IV. MAIN R&D INDICATORS - INTERNATIONAL COMPARISON

IV.1 R&D expenditure – international comparison

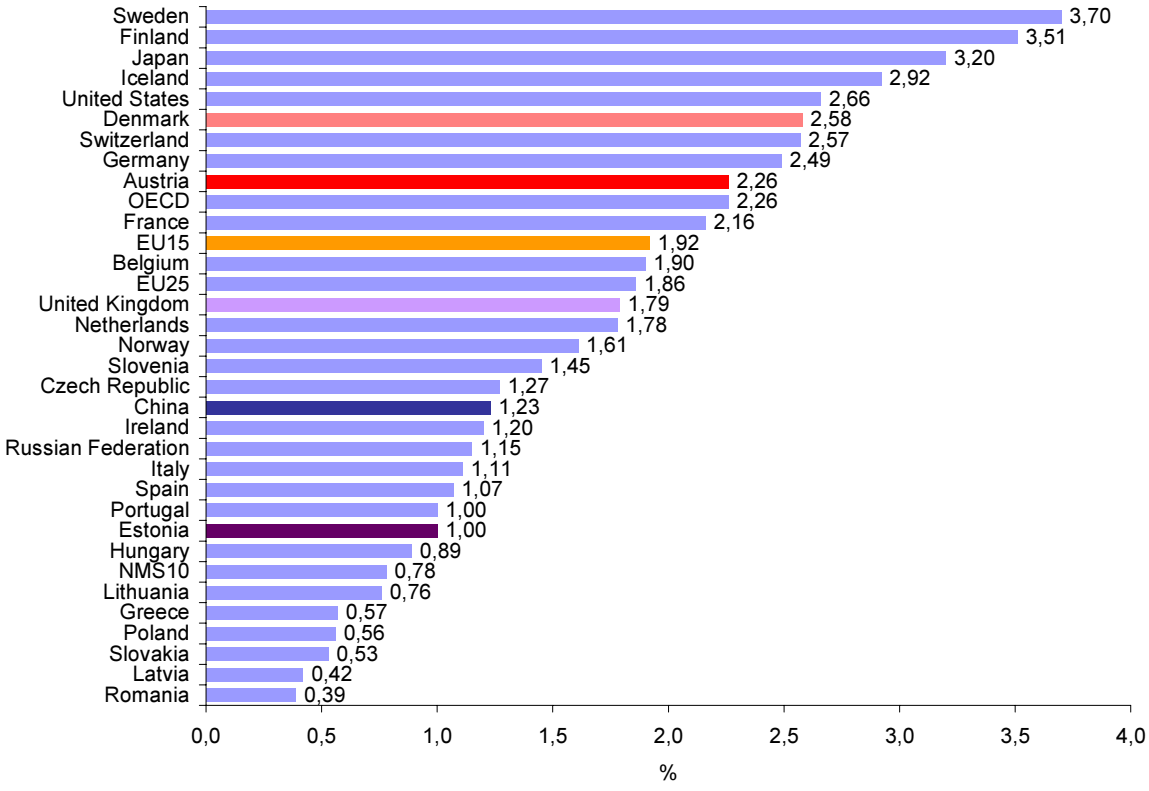
International data about R&D statistics are collected by various international organizations. The most important are EUROSTAT and OECD. Because of necessity to keep international comparability of the data, it is used harmonized methodology when collecting the data following methodological guidelines 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) the 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%. From the 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 goals. In Japan R&D expenditure reached 3,20 % of GDP, in USA this share was 2,66 %. On the contrary, in 2004 Poland (0,56 %), the Slovak republic (0,53 %), Latvia (0,42 %) and Greece (0,57 %) were among the EU-25 countries with the lowest R&D expenditure compared to GDP (R&D intensity). The Czech Republic with its share (1,27 %) belonged to the group of countries with lower R&D expenditure. On the other hand the Czech Republic and Slovenia were the best from the new EU Member States.

Figure 4.1Total expenditure on R&D (GERD) as a percentage of GDP in selected countries in 2004(1)



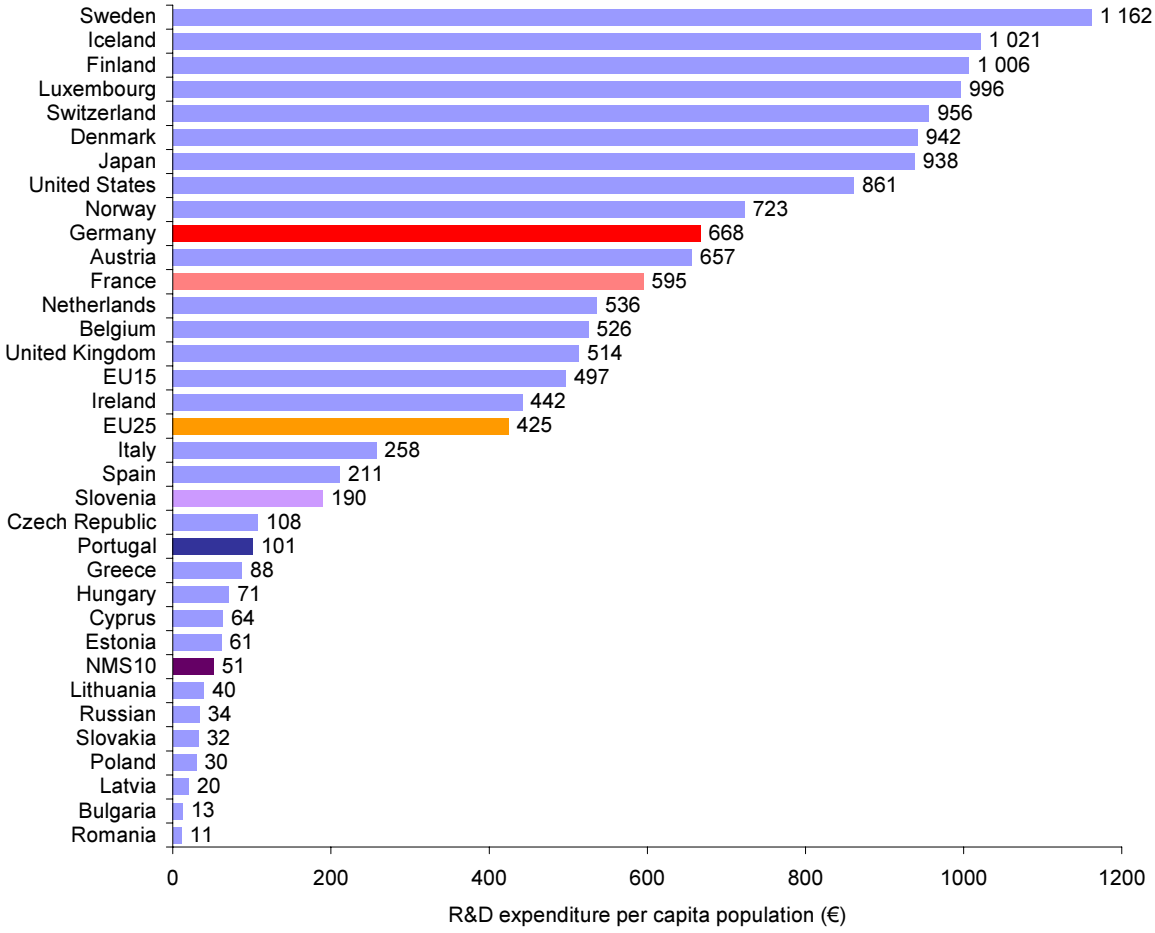
(1)Note: Data corresponds to: Italy and Japan 2003, and Switzerland 2000.

Source: Database New Cronos (Eurostat), MSTI 06/1 (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 Euro in the EU-25 countries 424,8 € in 2003. For a group of former EU-15 countries the average value of this indicator reached 497,2 €. The highest value of total R&D expenditure per 1 citizen within the EU-25 countries was recorded in Scandinavian countries, concretely in Sweden (1 161,6 € in 2004), Iceland (1 021 € 2004) and Finland (1 006,5 € in 2004). From non-European countries were the highest values in Japan (938,3 € in 2002) and USA (861,4 € in 2004). The Czech Republic stands at 25 % the EU-25 average level with its 107,7 € R&D expenditure. The ever lowest values of the EU-25 Member States were recorded in Latvia (20,1 €) and Poland (29,8 €).

Figure 4.2 Total R&D expenditure per capita population (current PPP in €) in selected countries in 2004[(1)]



(1) Comm.: Data corresponds to: Russia, Italy and Japan -year 2003; and Switzerland -year 2000.

Source: Database New Cronos (Eurostat)

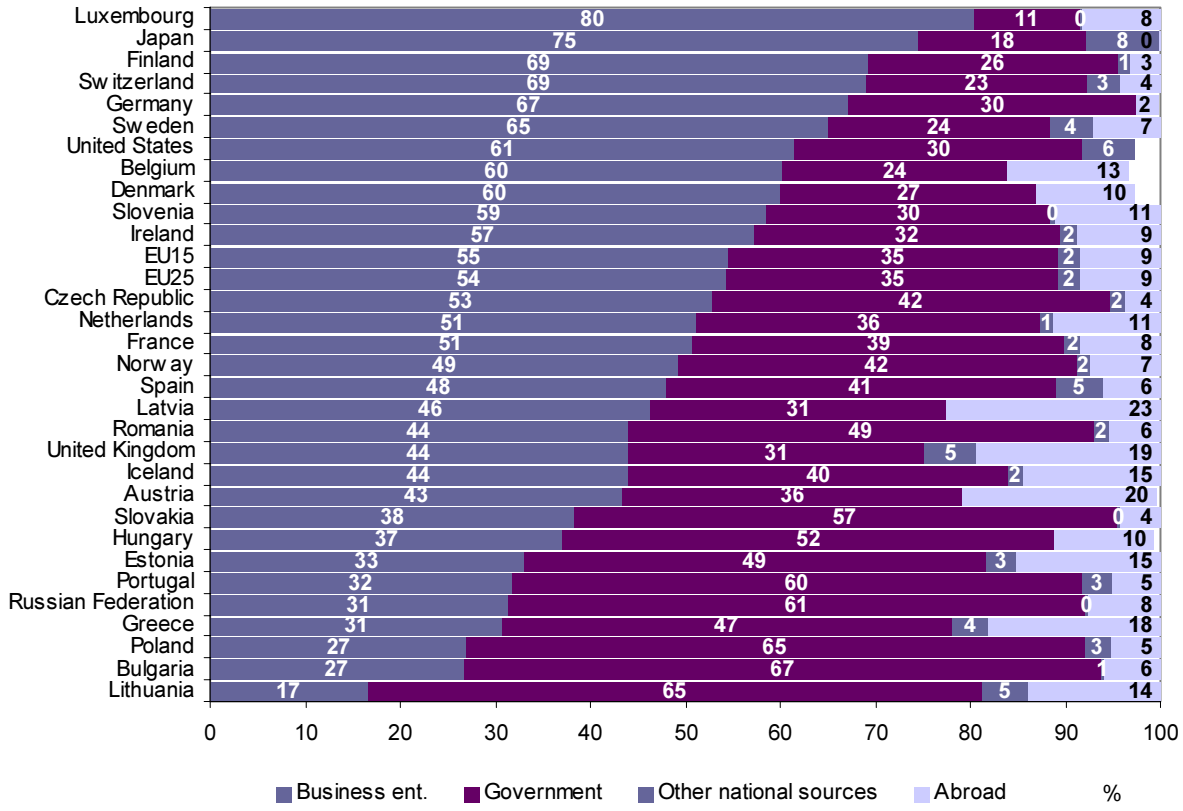
IV.1.3 Financial sources of R&D

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 the EU-25 countries level of 54,3 % in 2003. Among the EU-25 Member States the Business Enterprise sector traditionally mainly contributes to financing R&D, in Luxembourg (80,4 % in 2003), Finland (69,3 %) and finally Germany (67,1 %). Concerning the non-European countries the highest share of Business Enterprise sector on financing R&D was recorded in Japan (74,5 % in 2003) and Switzerland (69,1 % in 2000). The Czech Republic is with its share (52,8 % in 2004) near to the average of EU-25. From the EU-25 Member States the Business Enterprise sector has the lowest share of financing R&D in Lithuania (16,7 % in 2003) and Poland (26,9 % in 2004). On contrary the government dominates in these two countries as the most important investor into R&D. In 2003 the share of Government sector in Lithuania and Poland was (64,6 %), (65,2 %) respectively. Insufficient R&D expenditure of Business Enterprise sector is substituted by Government sector in these two countries.

Government sector got the share on total R&D expenditure in the EU-25 34,9 % in 2003. 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 Luxembourg (11,2 % in 2003), in Belgium and in Sweden it was (23,5 % in 2003). From non-European countries Japan shows regularly the lowest share (17,7 % in 2003). In the Czech Republic the share of the Government sector is above average of EU-25.

In 2003 the share of financial sources on R&D from abroad reached the level of 8,5 % in the EU-25. Latvia (22,5 %) and Austria (20,4 %) received the highest share of financial sources from abroad in 2004 for their research and development. The Czech Republic is, with its 3,7 %, at the level of 50% of the EU-25 average. Very low share of financial sources from abroad recorded in Japan (only 0,3% in 2003.

Figure 4.3 Structure of GERD by source of funds in selected countries 2004[(1)]



(1) Note: Data corresponds to: Luxembourg, Japan, Sweden, USA, Belgium, Denmark, EU-15, EU-25, Netherlands, France, Norway, UK, Island , Estonia, Portugal, Greece, Bulgaria –year 2003; Switzerland for 2000.

Source: Database New Cronos (Eurostat)

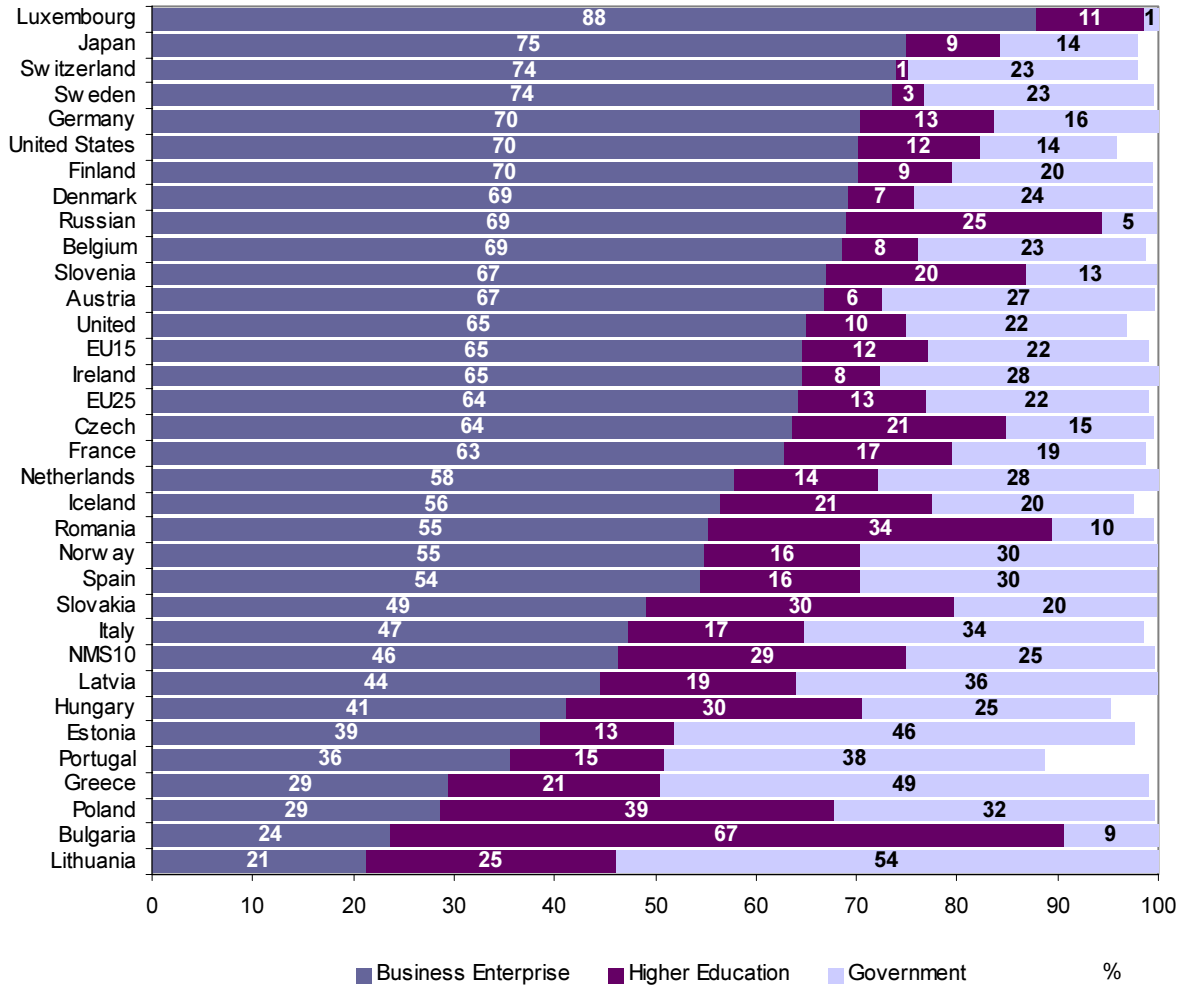
IV.1.4 Usage of financial sources in R&D by sectors of performance

The Business Enterprise sector is the most important sector of R&D performance just like in case of financing R&D. **In 2004, the average share of R&D expenditure used on R&D in the Business Enterprise sector in the EU-25 countries achieved the level of 64,2 %.** The highest share, of all time, of the EU Member States was in Luxembourg (87,8 % in 2004). High values were reached also by Sweden (73,5 % in 2004) and Germany (70,4 %). From non-European countries: the highest shares of R&D expenditure were used in the Business Enterprise sector by Japan (75,0 % in 2003) and Switzerland (73,9 % in 2000). In USA, this share reached 70,1 % in 2004. The Czech Republic with 63,7 % share in 2004 is near to the average of the EU-25.

In 2004, the share of R&D expenditure in the Government sector reached 12,8 % for the EU-25 Member States. The lowest shares of Government sector as a sector of performance show technologically developed countries (Switzerland- 1,3 % in 2000 and Sweden- 3,1 % in 2004). 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 (Bulgaria – 67,0 % and Poland- 39,0 % in 2004).

The Higher Education sector spent in the EU-25 countries on average 21,9 % of total R&D expenditure in 2004. In technologically developed countries the share is under the average level of the 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 2004[(1)]



(1) Note: Data corresponds to: for Italy, Japan 2003, Austria for 2002; Switzerland for 2000;Private Non-Profit sector is not included because of very low values.

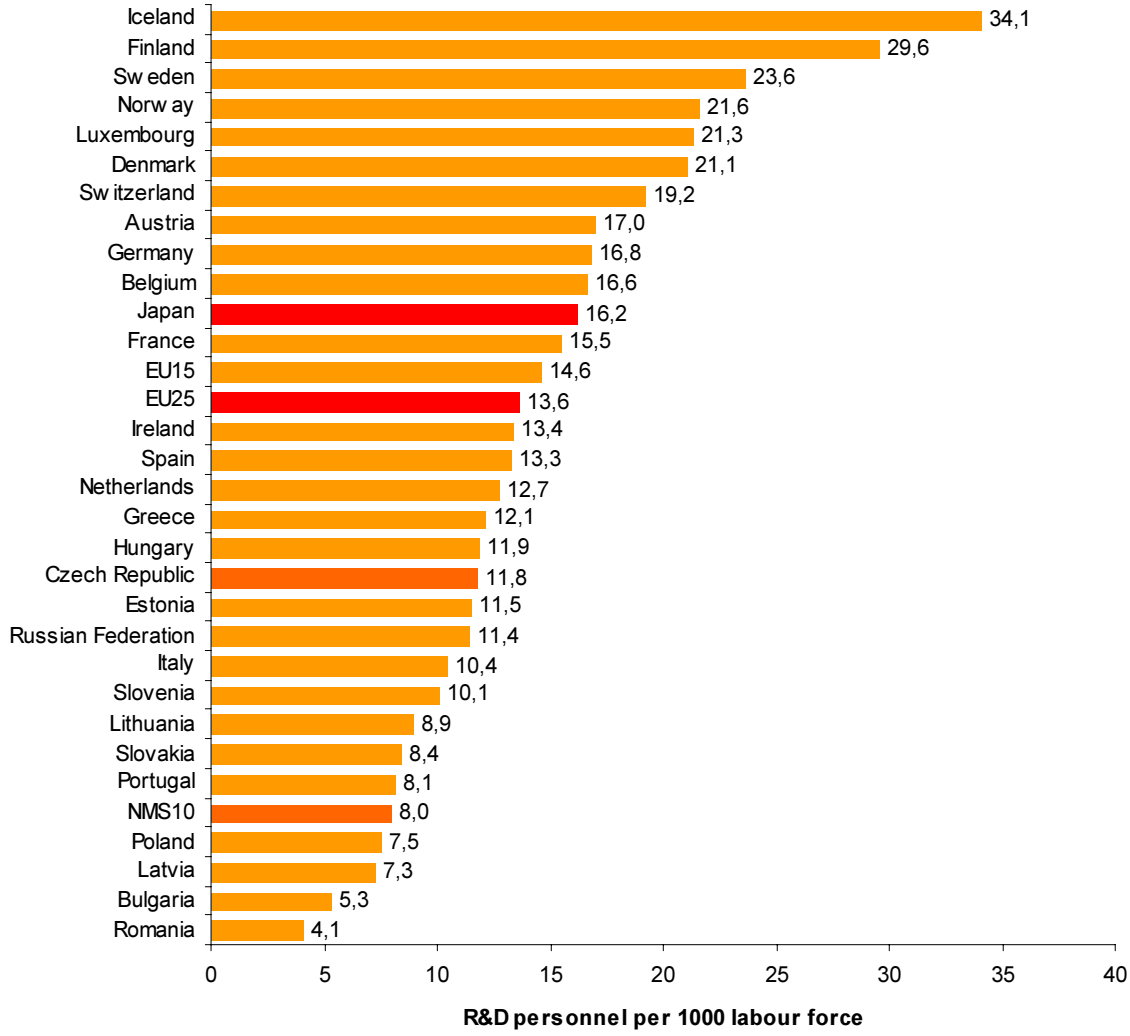
Source: Database New Cronos (Eurostat)

IV.2 Personnel of Research and Development – international comparison

IV.2.1 R&D Personnel per 1000 labour force

The average in countries EU-25 was 13,6 R&D personnel per 1000 labour force in 2004. This share reached 14,6 employees for members EU-15. Scandinavian countries have the highest shares of R&D personnel per 1 000 labour force. In 2004 the highest figures from member countries of EU-25 were recorded in Finland (29,6 in 2004), in Sweden (23,6 in 2003) and in Denmark (21,1 in 2004). The smallest shares were recorded in Latvia, Poland, Portugal, and the Slovak republic. The shares of new members, of EU, were on lower level of the interval.

Figure 4.5 Shares of R&D personnel per 1 000 labour force in selected countries in 2004[(1)]



(1) Comm.: Data corresponds to: Bulgaria, Portugal, Lithuania, Italy, Estonia, Greece, the Netherlands, France, Japan, Belgium, Germany, Denmark, Luxembourg, Norway, Sweden, Island,- year 2003, and Austria 2002. of Malta, Portugal, Italy, Austria, France for the year 2002; Sweden, Netherlands, Iceland - year 2001; Luxembourg 2000.

Source: Database New Cronos (Eurostat)

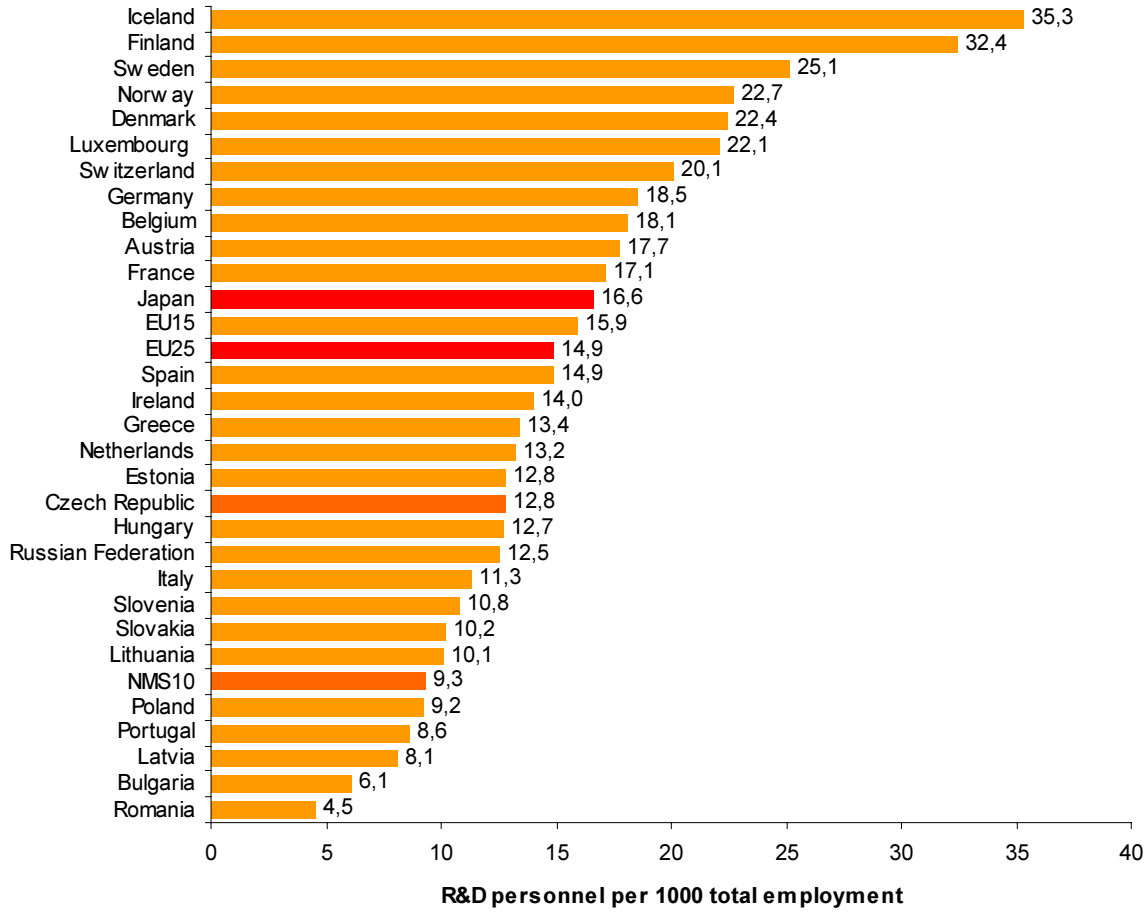
IV.2.2 R&D Personnel per 1 000 employed in economy

The average of personnel R&D of EU-25 was estimated: 14,9 employees per 1000 employed in economy in the year 2004. In the EU-15 this share reached 15,9 employees. Scandinavian countries reached again the highest shares of employees per 1 000 employed. In the EU-25 the highest figures were recorded in Finland (32,4 in 2004), in Sweden (25,1 in 2003) and in Norway (22,7 in the year 2003). From non-members of EU-25 it was Iceland, which reached the highest share (35,3 in 2003). In Japan, there were 16,6 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 the EU-15 members were recorded in Portugal (8,6 in 2004), Italy (11,3 in 2003) and the Netherlands (13,2 in 2003). The shares of the new members of EU were on lower level of the interval.

In 2004, 9,3 employees engaged in R&D per 1 000 employed was recorded in economy of 10 new member states of EU (NMS-10). In the EU-25 the smallest shares were recorded in these states: Latvia (8,1 in 2004), Portugal (8,6 in 2004) and Poland (9,2 in 2003).

In 2004, the share of R&D personnel in the Czech Republic reached 12,8 employees per 1 000 employed value, which it is above the average value of new member states. Only Estonia, which had the highest share among the new member states, had higher share, 12,8, than the Czech republic.

Figure 4.6 Shares of personnel R&D per 1 000 total employment in selected countries in 2004(1)



(1) Data corresponds to: Bulgaria, Poland, Lithuania, Italy, Estonia, the Netherlands, Greece, Japan, France, Belgium, Germany, Luxembourg, Denmark, Norway, Sweden, and Iceland- year 2003; Austria –2002.

Source: Database New Cronos (Eurostat)

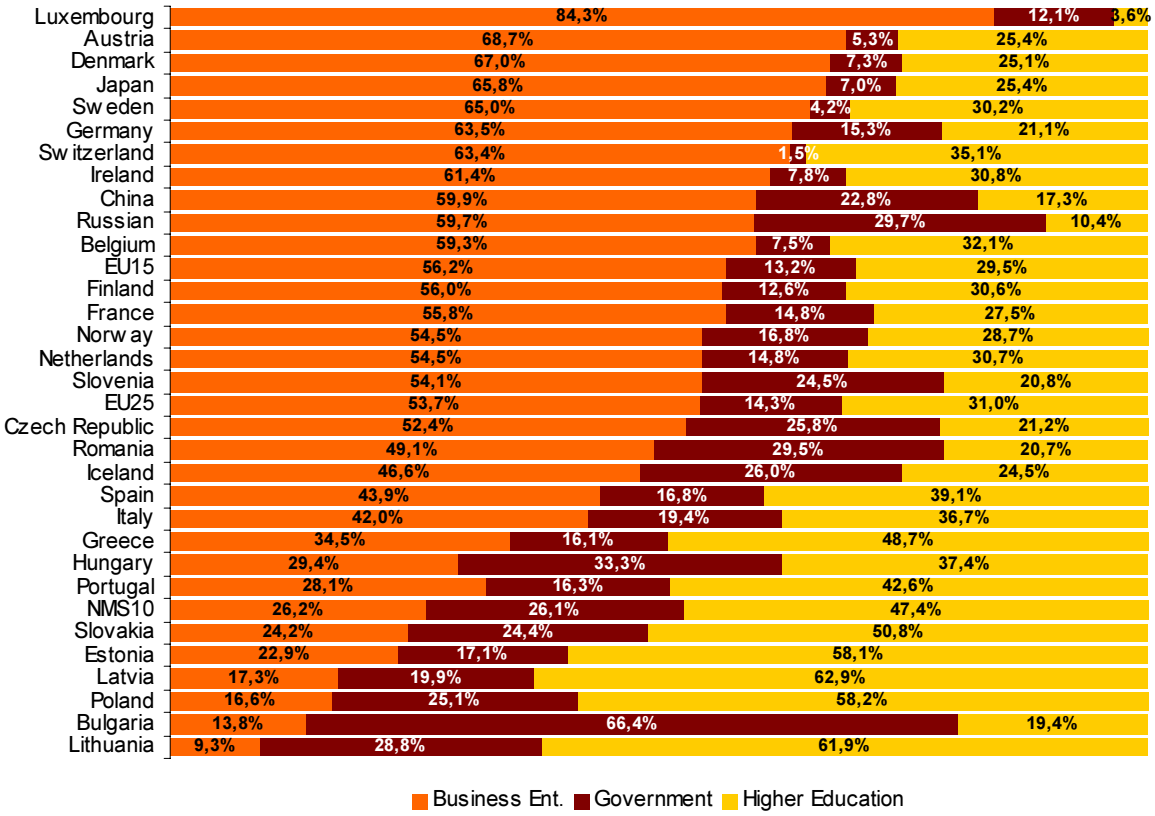
IV.2.3 R&D Personnel in FTE by sectors of performance

In 2004, on the average 53,7 % of R&D personnel worked in the Business Enterprise sector in the member states of EU-25. This share was lower than that 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 Luxembourg, 84,3 % in 2004. Austria (68,7 % in 2002), Denmark (67,0 % in 2004) and Sweden (65,0 % in 2004) also had high shares. In Japan this share reached 65,8 % in 2003. Among the new member states of EU, Lithuania (9,3 % in 2004), Poland (16,6 % in 2004) and Latvia (17,3 % in 2004) recorded the smallest shares of R&D personnel in the Business Enterprise sector. **The Czech Republic with 54,2 % share is very close to the average of EU-25. The average of new member states of EU reached the share 26,6 % in the year 2003.**

The average share, 14,3 %, of R&D personnel in the member states of EU-25 in the year 2004 was recorded in the government sector. This share in the EU-15 was 13,2 %. The highest shares of R&D personnel from the member states of EU-25 were recorded in Hungary (33,3 % in 2004), in Lithuania (28,8 % in 2004) and in the Czech Republic (25,8 % in 2004). Whereas the lowest shares of R&D personnel were recorded in technologically advanced states: Sweden (4,2 % in 2004), Austria (5,3 % in 2002) and Denmark (7,3 % in 2004). **In 2004 the average of the new member states of EU reached 26,1 %.**

The average share, 31,0 %, of R&D personnel in the member states of EU-25 in the year 2004 was recorded in the higher education sector. And in the case of EU-15, it was 29,5 %. The highest shares were recorded in the Baltic countries: Latvia (62,9 %) and Lithuania (61,9 %) in 2004. Whereas the lowest shares, in the higher education sector, were recorded in Luxembourg (3,6 % in 2004), Slovenia (20,8 % in 2004) and in Germany (21,1 % in 2004). **The average of new member countries of EU was 47,7 % in 2003 and this average was higher than that of EU-25.**

Figure 4.7 Shares of R&D personnel by three main sectors of performance in selected countries in 2004(1)



(1) Note: Data corresponds to: Japan, China, France, Italy- year 2003; Austria – 2002; Private Non-profit sector is not included in this figure. In some countries the total is not equal 100 %.

Source: Database New Cronos (Eurostat)

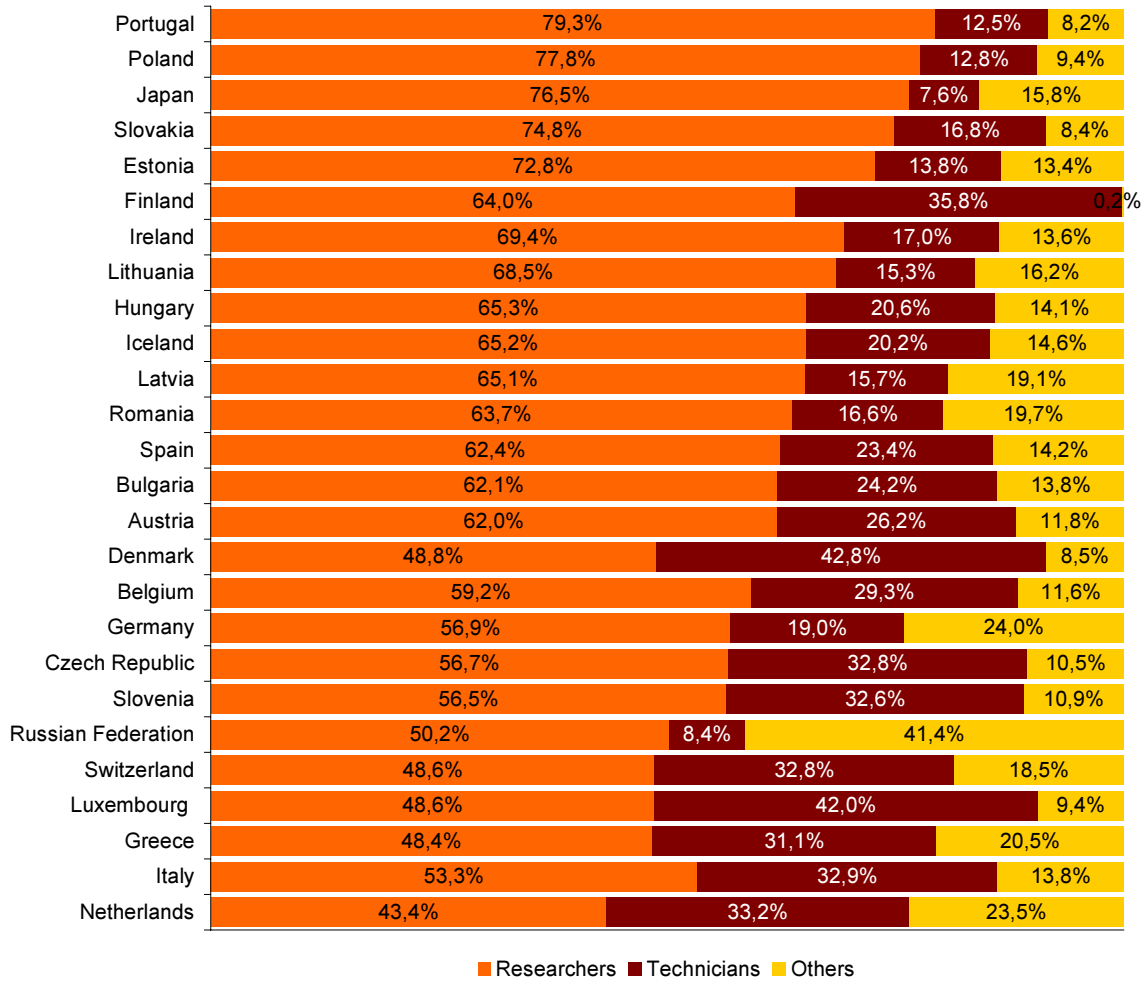
IV.2.5 R&D personnel in FTE by occupation

The highest shares of researchers in total R&D personnel were recorded in member states of EU-25. **In 2004, the average of this share in the EU-25 was 59,7 %. In states of the EU-15 this share was (58,7 %). The share of researchers on the average reached 70,3 % in new member sates of EU, which was higher than that of EU-15.** The highest shares of researchers in the EU-25 were recorded in countries with low expenditure on R&D. Among these countries were Portugal (79,3 % in 2003), Poland (77,8 % in 2004) and the Slovak republic (74,8 % in 2004). The lowest share of researchers was recorded in the Netherlands (43,4 %) in 2003. In the Czech republic this share in 2004 reached 56,7 %.

The average values of the group technicians and other R&D personnel are not available for EU-25 and EU-15. Even for new member states these average values are not available. The highest share of technicians was recorded in Luxembourg (42 % in 2003) then follows the Netherlands (33,2 % in 2003) and the Czech republic (32,8 % in 2004). The lowest shares were recorded in Portugal (12,5 % in 2002), Poland (12,8 %) and Estonia (13,8 % in 2003). Japan (7,6 % in 2003) and Russian federation (8,4 % in 2003) also recorded lower shares.

The highest shares of other R&D personnel were recorded in the EU-25: in Germany (24,0 % in 2003), the Netherlands (23,5 % in 2003) and Greece (20,5 % in 2003). The lowest shares were recorded in Portugal (8,2 % in 2003), the Slovak republic (8,4 % in 2004) and Luxembourg (9,4 % in 2003). In the Czech republic the share of other R&D personnel in 2004 was 10,5 %).

Figure 4.8 Shares of R&D personnel by occupation in selected countries in 2004[(1)]



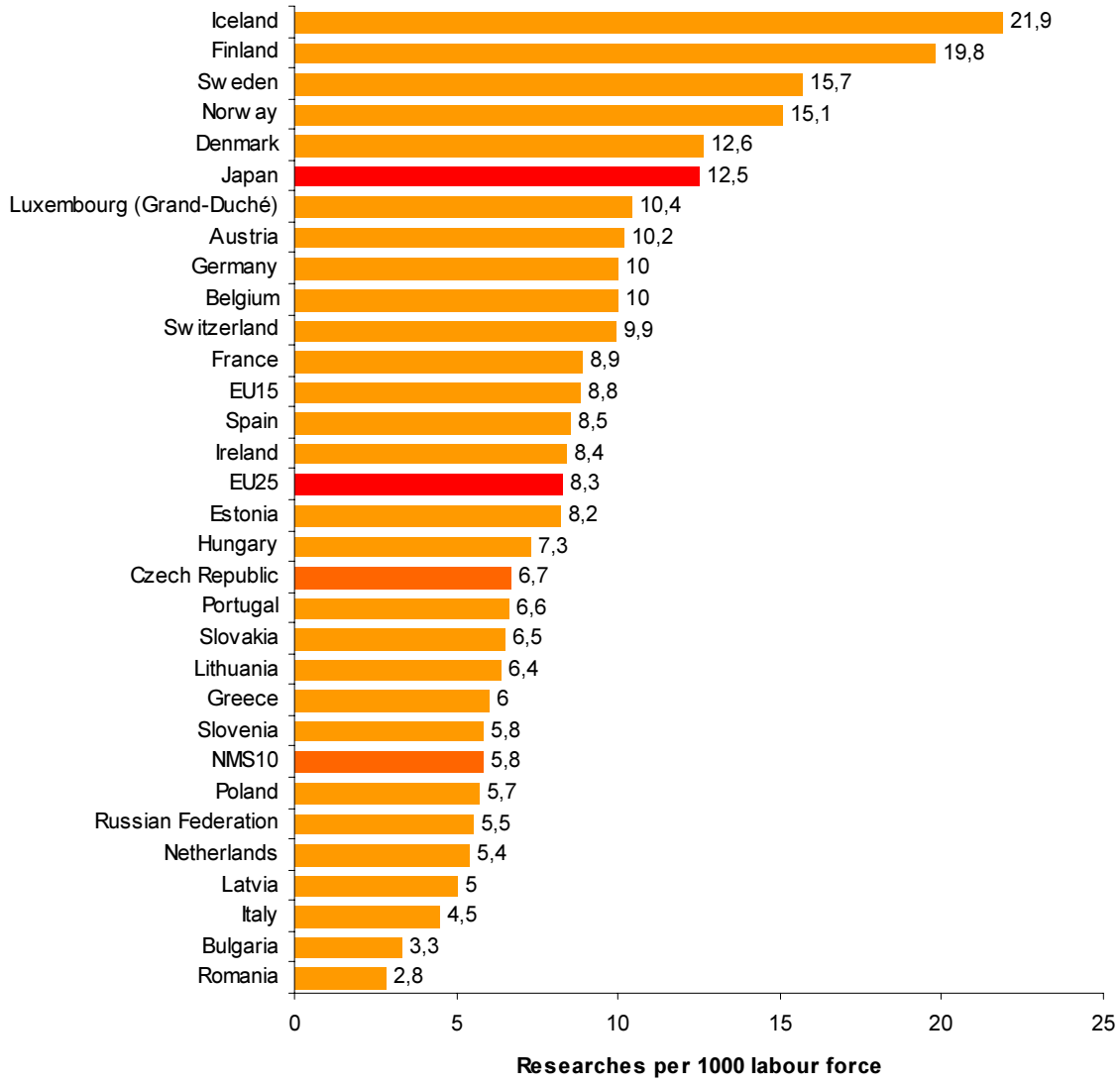
(1)Note: Data corresponds to: the Netherlands, Greece, Russian Federation, Germany, Belgium, Bulgaria, Iceland, Lithuania, Estonia, Japan and Portugal - year 2003; Austria - 2002; Denmark – 2001; Switzerland - 2000; Finland – 1997; Italy - 1995,. United States and United Kingdom don't give data of R&D personnel.

Source: Database New Cronos (Eurostat)

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

In 2004, 8,3 researchers on the average per 1 000 labour force was recorded in the member states of EU-25. In the EU-15 this share was 8,8 % and in new member states, NMS-10, it was 5,8. In the EU-25 the highest numbers of researchers per 1 000 labour force were recorded in Finland (19.8 in 2004), further in Sweden (15,7 in 2003) and in Denmark (12,6 in 2003). The smallest numbers of researchers per 1 000 labour force were recorded in Italy (4,5 in 2003), in Latvia (5,0 in 2004) and in the Netherlands (5,4 in 2004). The Czech Republic, with its share, is nearly in the middle of EU level above the average of NMS-10, but below the average of EU-25.

Figure 4.9 Number of researchers engaged in R&D per 1 000 labour force in selected countries in 2004[(1)]



(1) Note: Data corresponds to: Bulgaria, Portugal, Lithuania, Italy, Estonia, Greece, the Netherlands, France, Japan, Belgium, Germany, Denmark, Luxembourg, Norway, Sweden and Iceland- 2003; Austria-2002.

Source: Database New Cronos (Eurostat)