

IV. Main R&D indicators - International comparison

IV.1 R&D expenditure – international comparison

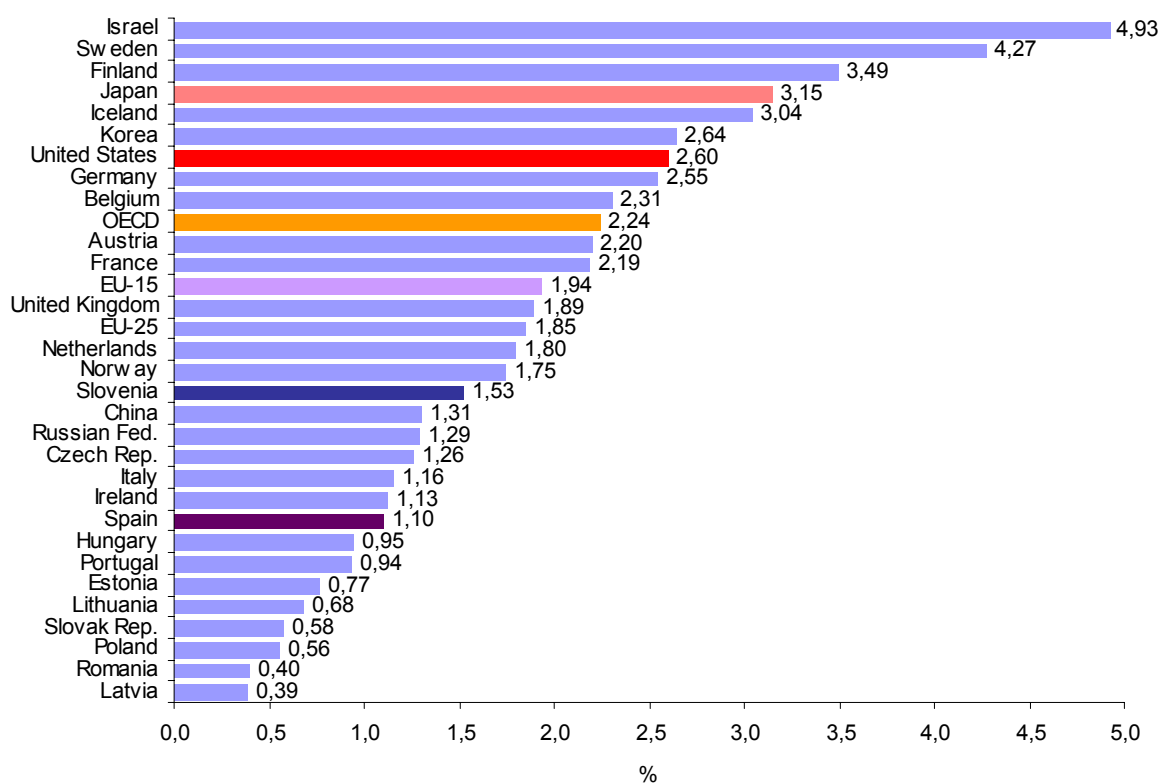
International data about R&D statistics are collected by various international organizations. The most important are EUROSTAT and OECD. Because of necessity to keep international comparability of the data, it is used harmonized methodology when collecting the data following methodological guidelines of Frascati manual. OECD, which was taken as a source for the following comparisons, publishes twice a Year data about research and development in a publication called: Main Science and Technology Indicators (MSTI).

IV.1.1 Total R&D expenditure (GERD) compared with GDP (R&D intensity)

In line with the Lisbon strategy, EU should increase R&D expenditure progressively in order to reach a set level of 3 % of GDP by 2010. As implies from the recent numbers, the set goal will not be fulfilled by 2010.

According to the latest available data (source MSTI 2005/1) EU-25 Member States spent on research and development on average 1,85 % of GDP in 2003. In a group of former EU-15 Member States reached the average value 1,94%. Form EU-25 countries, Sweden had the highest R&D expenditure compared to GDP, in 2003 reached this share 4,27%. Very high share reached also Finland (3,49 %). Both of these countries so fulfilled already now one of the Lisbon strategy's goal. Absolutely highest share (R&D intensity) in 2003 was reached by Israel (4,93 %), in its case it is considered only civil research and development, military R&D is not included. In Japan achieved R&D expenditure 3,15 % of GDP, in USA was this share 2,6 %. On the contrary, in 2003 belonged Poland (0,56%), Slovakia (0,58%) and Portugal (0,94%) among EU-25 countries with the lowest R&D expenditure compared to GDP (R&D intensity). The Czech Republic with its share (1,26%) belongs to the group of countries with lower R&D expenditure. On the other hand the Czech Republic together with Slovenia are from the new EU Member States the best.

Figure 4.1 Total expenditure on R&D (GERD) as a percentage of GDP in selected countries in 2003⁽¹⁾



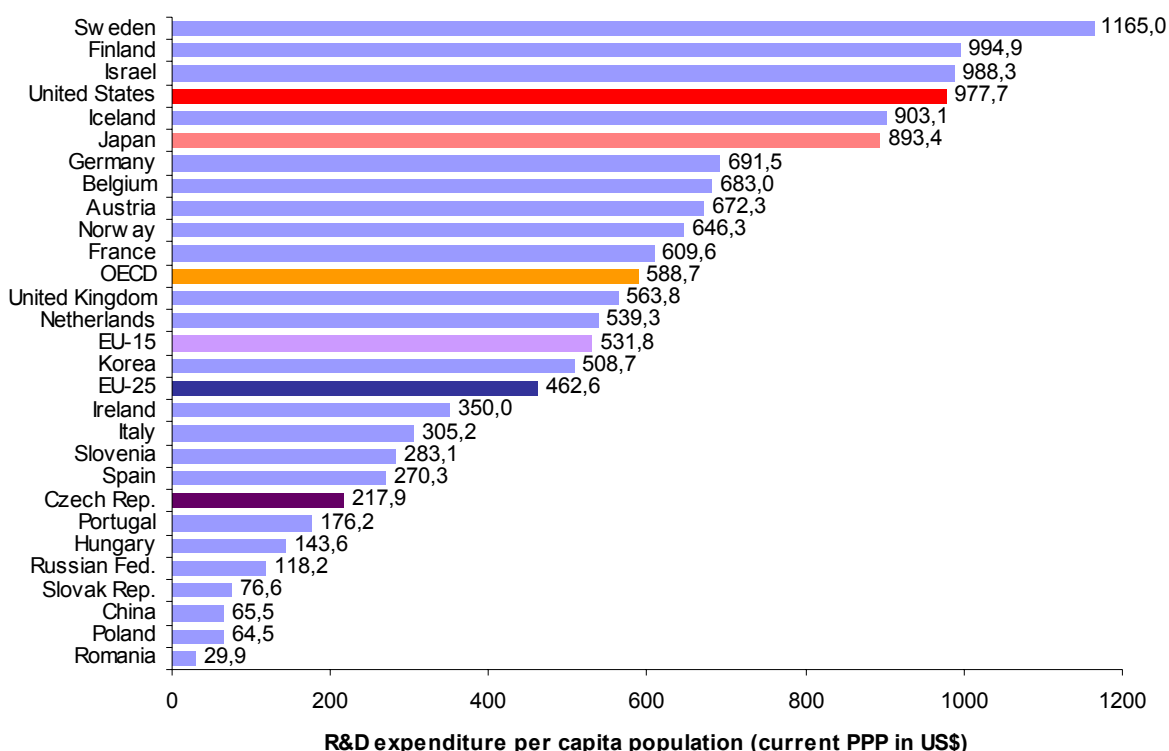
Data of Ireland, Italy and Netherlands for the year 2002, Sweden for the year 2001.

Source: Database New Cronos (Eurostat), MSTI 05/1 (OECD)

IV.1.2 Total R&D expenditure per capita population

Average value of R&D expenditure per one citizen in PPP (Purchasing Power Parity) was in current dollars in EU-25 countries 462,6 US\$ in 2003. For a group of former EU-15 countries achieved the average value of this indicator 531,8 US\$. The highest value of total R&D expenditure per 1 citizen within EU-25 countries was recorded in Scandinavian countries, concretely in Sweden (165,0 US\$ in 2001) and Finland (994,9 US\$ in 2003). From non-European countries were the highest values in Israel (988,3 US\$), USA (977,7 US\$) and Japan (893,4 US\$). The Czech Republic with its R&D expenditure at the level of 217,9 US\$ per one citizen stands at 50% of the EU-25 average. The ever lowest values from the stated EU-25 Member States reached Poland (64,5 US\$) and Slovakia (76,6 US\$).

Figure 4.2 Total R&D expenditure per capita population (current PPP in US\$) in selected countries in 2003⁽¹⁾



⁽¹⁾Comm.: Data of Ireland, Italy, Portugal for the year 2002; Sweden for the year 2001.

Source: Database New Cronos (Eurostat), MSTI 05/1 (OECD)

IV.1.3 Financial sources of R&D

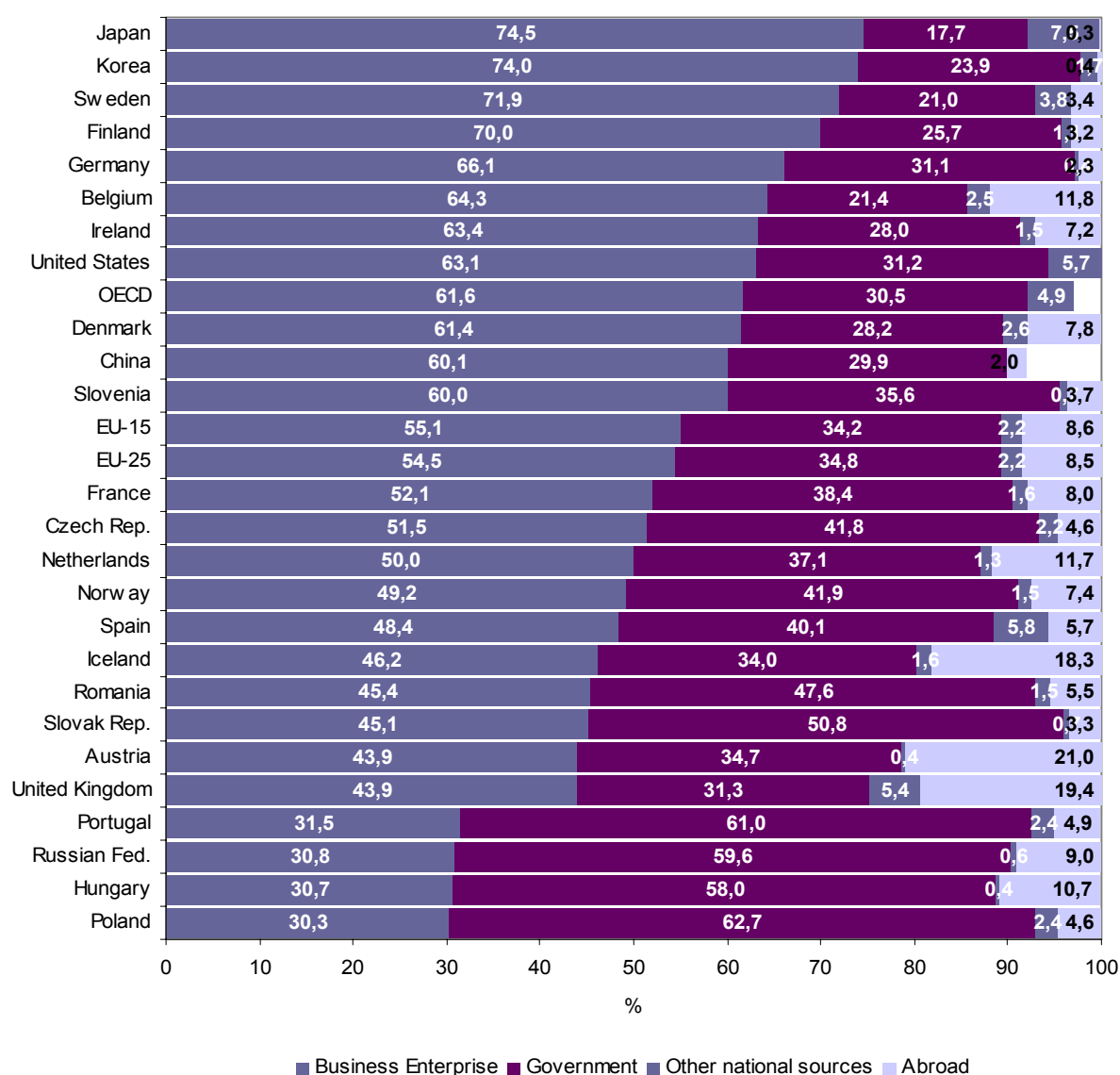
The main role in the investment into the research and development plays Business Enterprise sector. The share of total R&D expenditure financed by Business Enterprise sector achieved in EU-25 countries level of 54,5% in 2002. In EU-25 Member States the Business Enterprise sector traditionally mainly contributes to financing R&D in Scandinavian countries. In Sweden reached its share 71,9% in 2001, and in Finland exactly 70% in 2003. Concerning non-European countries was the highest share of Business Enterprise sector on financing R&D recorded in 2003 in Japan (74,5 %) and Korea (74,0 %).¹ The Czech Republic is with its share (51,5% in 2003) near to the average of EU-25. From EU-25 Member States the Business Enterprise sector has the lowest share on financing R&D in Poland (30,3 % in 2003) and Hungary (30,7 % in 2003). On contrary the government dominates in these two countries as the most important investor into R&D. Share of Government sector was in Poland (62,7%) and in Hungary (58,0%) in 2003. Insufficient R&D expenditure of Business Enterprise sector is substituted by Government sector in these two countries.

¹ Unfortunately shares of individual sectors financing R&D are not available for Israel that shows the highest R&D expenditure compared to GDP.

Government sector got the share on total R&D expenditure in EU-25 34,8% in 2002. The lowest share of Government sector is monitored in technologically developed countries with high share of Business Enterprise sector. For that reason reached the share of Government sector in Sweden (21% in 2003) and in Finland (25,7% in 2003). From non-European countries Japan shows regularly the lowest share (17,7 % in 2003). In the Czech Republic is the share of the Government sector above average of EU-25.

In 2002 achieved the share of financial sources on R&D from abroad the level of 8,5 % in EU-25. Austria (21,0 %) and Great Britain (19,4 %) received the highest share of financial sources from abroad in 2003 on their research and development. The Czech Republic is with its 4,6% at the level of 50% of EU-25 average. Very low share of financial sources from abroad reaches Japan (only 0,3% in 2003) and USA (actually equal zero).

Figure 4.3 Structure of GERD by source of funds in selected countries 2003⁽¹⁾



⁽¹⁾ Note.: Data of Ireland, Portugal, Netherlands, France, average EU-25, average EU-15 are for 2002, for Belgium, Denmark, Iceland, Sweden for 2001; data from abroad of USA and OECD is not known; data of China - not available other national sources (estimation 8 %).

Source: Database New Cronos (Eurostat), MSTI 05/1 (OECD)

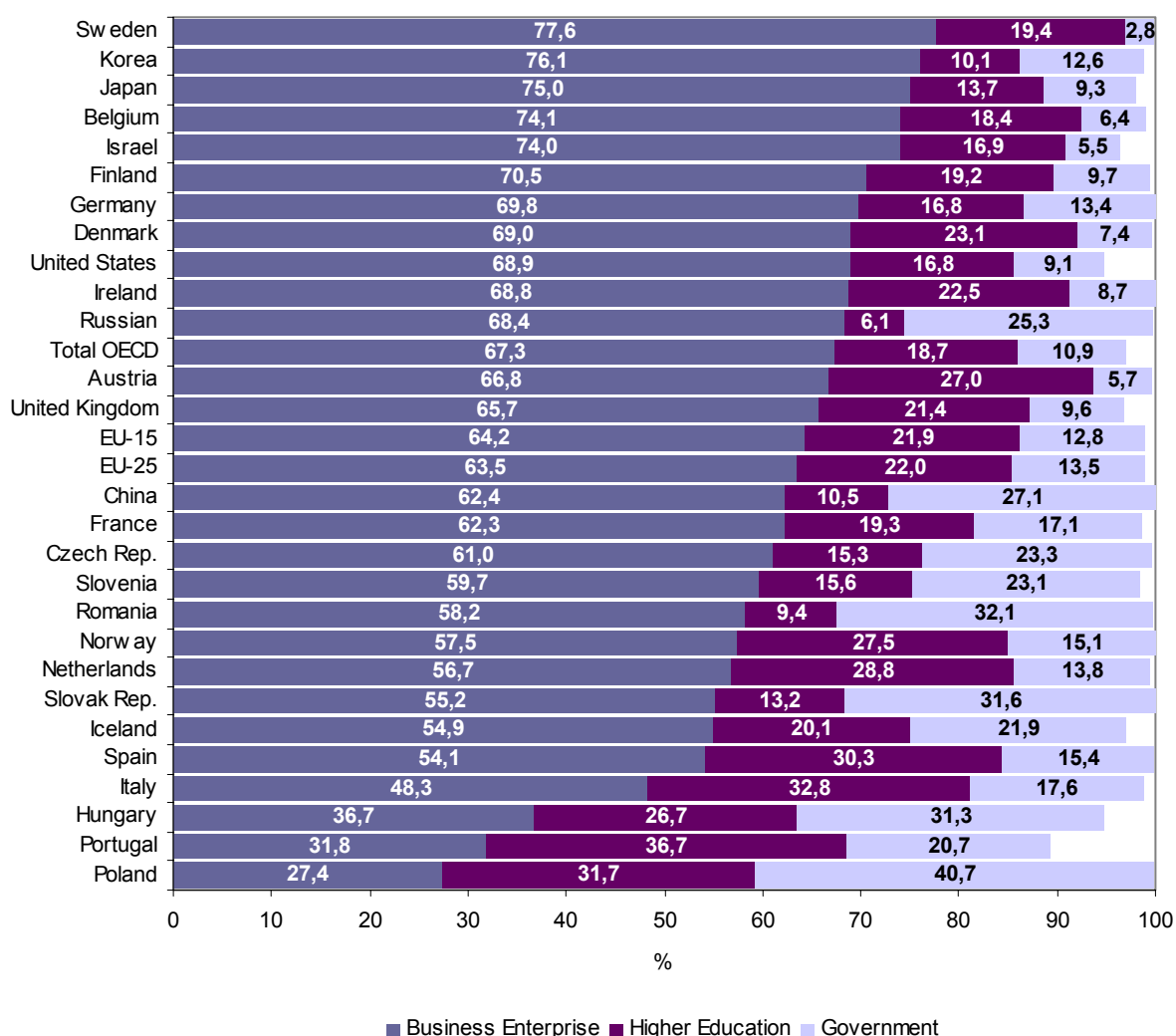
IV.1.4 Using of financial sources in R&D by sectors of performance

The Business Enterprise sector is the most important sector of R&D performance just like in case of financing R&D. **In 2002, the average share of R&D expenditure used on R&D in the Business Enterprise sector in EU-25 countries achieved the level of 63,5%.** The highest share ever from EU Member States had in 2001 Sweden (77,6%). High values were reached also by Belgium (74,1% in 2002) and Finland (70,5% in 2003). From non-European countries: the highest shares of R&D expenditure were used in the Business Enterprise sector by Korea (76,1 % in 2003) and by Japan (75,0 % in 2003). In USA, this share reached 68,9 %. The Czech Republic with the share 61,0% in 2003 is near to the average of EU-25.

In 2002, the share of R&D expenditure in the Government sector reached 13,5% for EU-25 Member States. The lowest shares of Government sector as a sector of performance show technologically developed countries (Sweden-2,8% in 2001, Israel-5,5% in 2003). On the other hand countries with low R&D expenditure in the Business Enterprise sector have the high share of R&D expenditure used in Government sector (Poland-40,7% in 2003, Romania-32,1% in 2003).

The Higher Education sector spent in EU-25 countries on average 22,0% of total R&D expenditure in 2002. In technologically developed countries the share is under the average level of EU, which is due to the importance of Business Enterprise sector.

Figure 4.4 Structure of GERD by sectors of performance in selected countries in 2003⁽¹⁾



(1) Note: Data of Ireland, Denmark, Portugal, Netherlands, Italy, Slovenia, Austria, average EU-25, average EU-15 are for 2002, data for Sweden for 2001; Private Non-Profit sector is not included because of very low values are into the figure.

Source: Database New Cronos (Eurostat), MSTI 05/1 (OECD)

IV.2 Personnel of Research and Development – international comparison

IV.2.1 R&D Personnel – headcount (HC) as the share of labour force

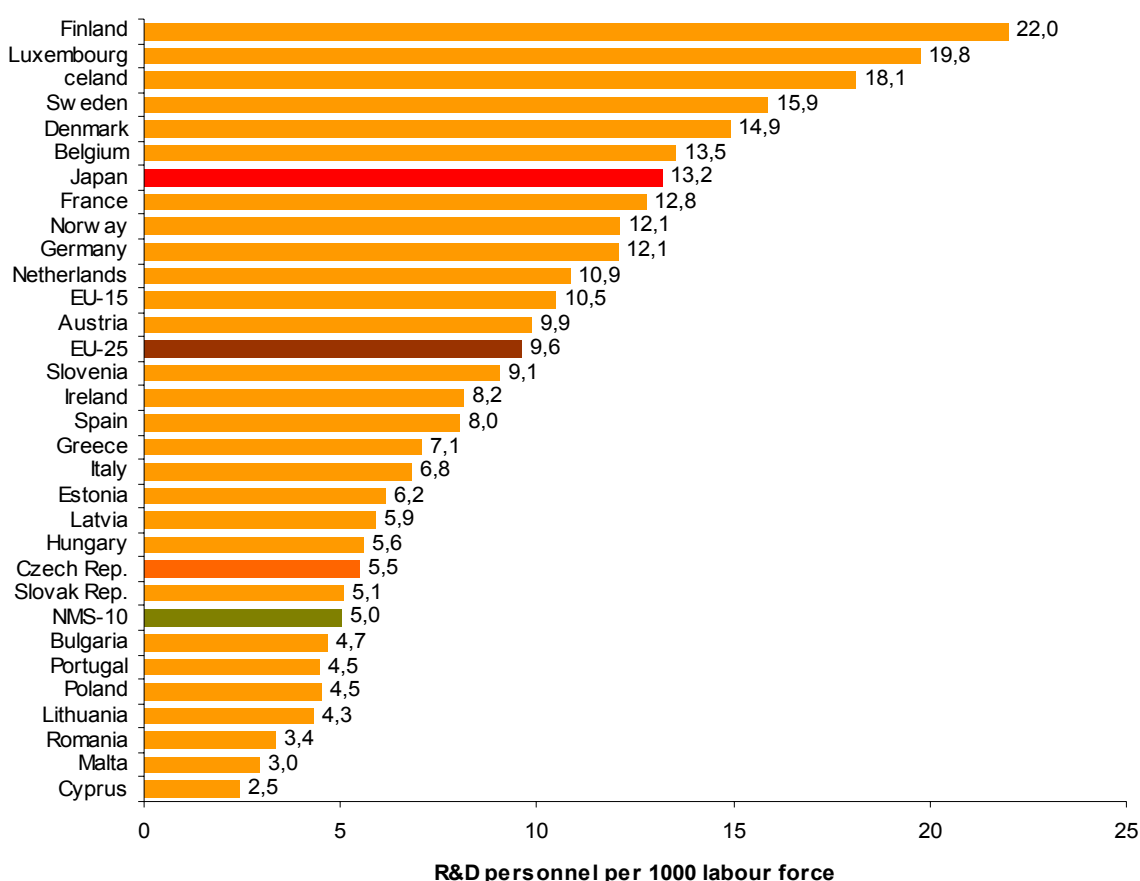
The estimate of EUROSTAT was 1,32 % for the average share personnel R&D in headcount (HC) of total labour force in member states EU-25 in 2003. The highest shares were in Finland (2,72 % in 2002), Sweden (2,43 % in 2001) and Denmark (2,16 % in 2002) of member states. The high shares were recorded in Iceland (3,09 % in 2002) and Norway (2,14 % in 2002) from non-member countries EU-25. The smallest shares of personnel R&D as the shares of labour force were in Ireland (0,94 % in 2000), Italy (0,92 in 2000), Portugal (0,74 % in 2001).

Nobody from new member countries EU reached the average of EU-25 in 2002. The highest share was recorded in Slovenia (1,26 %), further Hungary (1,19 %), Estonia (1,08 %) and the Czech Republic (1,05 %).

IV.2.2 R&D Personnel in FTE per 1000 labour force

The average in countries EU-25 was estimated, it did 9,6 personnel R&D per 1000 labour force in 2003. This share reached 10,5 employees for members EU-15. Scandinavian countries have the highest shares of R&D personnel per 1000 labour force, as in the cases of headcount. The highest figures from member countries of EU-25 were recorded in Finland (22,0), in Sweden (15,9 in 2001) and in Denmark (14,9) in the year 2003. The smallest shares were recorded in Portugal, Greece, Italy and Spain. The shares of new members EU were on lower level of the interval.

Figure 4.5 Shares of R&D personnel in FTE per 1 000 labour force in selected countries in 2003⁽¹⁾



⁽¹⁾Comm.: Data of Malta, Portugal, Italy, Austria, France for the year 2002; Sweden, Netherlands, Iceland - year 2001; Luxembourg 2000.

Source: Database New Cronos (Eurostat), MSTI 05/1 (OECD)

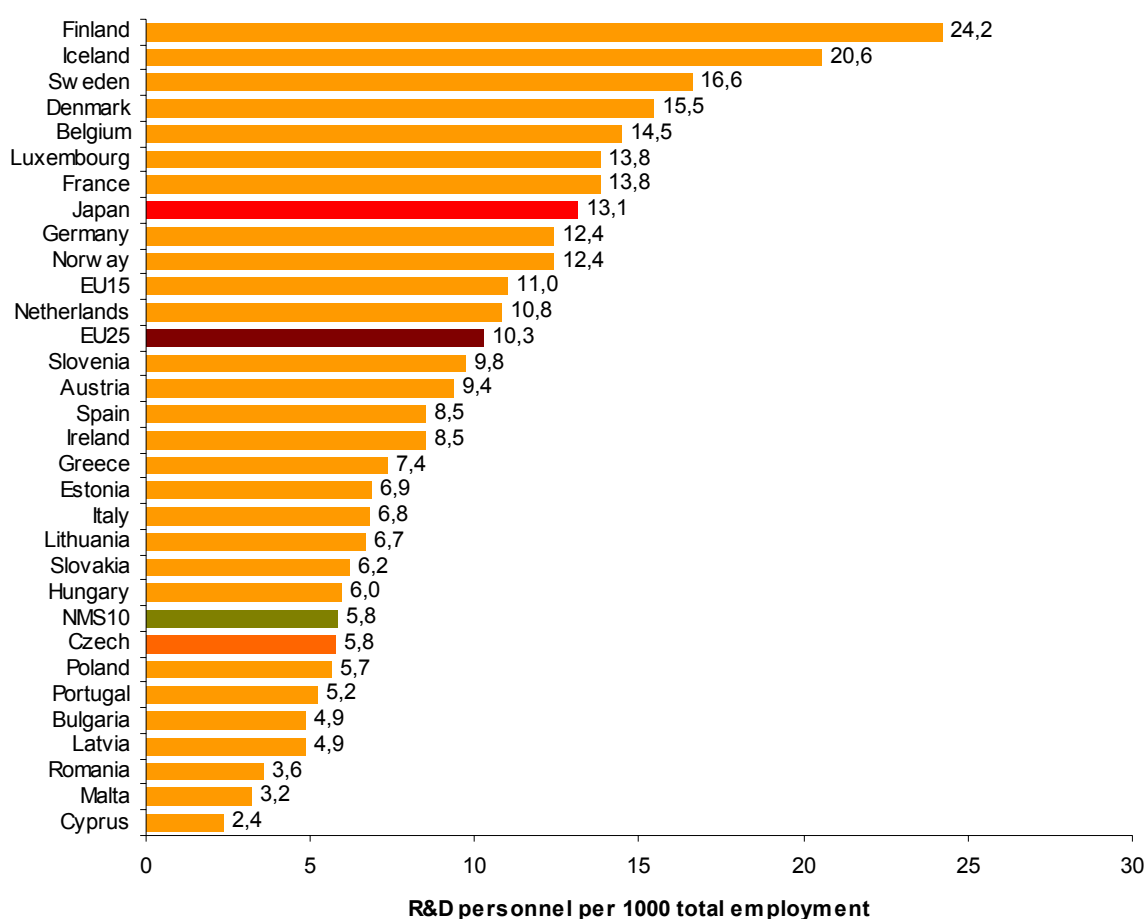
IV.2.3 R&D Personnel in FTE per 1 000 employed in economy

The average of personnel R&D in FTE of countries EU-25 was estimated: **10,3 employees per 1000 employed in economy in the year 2003**. This share did 11,0 employees for the group of EU-15. Scandinavian countries reached again the highest shares of employees per 1 000 employed. The highest figures from EU-25 members were recorded in Finland (24,2), in Sweden (16,6 in 2001) and in Denmark (15,5) in the year 2003. From non-members EU-25 it was Iceland, which reached the highest share (20,6 in 2001). In Japan, there were 13,1 employees engaged in R&D per 1 000 employees. United States and United Kingdom don't give data of R&D personnel. The smallest shares of members EU-15 were recorded in Portugal (5,2 in 2003), Italy (6,8 in 2002) and Greece (7,4 in 2003). The shares of new members EU were on lower level of the interval.

In 2003, 5,8 employees engaged in R&D per 1 000 employed was recorded in economy of 10 new member states of EU (NMS-10). The smallest shares were recorded from NMS-10 and also EU-25 in these states: Cyprus (2,4 in 2003), Malta (3,2 in 2002) a Lithuania (4,9 in 2003).

The share of R&D personnel in the Czech Republic did 5,8 employees per 1 000 employed, it is average of new member states. Higher shares were recorded in Hungary (6,0 in 2003), Slovakia (6,2 in 2003), Latvia (6,7 in 2003), Estonia (6,9 in 2003) and Slovenia (9,8 in 2003 – the highest share from new member states).

Figure 4.6 Shares of personnel R&D in FTE per 1 000 total employment in selected countries in 2003⁽¹⁾



⁽¹⁾ Data of Malta, Italy, Austria, France, Japan from the year 2002; Sweden, Netherlands, Iceland for the year 2001; Luxembourg for the year 2000.

Source: Database New Cronos (Eurostat), MSTI 05/1 (OECD)

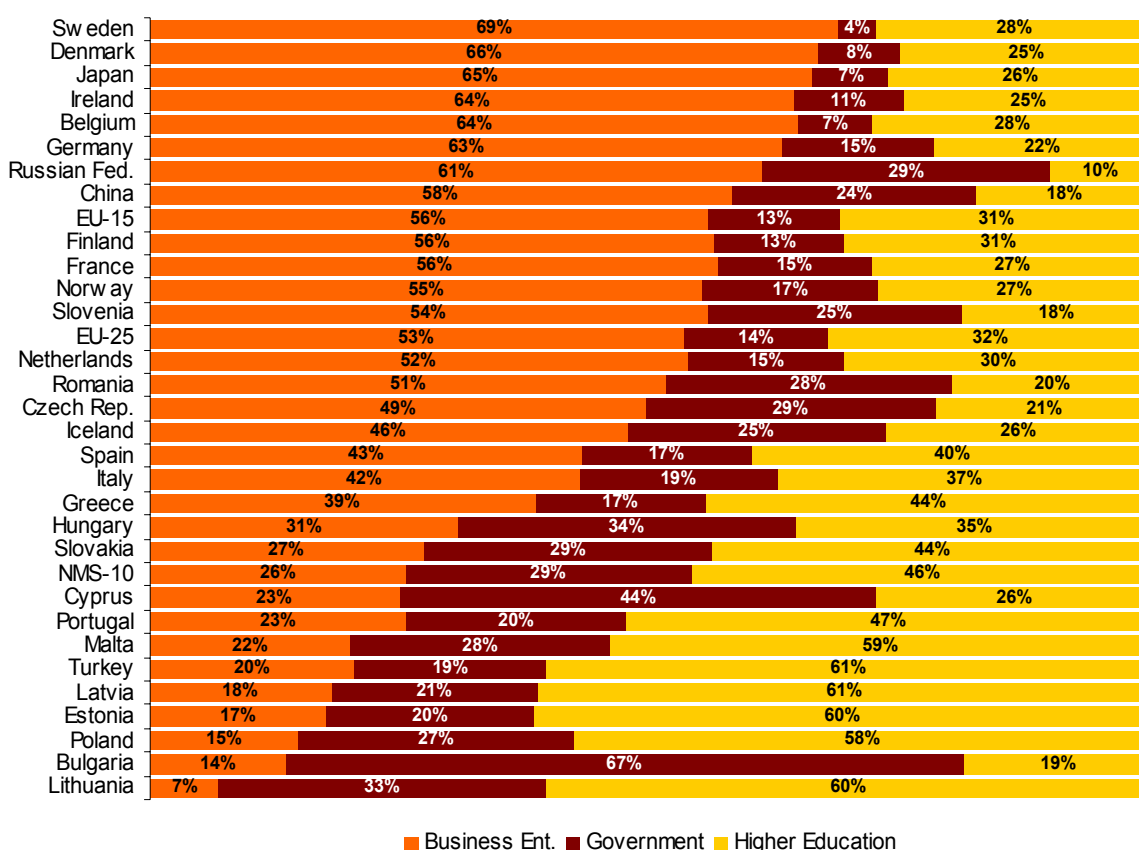
IV.2.4 R&D Personnel in FTE by sectors of performance

In 2003, it was on the average 53 % personnel R&D in the Business Enterprise sector in member states of EU-25. This share was higher in the case of EU-15 (56 %). The highest share of R&D personnel from member states of EU-25 was recorded in the Business Enterprise sector in Sweden, it did 69% in 2001. Denmark (66 % in 2003), Ireland (64 % in 2003) and Belgium (64 % in 2003) had also high shares. This share did 65 % in Japan and in Russia (61 % in 2003). The smallest shares of R&D personnel were recorded in the Business Enterprise sector by new member states of EU, Latvia (only 7 % in 2003), Poland (15 % in 2003) and Estonia (17 % in 2003). The Czech Republic approximate with the share 49 % to the average of EU-25. The average of new member states of EU reached the share 26 % in the year 2003.

In 2003, it was on the average 14 % in the Government sector in member states of EU-25. This share did 13 % in the case of EU-15. The highest shares of R&D personnel from member states of EU-25 were recorded in Cyprus (44 % in 2003), in Hungary (34 % in 2003), in Slovakia and in the Czech Republic (the same share 29 % in 2003). The smallest shares of R&D personnel were recorded in technological advanced states: Sweden (4 % in 2001), Belgium (8 % in 2002) a Denmark (8 % in 2003). The average of new member states of EU reached 29 %.

In 2003, there were employed on the average 32 % R&D personnel in the Higher Education sector in countries of EU-25, it did the share 31% in the case of EU-15. The highest shares were recorded in Baltic countries: Lithuania (61 %), Estonia and Latvia (the same share 60 %) in 2003. The smallest shares of R&D personnel engaged in the Higher Education sector worked in Slovenia (18 % in 2003) and in the Czech Republic (20 % in 2003). The average of new member countries of EU did 46 % for the year 2003 and this average was higher than the average of EU-25.

Figure 4.7 Shares of R&D personnel by three main sectors of performance in selected countries in 2003⁽¹⁾



⁽¹⁾ Note: Data of Japan, China, France, Italy, Turkey for the year 2002; Sweden, Netherlands, Iceland for the year 2001. There are not Private Non-profit sector in this figure, total of some countries are not equal 100 %.

Source: Database New Cronos (Eurostat), MSTI 05/1 (OECD)

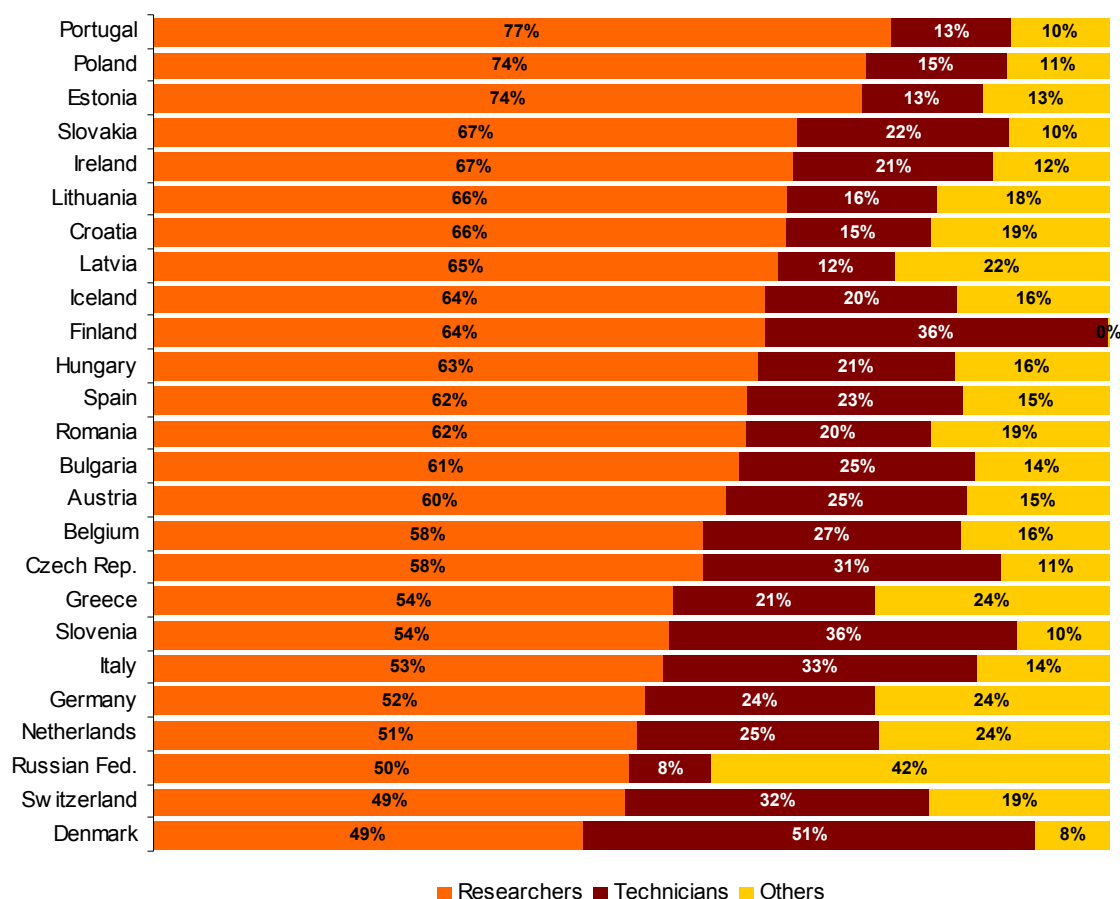
IV.2.5 R&D personnel in FTE by occupation

The highest shares of researchers from total R&D personnel were recorded in member states of EU-25. **In 2003, the share of researchers did on the average 58 % in EU-25. This share was lower (56 %) in states of EU-15. The share of researchers reached on the average 69 % in new member states of EU, it did higher share than in states of EU-15.** The highest shares of researchers in EU-25 were recorded in countries with low expenditure on R&D, there were Portugal (77 % in 2001), Poland (74 % in 2002) and Estonia (74 % in 2002). The smallest share of researchers was recorded in Denmark (49 %) in 2001. The share of researchers from total R&D personnel reached 58 % in the case of the Czech Republic in the year 2002.

The share of technicians in states of EU-25 reached 22 % on the average. This share did 23 % for states of EU-15 in 2003. This share did 21 % on the average in new member states of EU. The highest shares of technicians were recorded in Denmark (51 % in 2001), further in Finland (36 % in 1997) and in Slovenia (36 % in 2002). The smallest shares were recorded in Latvia (12 % in 2002), Estonia (13 % in 2002) and Portugal (13 % in 2001). This share did 31 % in the case of the Czech Republic, it is higher number than the average of EU-25.

The averages of other R&D personnel don't known in the cases of EU-25 and EU-15. **The share of other R&D personnel from total R&D personnel in new members states of NMS-10 reached 12 % on the average in 2003.** The highest shares of other R&D personnel from EU-25 were recorded in Greece (24 % in 1997), in Netherlands (24 % in 2001) and in Germany (24 % in 1998). The smallest shares were reached in Portugal (10 % in 2001), in Slovakia (10 % in 2002) and in Poland (11 % in 2002). The share of other R&D personnel did 11 % in the case of the Czech Republic in 2002.

Figure 4.8 Shares of R&D personnel by occupation in selected countries in 2002⁽¹⁾



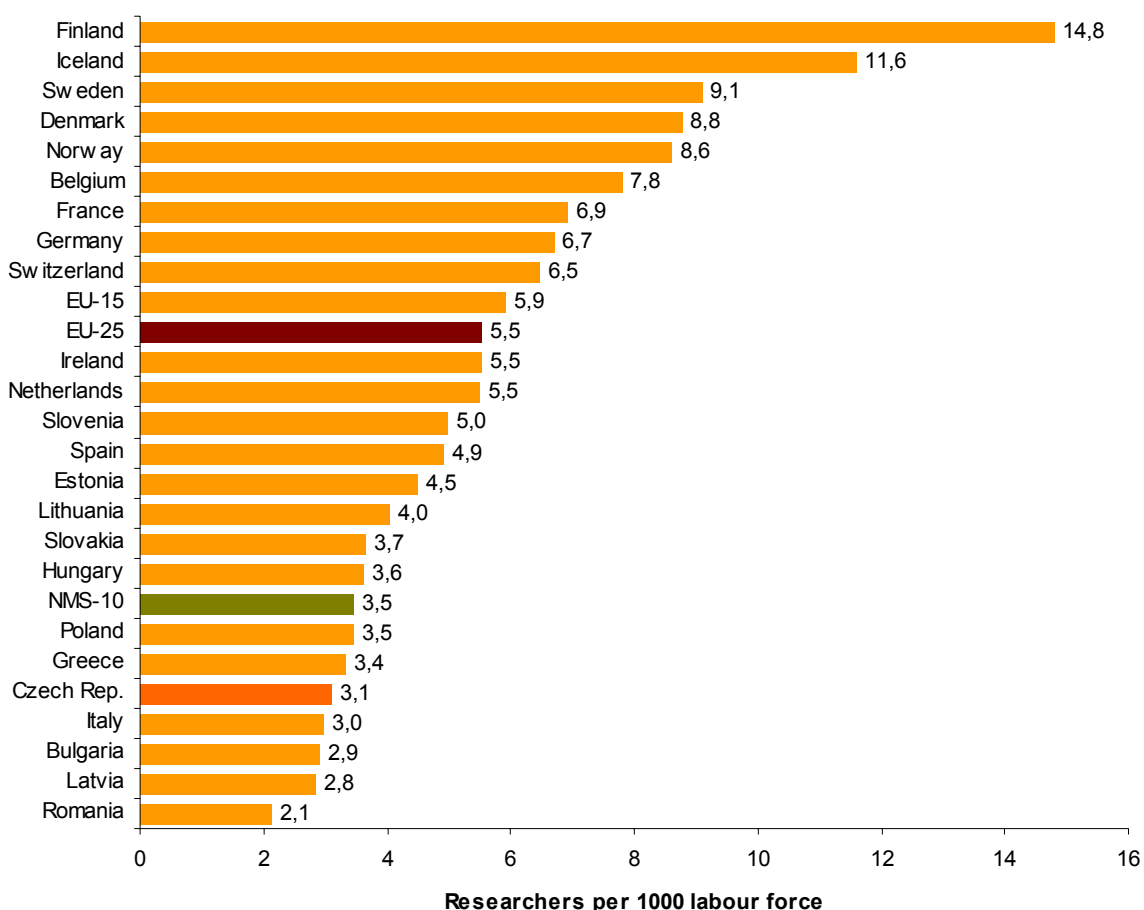
⁽¹⁾Note: Data of Belgium, Denmark, Netherlands, Portugal – the year 2001; Switzerland the year 2000; Ireland - the year 1999; Germany, the year 1998; Finland, Greece - the year 1997; Italy - the year 1995. United States and United Kingdom don't give data of R&D personnel.

Source: Database New Cronos (Eurostat), MSTI 05/1 (OECD)

IV.2.6 Researchers in FTE per 1 000 labour force in economy

In 2003, 5,5 researchers on the average per 1 000 labour force was recorded in member states of EU-25. This share did 5,9 % for member states of EU-15. There worked 3,5 researchers on the average per 1 000 labour force in new member states of NMS-10. The highest numbers of researchers per 1 000 labour force were recorded in member states of EU-25 (14,8 in 2002), further in Sweden (9,1 in 1999) and in Denmark (8,8 in 2003). The smallest numbers of researchers per 1 000 labour force were recorded in Latvia (2,8 in 2003), in Italy (3,0 in 2002) and in the Czech Republic (3,1 in 2003). The Czech Republic has numbers of researchers per 1 000 labour force on low level of member states of EU, under the averages of EU-25 and of NMS-10.

Figure 4.9 Number of researchers engaged in R&D per 1 000 labour force in selected countries in 2003⁽¹⁾



⁽¹⁾ Note: Data of Finland, Italy, France – the year 2002; Netherlands, Iceland – the year 2001; Sweden – the year 1999.

Source: Database New Cronos (Eurostat), MSTI 05/1 (OECD)

