Year	Researchers[1] broken down by sectors of employment, %			
	Business sector (BS)	Government sector (GS)	Higher education sector (HES)	Private non-profit sector (PNPS)
1996	30.5	35.2	31.4	2.8
1997	34.0	34.8	28.4	2.8
1998	34.0	35.0	28.8	2.2
1999	34.8	34.1	29.5	1.6
2000	31.8	34.5	30.9	2.8

Year	Structure of gross domestic expenditure on R&D (GERD)								
	by sectors of performance, %				by source of funds, %				
	BS	GS	HES	PNPS	BS	GS	HES	PNPS	abroad
1996	50.7	26.6	21.6	1.1	49.1	43.4	4.5	0.4	2.7
1997	53.0	28.2	17.4	1.4	53.7	37.1	0.8	0.2	8.2
1998	52.0	30.4	16.6	0.9	52.6	39.9	0.8	0.0	6.7
1999	55.0	28.5	15.9	0.6	56.9	36.8	0.6	0.1	5.6
2000	56.3	25.9	16.6	1.2	53.3	40.0	0.4	0.0	6.2

Source of data: SORS, calculations by the IMAD. *Note:* [1] the number of researchers is given in the full-time equivalent (they are engaged in R&D activity full time or part time – more than 10% and less than 90% of the time).

A new paper was published in the IMAD's **Working Paper** series: **Research and Development Activity in Slovenia**. The author, Ana Vidrih, presents R&D from different aspects: protection of intellectual property rights, innovation policy in the EU, and Slovenia's support environment on which R&D depends. Company performance, human and financial resources – the number of researchers and R&D expenditure, innovation etc – determine the state and level of development of R&D in Slovenia (1996-2000).

The **sectoral distribution** of researchers evolved favourably up until **1999**, with the share of researchers rising in the business sector (BS), the main vehicle of applied research and experimental development, up by an average of 2.5% a year in 1996-1999. Nevertheless, Slovenia's structure of researchers is inappropriate compared to the EU, where the BS employed as many as half of all researchers in 1999 (34.8% in Slovenia), the higher education sector (HES) employed 34.3% of all researchers (29.5%), and the government sector (GS) just 14.2% of all researchers (34.1%) – see graph. In 1999, Slovenia was behind the EU average in terms of the number of researchers per thousand labour force (4.6 in Slovenia and 5.4 in the EU), but it was better than the Mediterranean EU members.

In 1996-2000, the **BS carried out** over half of all R&D activity and its share increased steadily (see table). By far the largest share of R&D in the BS was carried out by **manufacturing** (the most R&D intensive industries were the manufacture of pharmaceutical raw materials and preparations and the manufacture of radio, television and communications apparatus and equipment). In 2000, manufacturing spent 77% of all funding earmarked by the BS for carrying out R&D. **Service sectors**, which in principal have important development potential, only represented 19% of total spending of the BS on carrying out R&D. **International comparisons** show that the **BS** carried out 65% of R&D in the EU in **1999**, and as much as 76% in the USA and 71% in Japan. As regards the public R&D sector, the **HES** performed the most R&D activities in the EU (20%), USA (14%) and Japan (15%), while the GS was most active in Slovenia (28%). In 1996-1999, the **BS** was the only one to have increased investment in R&D in Slovenia (see table), while investment in Slovenia's R&D was also increased by funding from **abroad** (the main share of these funds goes to the BS, i.e. a good two-thirds in 1998-2000).

Gross domestic expenditure on R&D (GERD) totalled 1.52% of GDP in **2000** (GDP before the SORS' revision in March this year), 0.08 of a percentage point more than in 1996. Public funding represented 0.55% of GDP. In 1996-2000, GERD as a percent of GDP amounted to an average of 1.47%. The **volume of GERD** depends on government priorities, implementation of the adopted development strategies which are important for R&D, R&D infrastructure, as well as the economy's structure. If sectors characterised by intensive R&D prevail, then the volume of GERD is relatively large. In **2001**, the share of high-technology industries in total exports of goods was 8.2%, while medium high-technology industries had a much larger share of 41.9%. The pharmaceuticals industry and manufacture of radio and television transmitters and telephone and telegraph apparatus alone contributed 1% to Slovenia's exports of goods in 1996-2001 on average (4.6% and 1.0%) as against an average of 1.7% which came from the other four high-technology industries. High-technology industries will therefore have to contribute more to improving the economic structure. Potential for improving the economic structure also rests on services, especially knowledge-based ones.

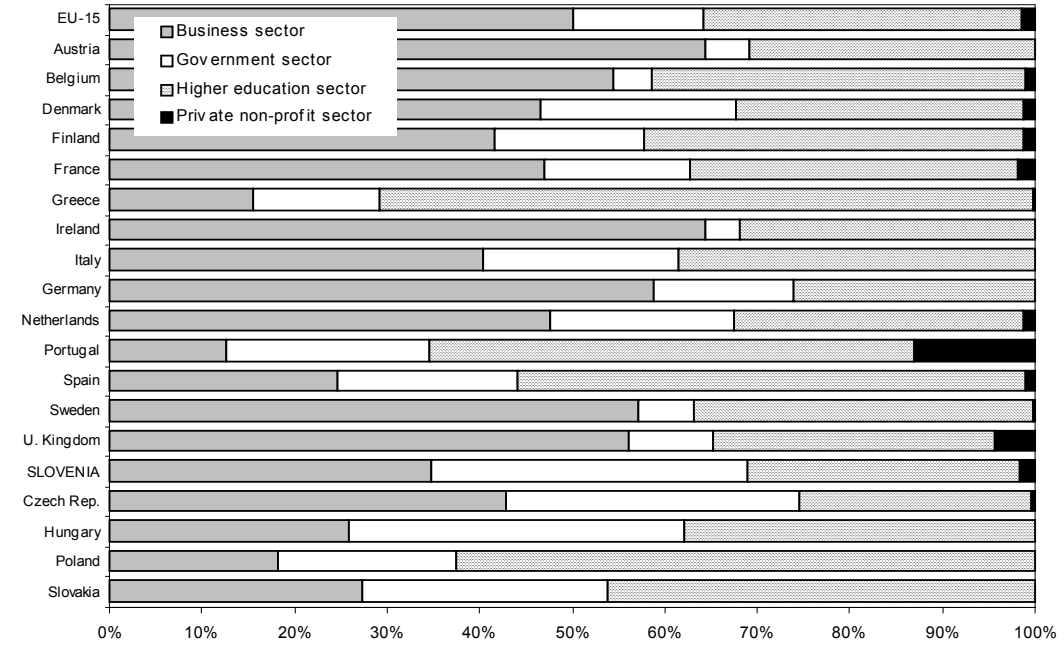
The **R&D infrastructure** is intended to bring about knowledge and technology for commercial exploitation, at both the level of industries and regions. Technology centres, which stimulate innovation and technology transfer, are chiefly important for the population of **small and medium-sized enterprises** (SMEs), which tend to lack human capital, technological know-how, and appropriate infrastructure to be able to introduce or develop new and up-to-date technologies. It is therefore not surprising that SMEs lag behind large enterprises in terms of the share of innovative enterprises in manufacturing. In Slovenia, the **share of innovative enterprises** is growing markedly with the **size of enterprises**. In 1994-2000, the relationship between the three groups of enterprises seen in terms of the share of innovative enterprises in manufacturing was as follows: 1 (small) : 2.3 (medium-sized) : 4.2 (large). This relationship was much more balanced in the EU in 1996: 1 : 1.3 : 1.8.

Unlike the USA and Japan, the **EU** is characterised by a **paradox** whereby the level of 'scientific production' is relatively high, but commercial exploitation of know-how and technological achievements is too low. In order to deal with these shortcomings in R&D, the EU introduced joint research programmes as early as in the 1980s in order to guide research activity. In 2002, the 6th Framework Research Programme was adopted for 2002-2006. The EU's activity in innovation policy is being intensified further: the Lisbon strategy, the European Research Area – an internal market for knowledge, science and innovation – the Barcelona objective, i.e. increase expenditure on R&D and innovation to 3% of GDP up until 2010 at the EU level, with 2/3 of expenditure coming from the private sector. In **2000**, the EU appropriated 1.93% of GDP for R&D; Scandinavian members appropriated much more (an average of 3.1% of GDP) and Mediterranean members much less (an average of 0.8% of GDP in **1999**).

Like that in the EU, **Slovenia's** R&D is characterised by an **ineffective transfer** of knowledge and technological achievements to the commercial sector; further, **co-operation** between R&D organisations is **not close enough** and the **flow** of R&D results is **weak**. The latter is confirmed by financial flows which are confined to individual sectors. The BS largely finances research units of enterprises (85.5% in 2000 and 90.7% in 1996), and government budget funding is mainly allocated to the public R&D sector (49.0% to the GS and 40.3% to the HES in 2000 and 52.2% and 36.3% in 1996). The isolation of individual R&D sectors can also be explained by the **structure of government budget appropriations** on R&D. In **2000**, most appropriations were earmarked for basic research (73.6 %), which is mainly carried out in the GS, 11.8% of appropriations were for applied research and 14.6% for experimental development.

Slovenia has committed itself to increase expenditure on R&D several times (to about 2.5% of GDP), however, this goal remains unfulfilled. Changes in R&D are therefore urgent. In **2002**, Slovenia passed the **Research and Development Activity Act**, which introduced a number of improvements: networking between R&D organisations operating in science, education and business areas; the transfer of new knowledge, including that accessible in the international environment, to the public benefit and for economic exploitation. The law envisaged two public agencies being set up, one for R&D and one for technological advancement. It is therefore necessary to make a **qualitative shift** towards better co-operation between universities and industry by identifying and dealing with the existing shortcomings in the research and innovation process, while industry itself will have to employ more resources to create a culture of innovation in enterprises. Further, the government will have to provide an appropriate support environment (a regulatory framework conducive to innovation, tax legislation, research infrastructure) and change the structure of financing R&D. In **2005**, basic and applied research should be allocated 30% each and experimental development 40% of government budget appropriations. Basic research should mainly focus on target projects and programmes, while taking national priorities and specific features into account.

Graph: **Researchers broken down by sector of employment, 1999**



Source of data: Main Science and Technology Indicators, Volume 2/2001, OECD 2001; Towards a European Research Area. Science, Technology and Innovation. Key Figures 2002. European Commission, 2002; SORS.