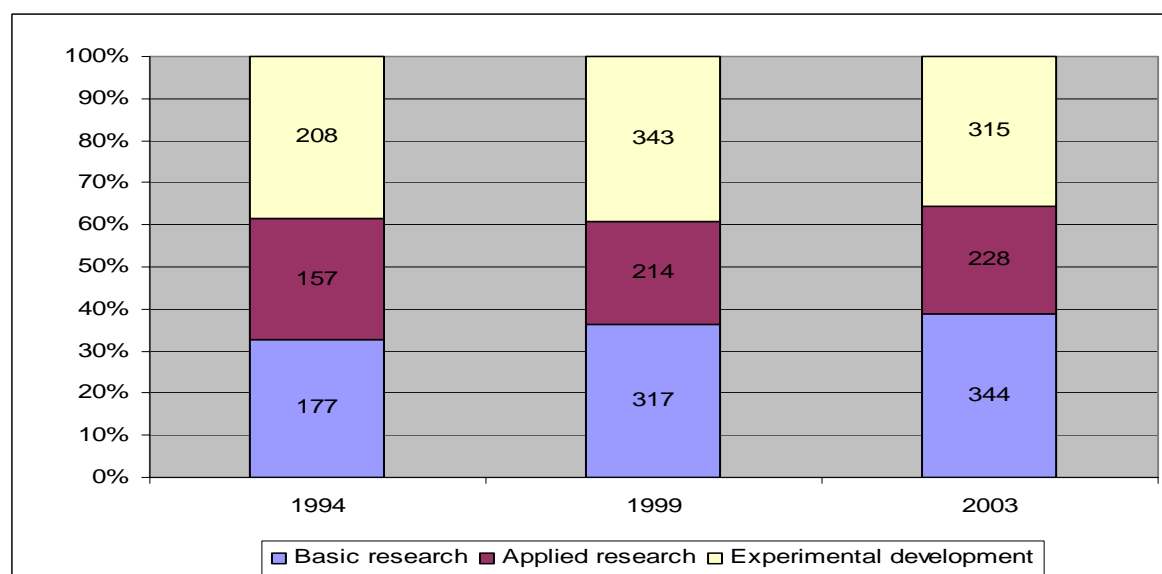
Source: OECD OFFBERD 2005

Table 1. R&D expenditure by sector of performance and source of funds . Poland. 1994 and 2003. Million Euros. Current prices.

	GOVERD		BERD		HERD		Non profit		Total	
	1994	2003	1994	2003	1994	2003	1994	2003	1994	2003
Business	63.7	57.7	171.3	236.2	17.1	19.7	0.0	0.4	252.1	314.0
Government	153.9	332.7	89.4	43.2	122.6	274.4	0.1	0.3	366.0	650.7
Higher Education	0.4	1.2	0.2	0.3	8.8	20.3	0.0	0.0	9.4	21.7
Non profit	1.1	1.3	0.2	0.4	1.1	0.4	0.0	0.9	2.4	3.0
From Abroad	4.9	29.0	2.3	4.2	1.4	14.3	0.0	0.5	8.6	48.1
Total	224.0	421.9	263.4	284.4	151.0	329.1	0.1	2.0	638.5	1037.5

Source: OECD OFFBERD 2005

Figure 2. GERD by type of research. Poland. 1994, 1999 and 2003

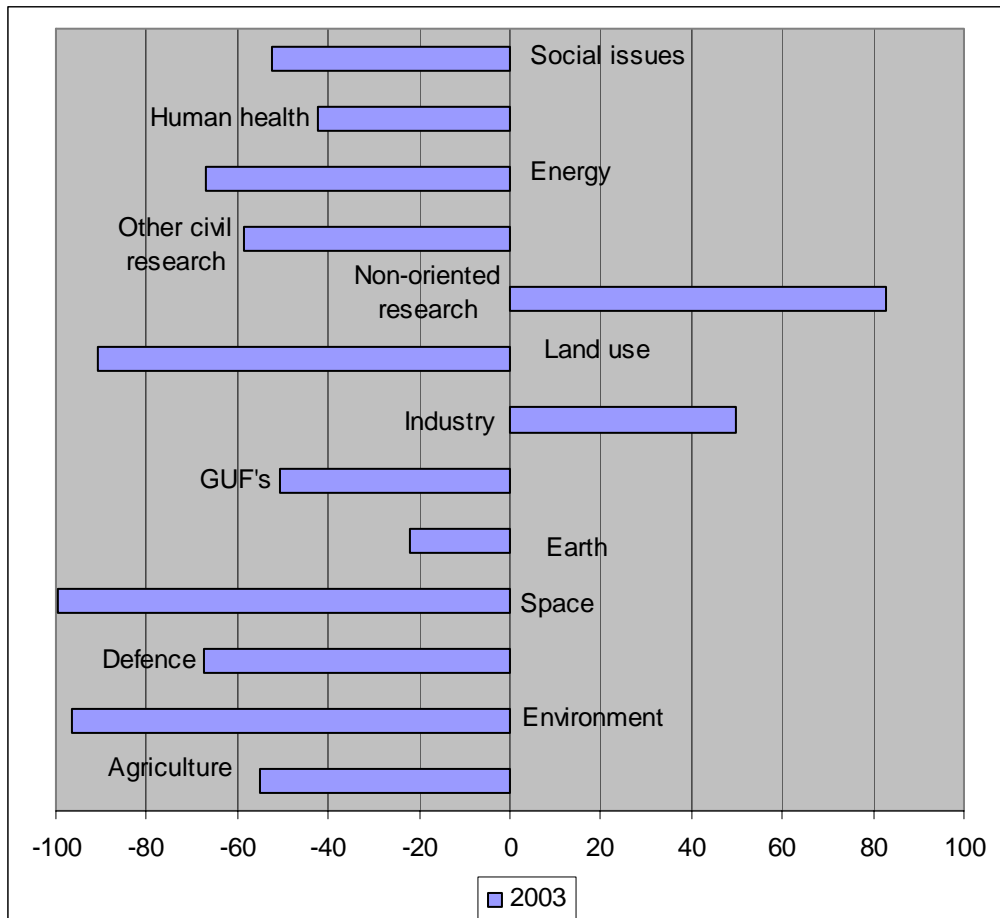


Source: OECD OFFBERD 2005

**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. Poland. 2003.

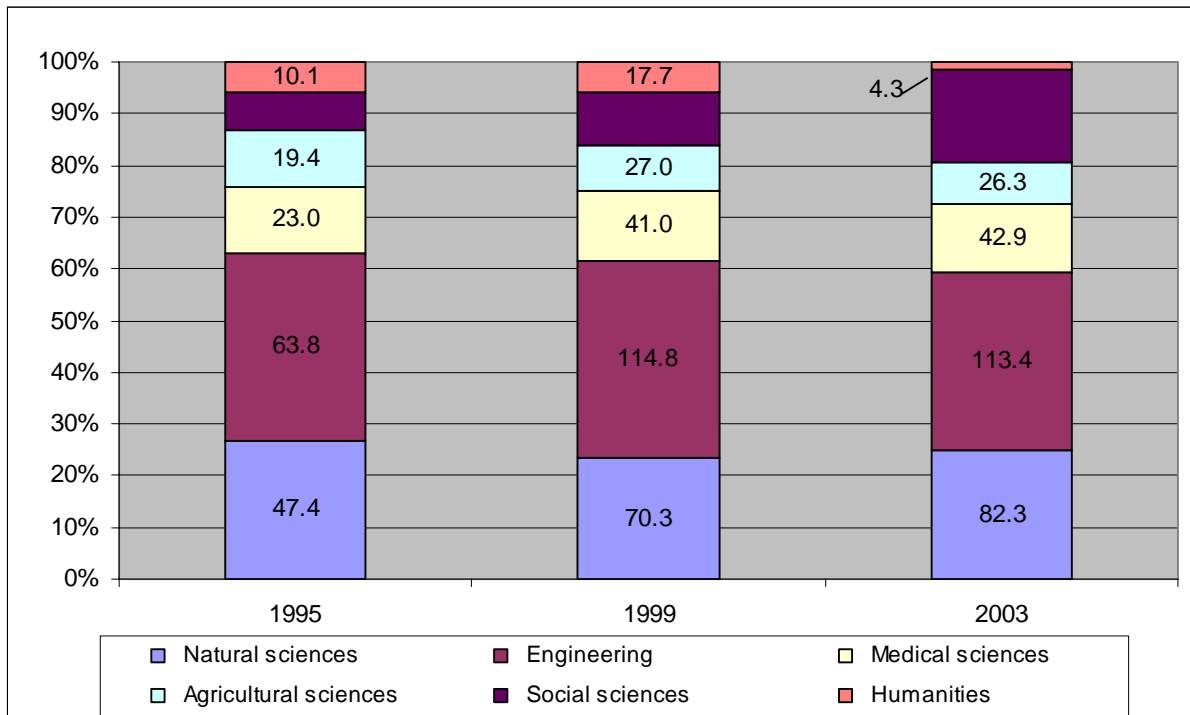


Notes: Specialisation index with EU15 as reference. Max specialisation: + 100. Min. specialisation: -100.  
 Source: OECD Basic Science and Technology Statistics 2005, own calculations.



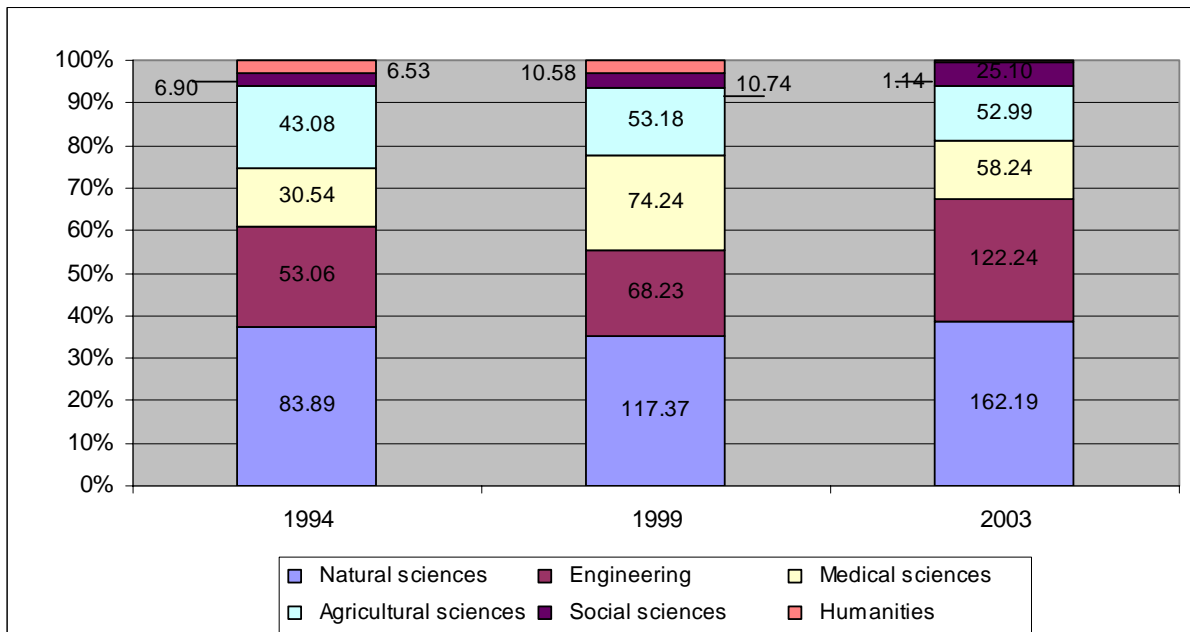
**HERD by field of science**

Figure 4. Expenditure on R&D in the Higher Education Sector (HERD) by field of science. Poland. 1995, 1999 and 2003. Per cent of total HERD and in million Euros.



Source: OECD Basic Science and Technology Statistics 2005.

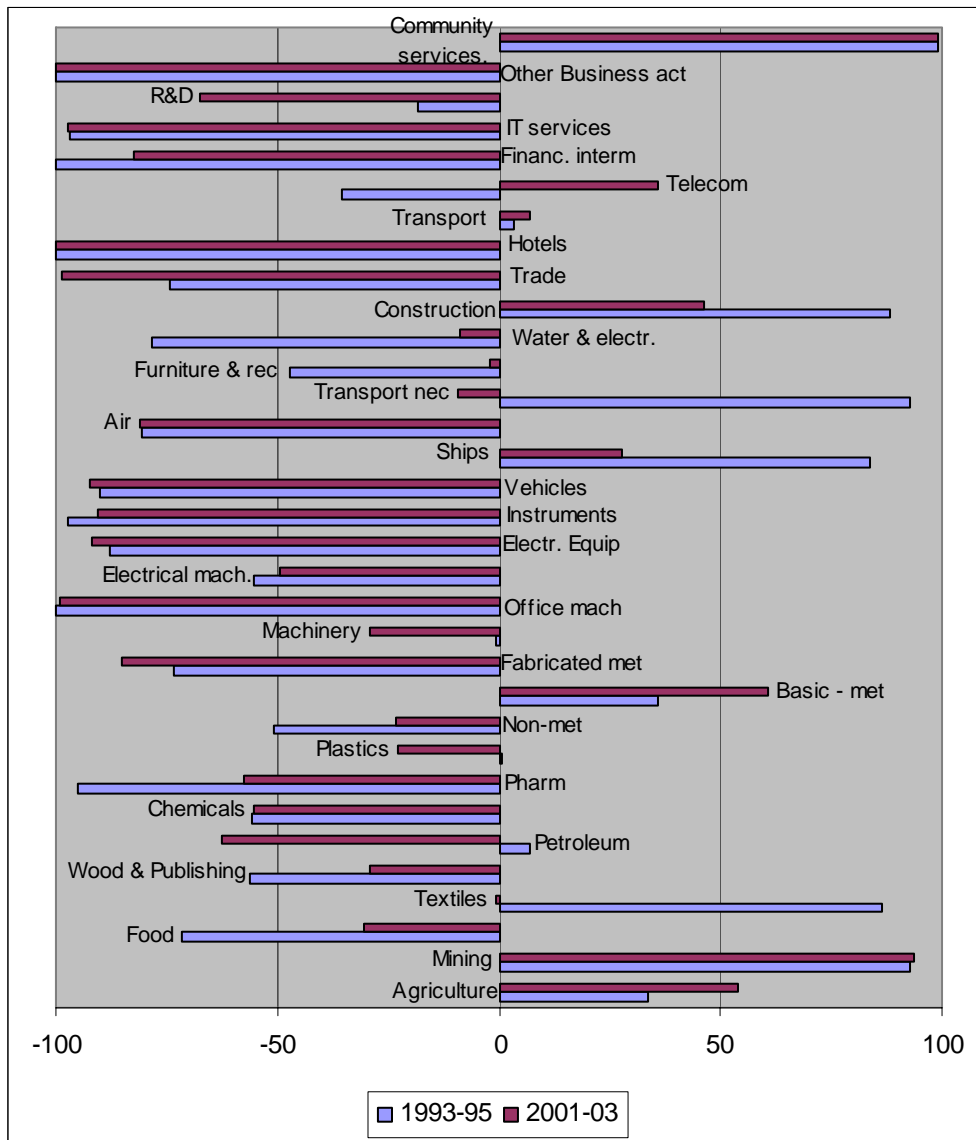
Figure 5. Expenditure on R&D in the Government sector (GOVERD) by field of science. Specialisation profile. Poland. 1994, 1999 and 2003.



Source: OECD Basic Science and Technology Statistics 2005

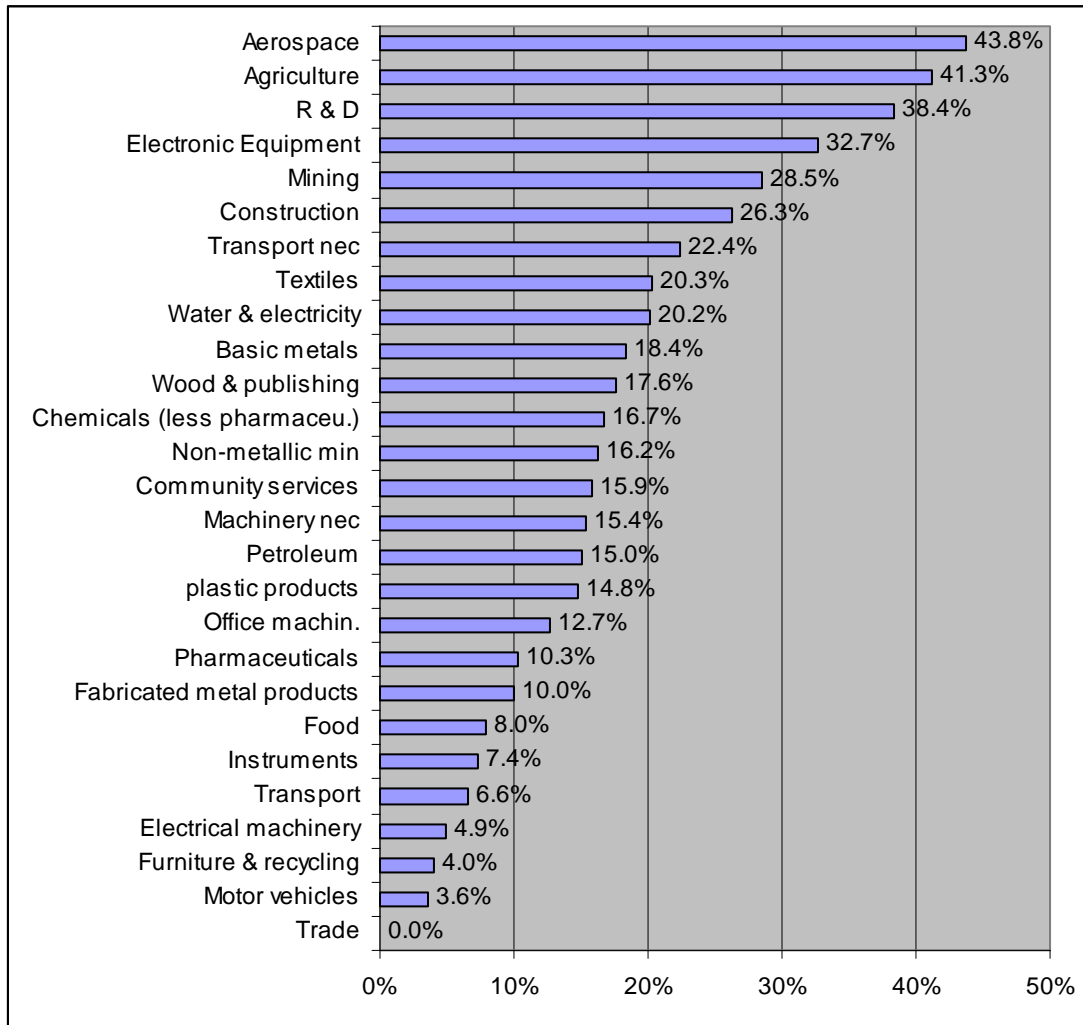
**BUSINESS ENTERPRISE INTRAMURAL EXPENDITURE ON R & D (BERD)**

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



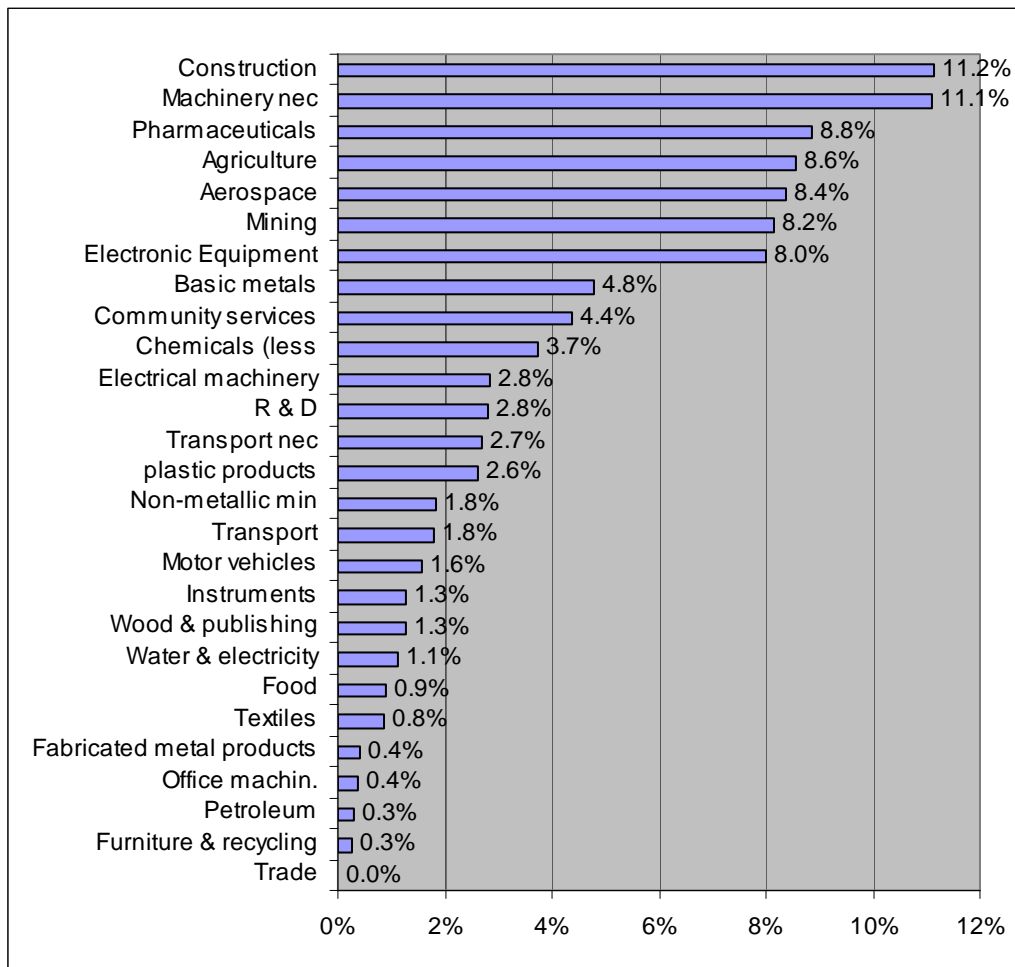
Notes: Specialisation index with EU15 as reference. Max specialisation: + 100. Min. specialisation: -100.  
 Source: OECD Basic Science and Technology Statistics 20052005, ANBERD 2005, own calculations

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



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

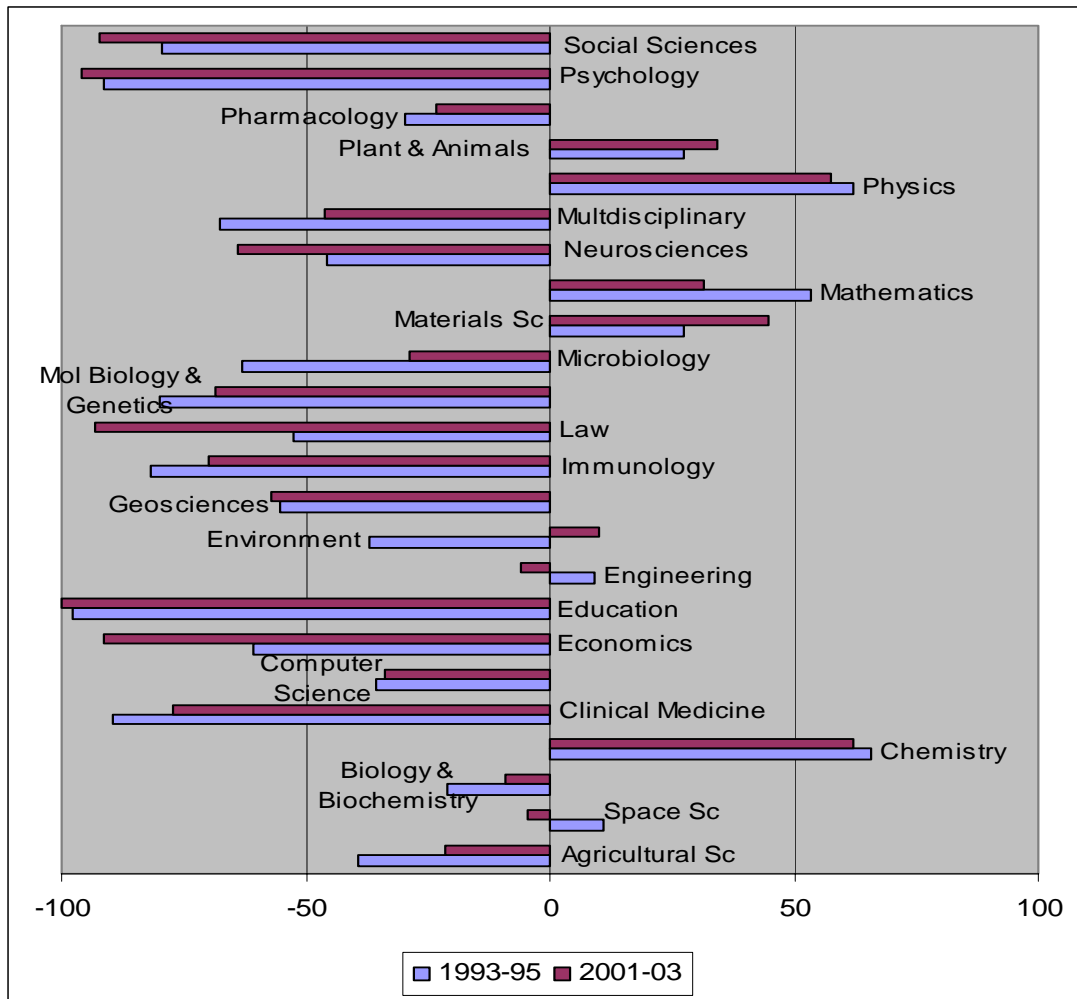
Figure 8. Shares of total government funding of Business enterprise intramural expenditure on R&D (BERD) by industrial sectors. 2003.



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

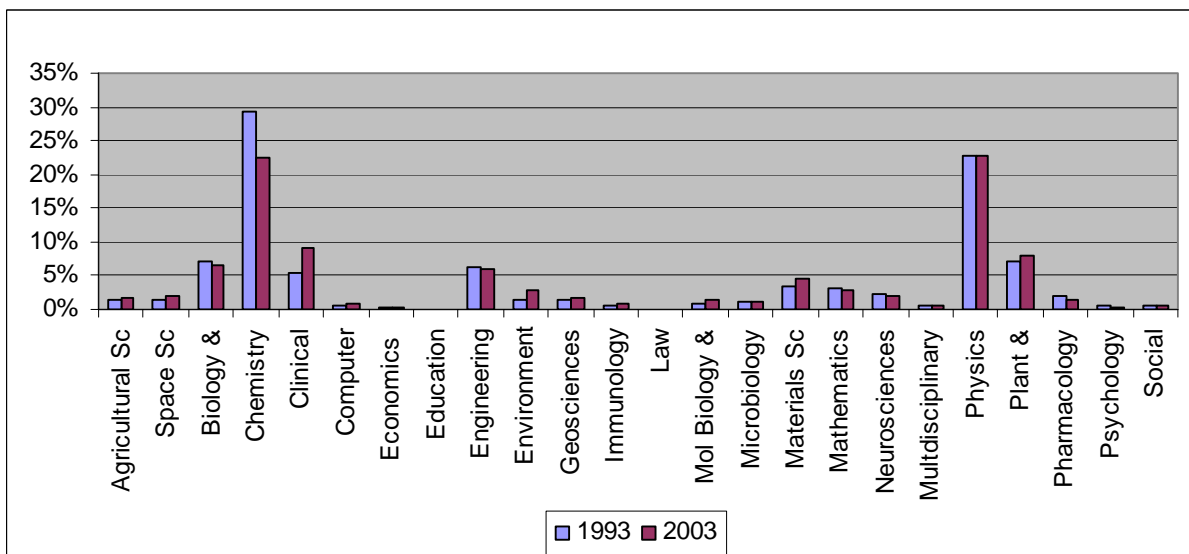
**BIBLIOMETRICS**

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



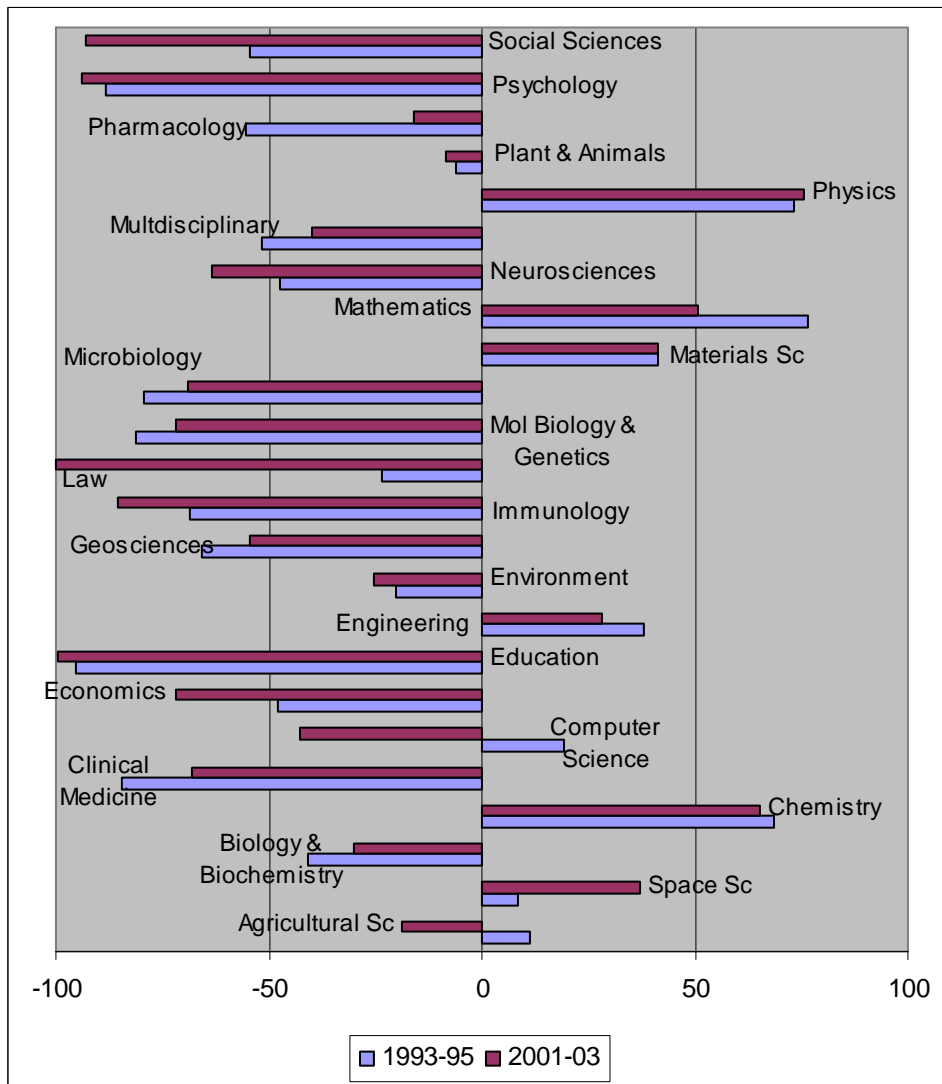
Notes: Specialisation index with EU15 as reference. Max specialisation: + 100. Min. specialisation: -100.  
 Source: Thomson ISI, NSIODE 2005, own calculations.

Figure 10. Shares of total publications by scientific field. 25 Scientific fields. Poland. 1993 and 2003.



Source: Thomson ISI, NSIODE 2005.

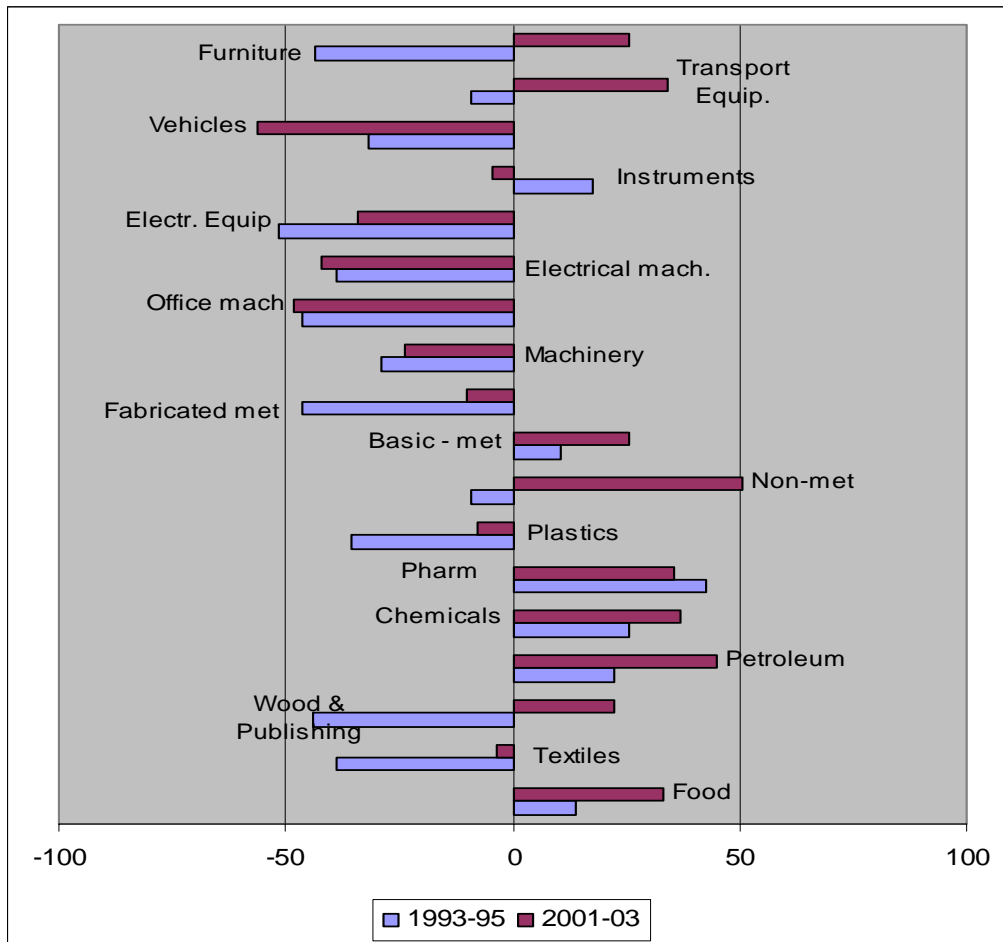
Figure 11. Number of citations by scientific field. 25 scientific fields. Specialisation profile. Poland. Averages 1993-1995 and 2001-2003. Five years citation window. (i.e. citations to papers published in the period 1989-1991 and in the period 1997-1999).



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

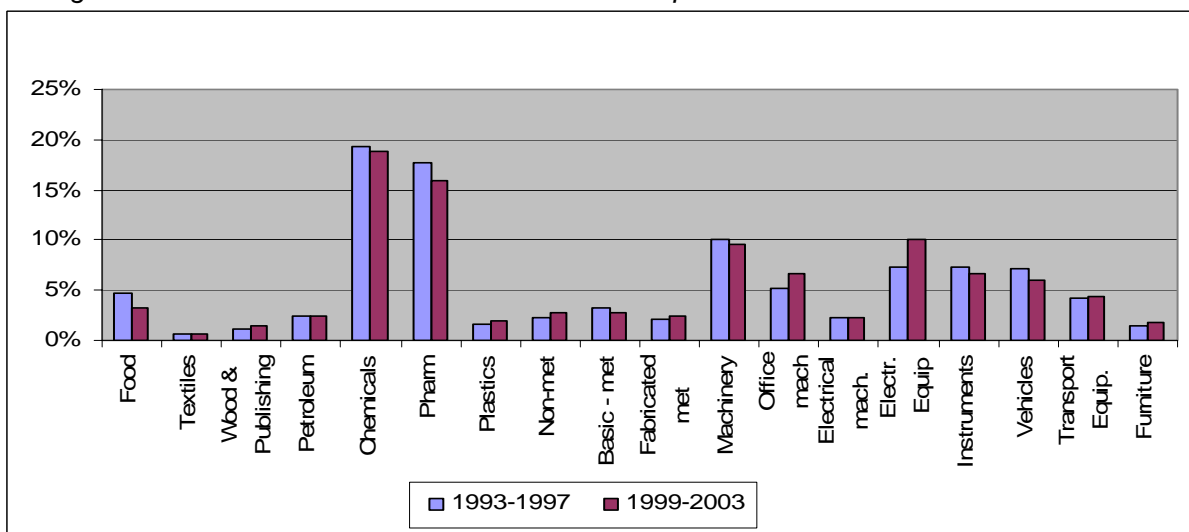
**PATENTS**

Figure 12. Number of patents by industrial sector. 18 sectors in manufacturing. Specialisation profile. Poland. 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.

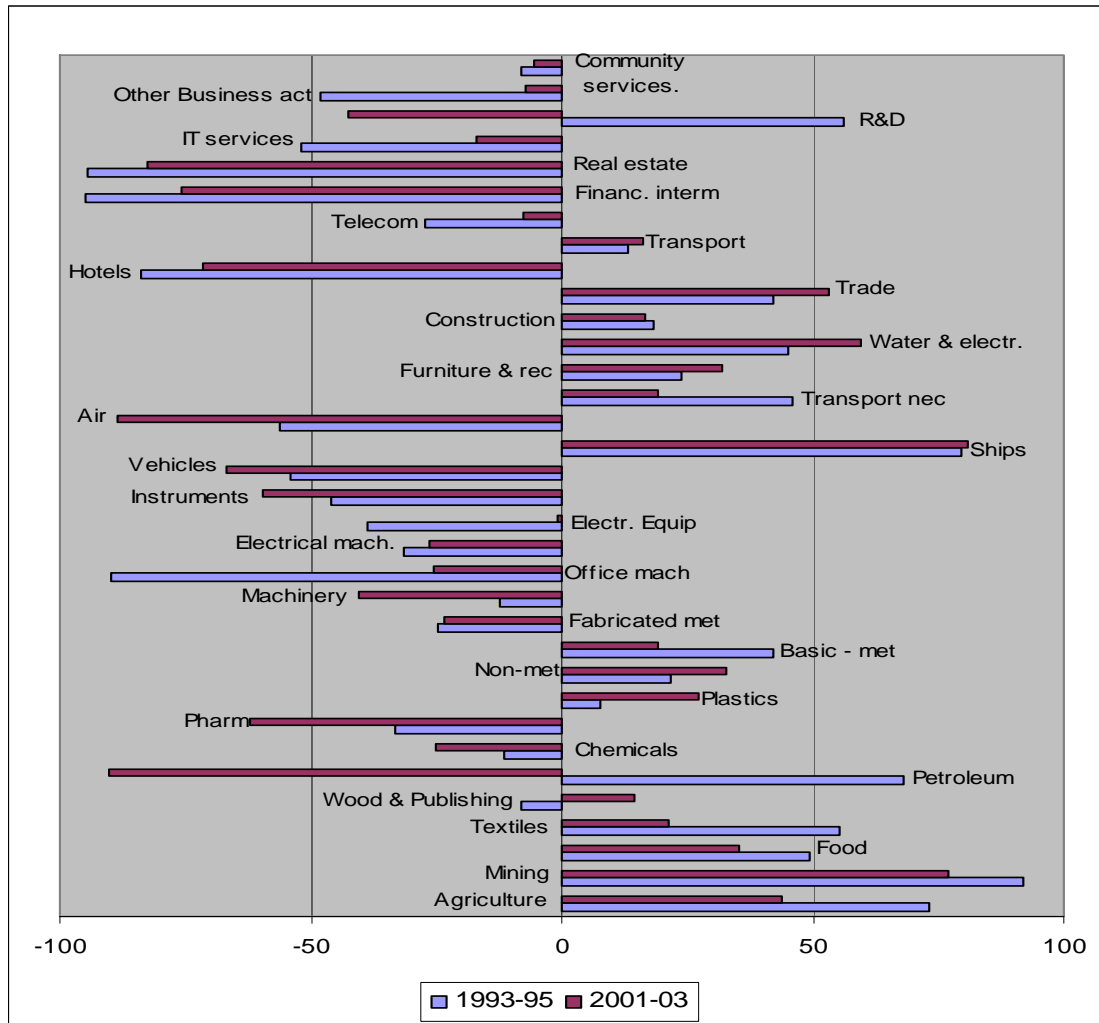
Figure 13. Shares of total patents by industrial sector. 18 sectors in manufacturing. Poland. Averages 1993-1997 and 1999-2003. Based on correspondence matrix ISI-SPRU-OST.



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

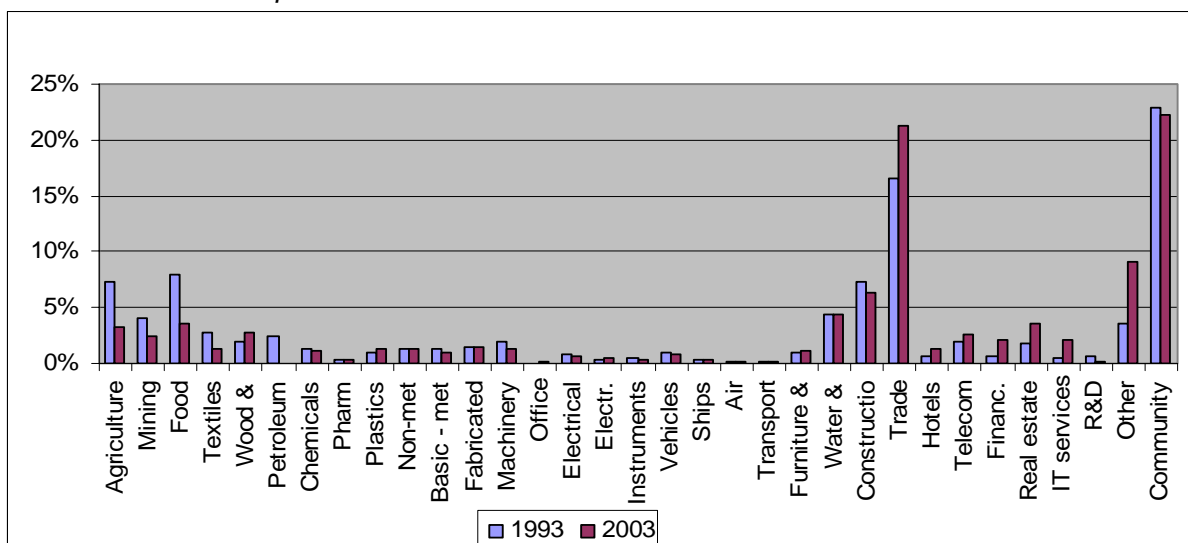
**ECONOMIC SPECIALISATION**

Figure 14. Value added by industrial sector. 34 sectors. Specialisation profile. Poland. 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.

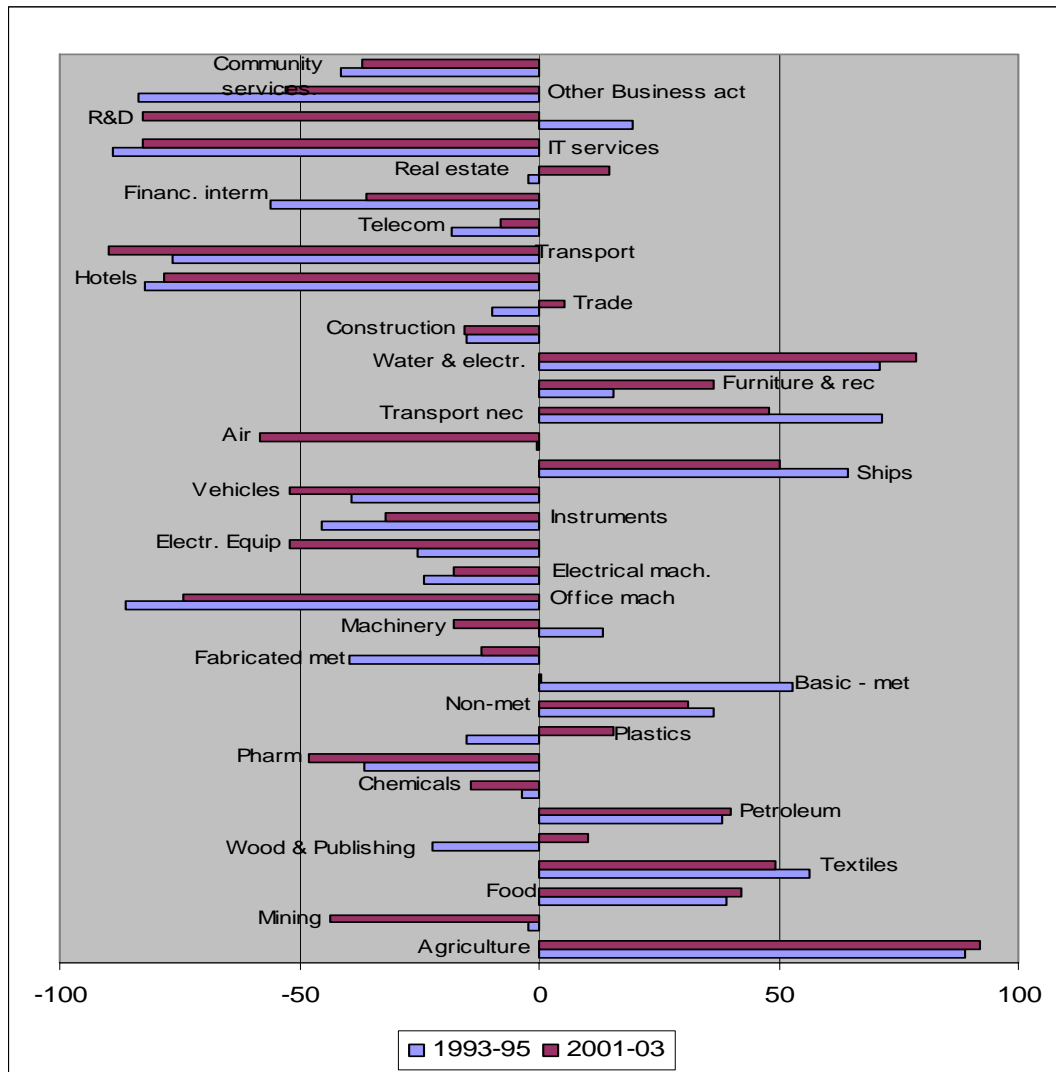
Figure 15. Shares of total value added by industrial sector. 34 sectors. Poland. 1993 and 2003. Million Euros. Current prices.



Source: OECD, STAN, 2005.

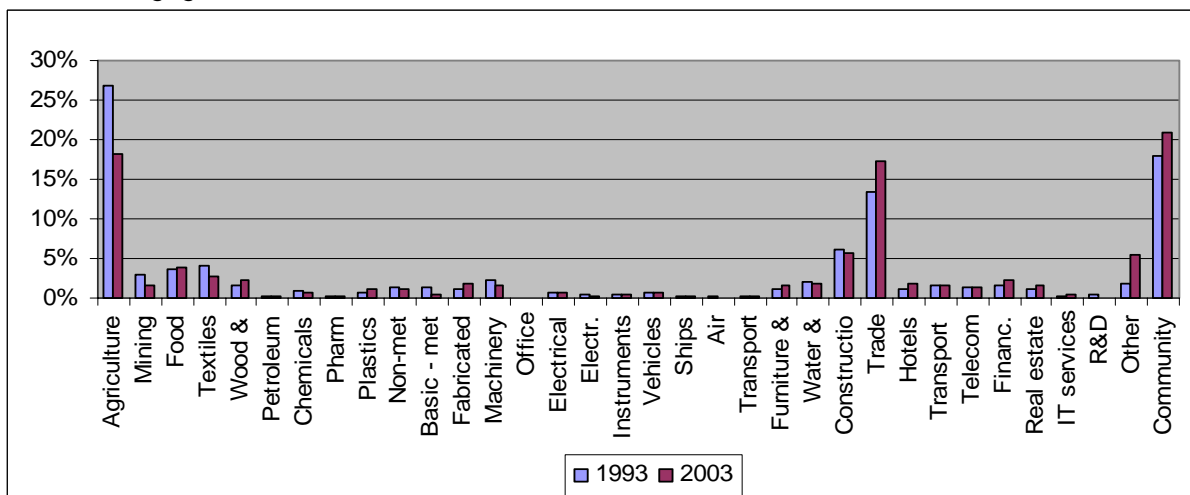


Figure 16. Employment by industrial sector. Specialisation profile. Poland. 34 sectors. Averages 1993-1995 and 2001-2003. Numbers engaged – hundreds.



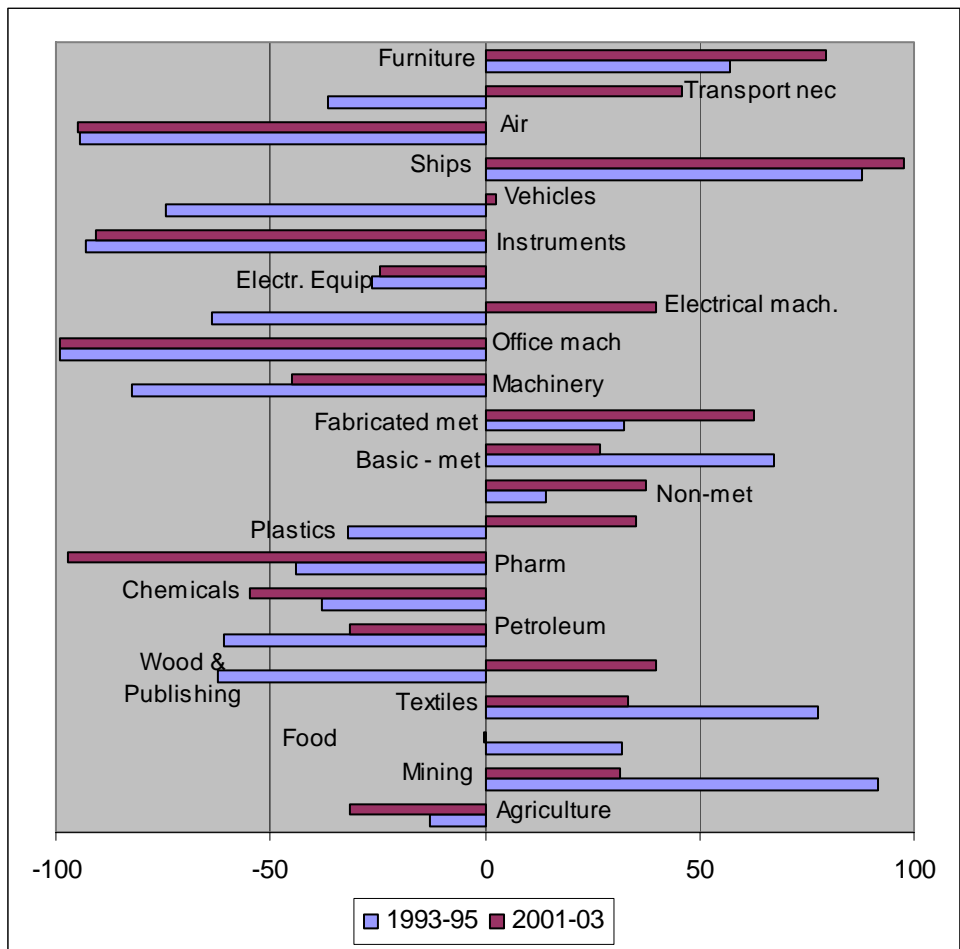
Notes: Specialisation index with EU15 as reference. Max specialisation: + 100. Min. specialisation: -100. Source: OECD, STAN, 2005, own calculations.

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



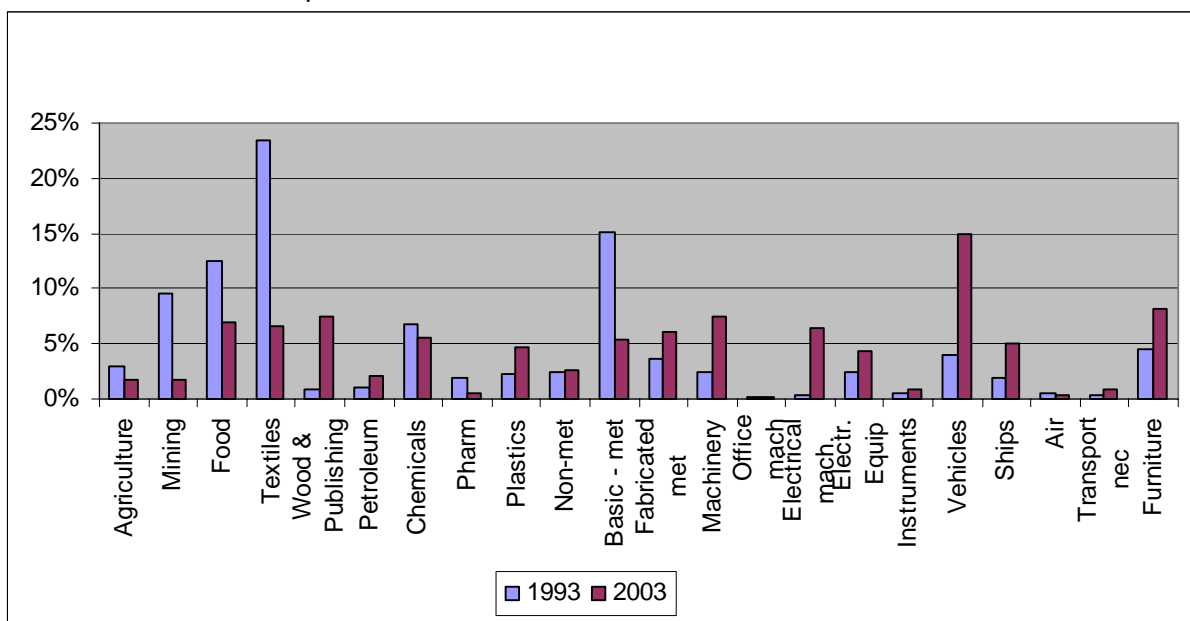
Source: OECD, STAN, 2005.

Figure 18. Exports by industrial sector. Specialisation profile. Poland. 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. Poland. 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. Poland. Averages 1993-1995 and 2001-2003.*

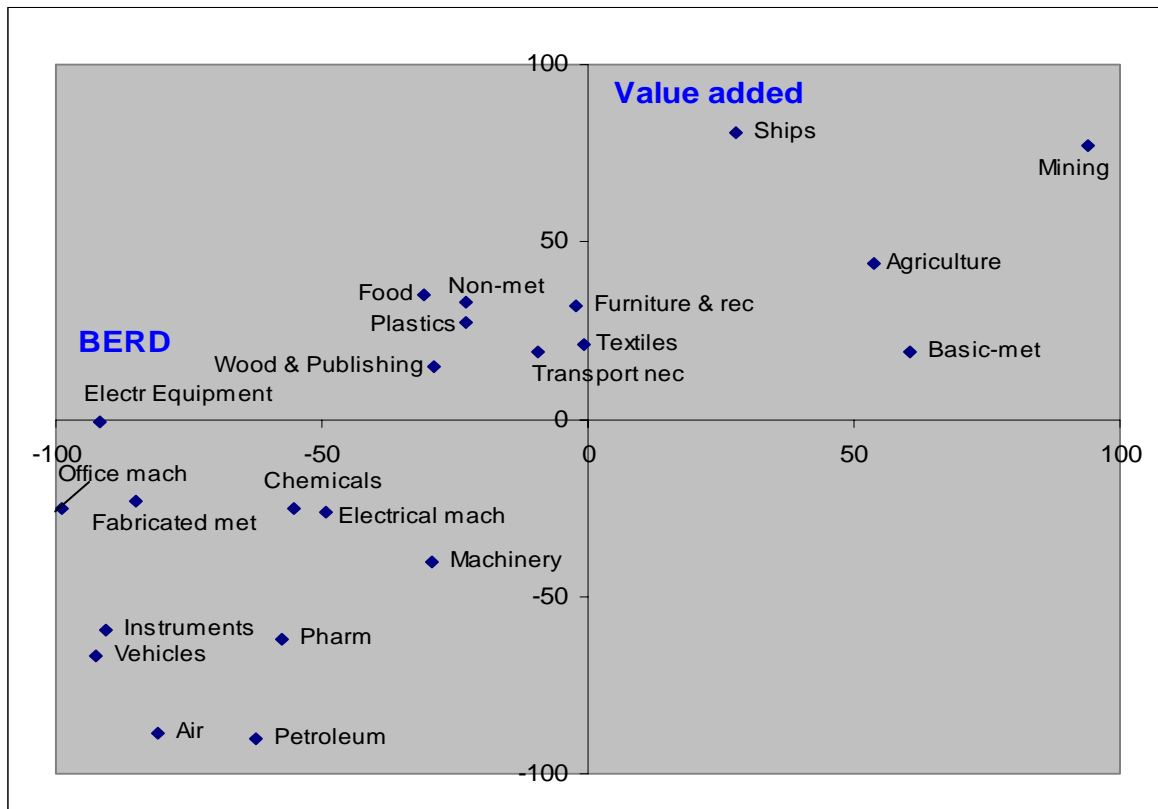
Correlations

	PL_BERD 9395	PL_BERD 0103	PL_PAT 9395	PL_PAT 0103	PL_VA 9395	PL_VA 0103	PL_EMP 9395	PL_EMP 0103	PL_EXP 9395	PL_EXP 0103
PL_BERD9395 Pearson Correlation Sig. (2-tailed)	1 .									
PL_BERD0103 Pearson Correlation Sig. (2-tailed)	.822** .000	1 .								
PL_PAT9395 Pearson Correlation Sig. (2-tailed)	-.031 .905	.101 .699	1 .							
PL_PAT0103 Pearson Correlation Sig. (2-tailed)	.222 .392	.475 .054	.646** .005	1 .						
PL_VA9395 Pearson Correlation Sig. (2-tailed)	.693** .000	.618** .000	.280 .276	.683** .003	1 .					
PL_VA0103 Pearson Correlation Sig. (2-tailed)	.478** .005	.597** .000	-.350 .168	.233 .368	.675** .000	1 .				
PL_EMP9395 Pearson Correlation Sig. (2-tailed)	.523** .002	.480** .005	.265 .304	.597* .011	.796** .000	.463** .007	1 .			
PL_EMP0103 Pearson Correlation Sig. (2-tailed)	.370* .034	.402* .020	.088 .738	.635** .006	.644** .000	.534** .001	.835** .000	1 .		
PL_EXP9395 Pearson Correlation Sig. (2-tailed)	.586** .004	.716** .000	-.044 .868	.417 .096	.726** .000	.769** .000	.522* .013	.461* .031	1 .	
PL_EXP0103 Pearson Correlation Sig. (2-tailed)	.506* .016	.495* .019	-.504* .039	.097 .711	.546** .009	.676** .001	.408 .059	.534* .010	.689** .000	1 .

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

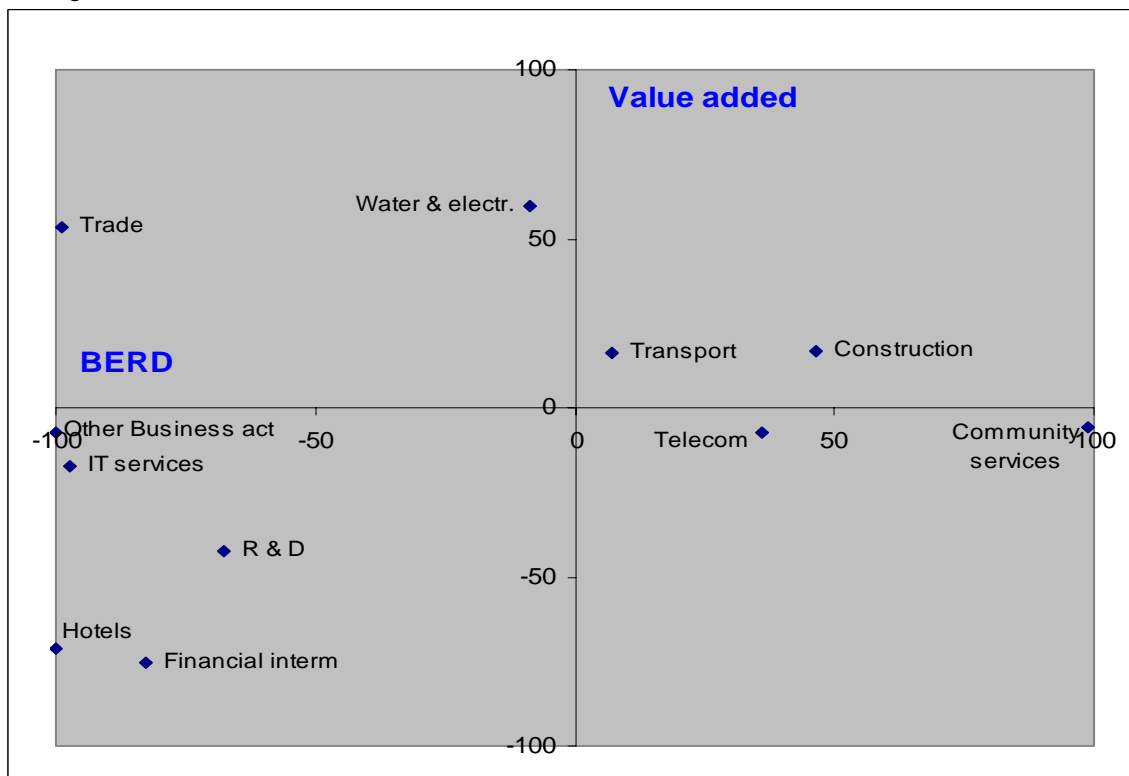
\* Correlation is significant at the 0.05 level (2-tailed).

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



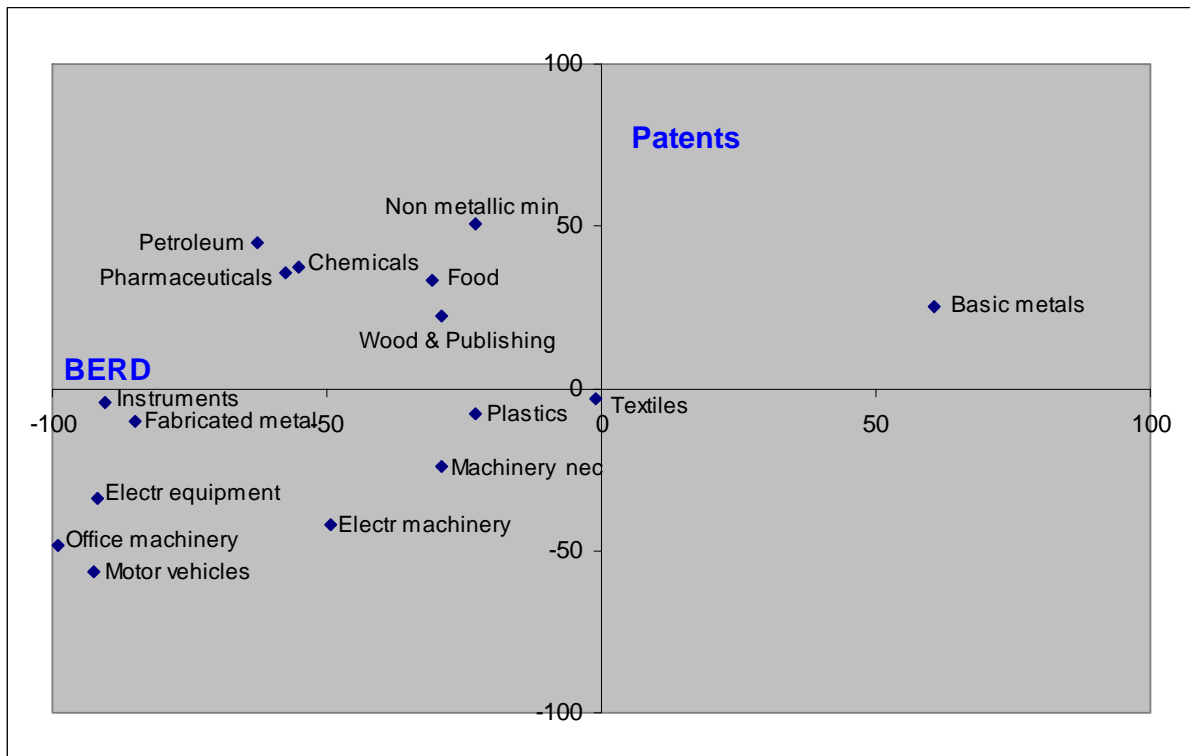
Notes: Specialisation index with EU15 as reference. Max specialisation: + 100. Min. specialisation: -100.  
Source: Own calculations

Figure 21. BERD versus Value Added in services. Specialisation indexes. Poland. Based on average values 2001- 2003.



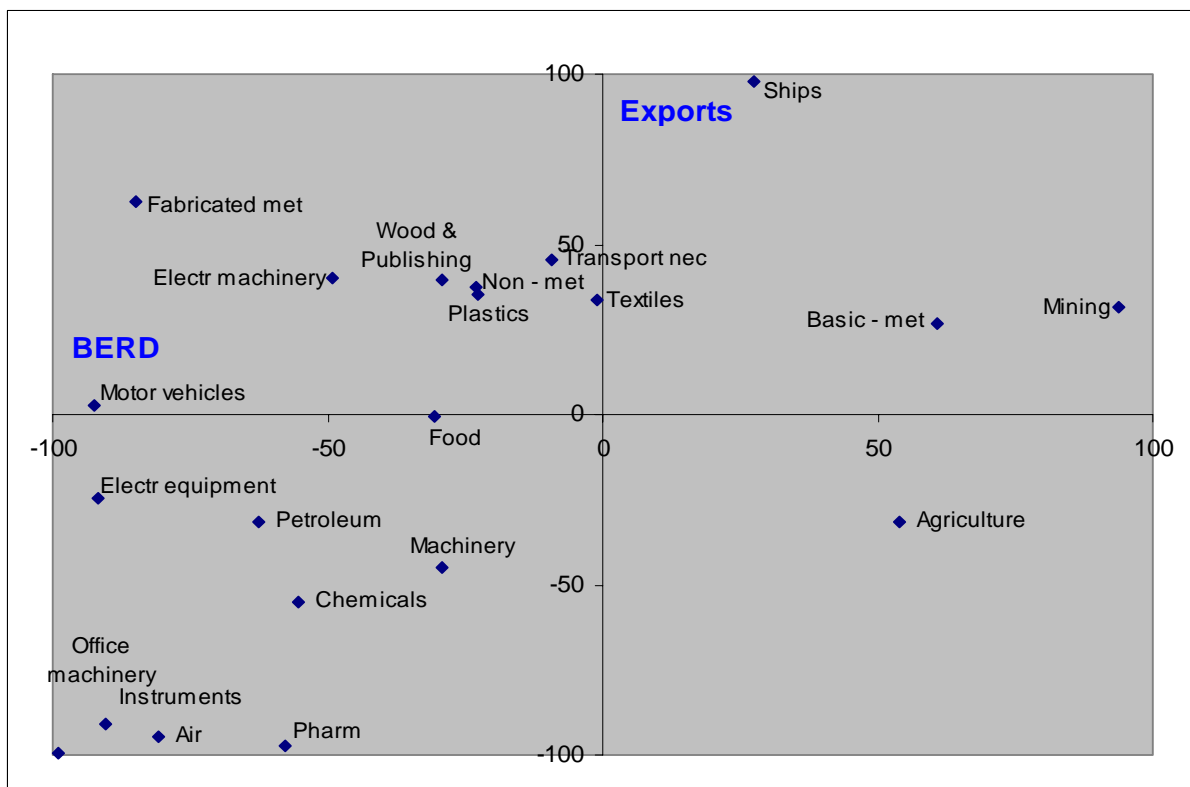
Notes: Specialisation index with EU15 as reference. Max specialisation: + 100. Min. specialisation: -100.  
Source: Own calculations

Figure 22. BERD versus patents. Specialisation indexes. Poland. 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. Poland. 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	Losing Specialisation	Increase Specialisation	Stable Specialisation	Losing Specialisation	Increase Specialisation	Stable Specialisation	Losing Specialisation
Specialisation BERD		60-63; 75-99	23; 352+359; 45	01-05; 27; 64	10-14;	25; 351;			17-19;
Specialisation Patents	23;		2423;	15-16; 20-22; 24ex2423; 26; 27; 35; 36;		33;			
Specialisation Value Added	50-52;	45; 60-63;	23; 352+359; 73	20-22; 25; 26; 36-37; 40-41;	351;	01-05; 10-14; 15-16; 27;			17-19;
Specialisation Employment	23; 50-52;		352+359; 73	20-22; 25; 36-37; 40-41; 70-71;	01-05; 15-16;	26; 27; 29; 351; 353;			17-19;
Specialisation Exports	352+359;			20-22; 25; 26; 28; 31; 34; 351; 36		10-14; 15-16; 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 - Poland**

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
Electr. 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*

