

## EXPENDITURE ON R&D

Expenditure on research and development (R&D) is a key indicator of countries' innovative efforts.

### Definition

Research and development (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge (including knowledge of man, culture and society) and the use of this knowledge to devise new applications. R&D covers three activities: basic research, applied research, and experimental development. Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view. Applied research is also original investigation undertaken in order to acquire new knowledge; it is, however, directed primarily towards a specific practical aim or objective. Experimental development is systematic work, drawing on existing knowledge gained from research and/or practical experience, which is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed.

The main aggregate used for international comparisons is gross domestic expenditure on R&D (GERD). This consists of the total expenditure (current and capital) on R&D carried out by all resident companies, research institutes, university and government laboratories, etc. It includes R&D funded from abroad but excludes domestic funds for

R&D performed outside the domestic economy. GERD is here expressed in constant 2005 dollars (adjusted for purchasing power parity) and as a share of GDP (R&D intensity).

### Comparability

The R&D data shown here have been compiled according to the guidelines of the OECD *Frascati Manual*. Estimates of the resources allocated to R&D are affected by national characteristics such as the periodicity and coverage of national R&D surveys across institutional sectors and industries (and the inclusion of firms and organisations of different sizes); and the use of different sampling and estimation methods. R&D typically involves a few large performers, hence R&D surveys use various techniques to maintain up-to-date registers of known performers, while attempting to identify new or occasional performers.

Data for Israel exclude defence. Those for Korea, prior to 2007, exclude social sciences and the humanities. For the United States, R&D capital expenditures are excluded and depreciation charges of the business enterprises are included.

### Overview

Among OECD countries, the United States is the main performer with 42% of the total OECD GERD in 2009, followed by Japan (15%) and Germany (9%). Since 1999, real R&D expenditure has been growing the fastest in Estonia, Korea, Portugal and Turkey, with average annual growth rates around 10%. Outside the OECD area, China's average annual real growth in R&D spending has been close to 20%, making it the world's second largest R&D performer and ahead of Japan since 2009.

In 2009, R&D amounted to 2.4% of GDP for the OECD as a whole. Denmark, Finland, Israel, Japan, Korea and Sweden were the only OECD countries whose R&D-to-GDP ratio exceeded 3%.

Over the last decade, R&D intensity grew in the EU (from 1.74% to 1.91%), in Japan (from 3.00% to 3.26%) and in the United States (from 2.71% to 2.90%). Estonia, Korea, Portugal and Turkey were the fastest growing OECD countries. In the same period (2000-10), R&D intensity in China almost doubled, increasing from 0.90% to 1.77%.

### Sources

- OECD (2012), *Main Science and Technology Indicators*, OECD Publishing.

### Further information

#### Analytical publications

- OECD (2012), *OECD Science, Technology and Industry Outlook*, OECD Publishing.
- OECD (2011), *OECD Science, Technology and Industry Scoreboard*, OECD Publishing.

#### Methodological publications

- OECD (2002), *Frascati Manual 2002: Proposed Standard Practice for Surveys on Research and Experimental Development*, The Measurement of Scientific and Technological Activities, OECD Publishing.

#### Online databases

- OECD Science, Technology and R&D Statistics

#### Websites

- OECD Science, Technology and Industry, [www.oecd.org/sti](http://www.oecd.org/sti).
- OECD Main Science and Technology Indicators, [www.oecd.org/sti/msti](http://www.oecd.org/sti/msti).
- OECD Research and Development Statistics, [www.oecd.org/sti/rds](http://www.oecd.org/sti/rds).
- OECD Measuring Science and Technology, [www.oecd.org/sti/measuring-scitech](http://www.oecd.org/sti/measuring-scitech).
- OECD Frascati Manual 2002 (supplementary material), [www.oecd.org/sti/frascaticmanual](http://www.oecd.org/sti/frascaticmanual).



## Gross domestic expenditure on R&amp;D

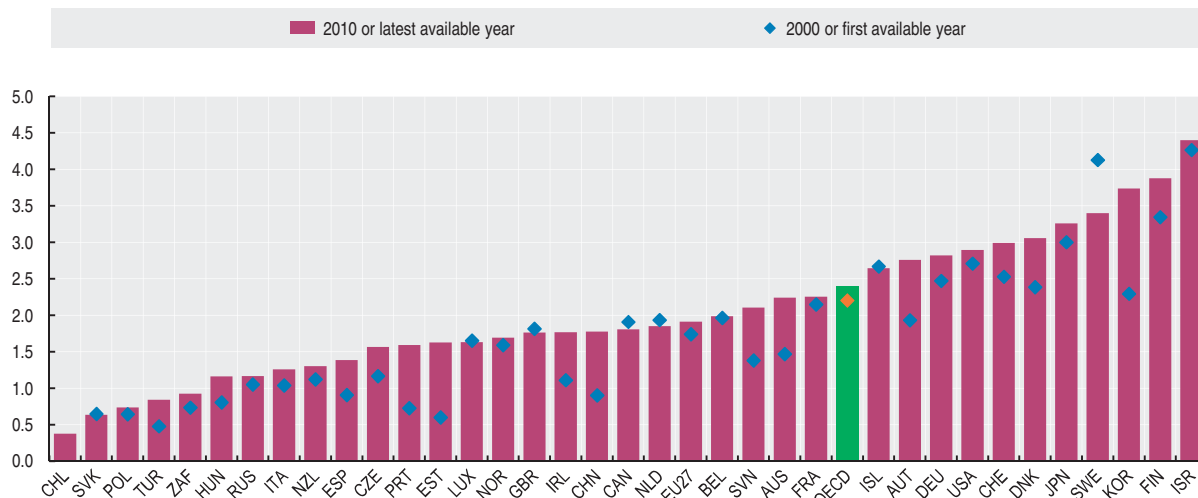
Million US dollars – 2005 constant prices and PPPs

|                    | 1999    | 2000    | 2001    | 2002    | 2003    | 2004    | 2005    | 2006    | 2007    | 2008    | 2009    | 2010    | 2011   |
|--------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------|
| Australia          | ..      | 8 936   | ..      | 10 719  | ..      | 12 061  | ..      | 14 902  | ..      | 17 644  | ..      | ..      | ..     |
| Austria            | 4 636   | 4 920   | 5 266   | 5 546   | 5 902   | 6 043   | 6 803   | 6 996   | 7 455   | 8 052   | 7 896   | 8 184   | 8 417  |
| Belgium            | 5 810   | 6 125   | 6 497   | 6 165   | 6 018   | 6 149   | 6 171   | 6 440   | 6 750   | 7 081   | 7 090   | 7 109   | ..     |
| Canada             | 17 032  | 19 063  | 21 215  | 21 352  | 21 687  | 22 709  | 23 090  | 23 336  | 23 356  | 22 796  | 22 416  | 21 708  | 21 448 |
| Chile              | ..      | ..      | ..      | ..      | ..      | ..      | ..      | ..      | 712     | 889     | ..      | ..      | ..     |
| Czech Republic     | 1 881   | 2 079   | 2 125   | 2 159   | 2 335   | 2 442   | 2 948   | 3 467   | 3 650   | 3 570   | 3 582   | 3 888   | ..     |
| Denmark            | 3 554   | ..      | 4 063   | 4 289   | 4 421   | 4 363   | 4 419   | 4 608   | 4 875   | 5 342   | 5 408   | 5 471   | ..     |
| Estonia            | 98      | 95      | 117     | 128     | 148     | 175     | 207     | 277     | 285     | 324     | 311     | 362     | ..     |
| Finland            | 4 260   | 4 733   | 4 799   | 4 955   | 5 170   | 5 401   | 5 601   | 5 846   | 6 151   | 6 576   | 6 406   | 6 553   | ..     |
| France             | 35 799  | 36 946  | 38 479  | 39 521  | 38 794  | 39 395  | 39 236  | 40 191  | 40 623  | 41 394  | 42 720  | 43 214  | ..     |
| Germany            | 58 231  | 61 579  | 62 557  | 63 289  | 63 981  | 63 800  | 64 299  | 67 595  | 69 569  | 74 705  | 74 375  | 77 098  | ..     |
| Greece             | 1 291   | ..      | 1 356   | ..      | 1 449   | 1 471   | 1 615   | 1 670   | 1 770   | ..      | ..      | ..      | ..     |
| Hungary            | 915     | 1 124   | 1 348   | 1 516   | 1 474   | 1 447   | 1 616   | 1 788   | 1 751   | 1 803   | 1 955   | 1 967   | ..     |
| Iceland            | 185     | 224     | 258     | 258     | 252     | ..      | 287     | 324     | 308     | 308     | ..      | ..      | ..     |
| Ireland            | 1 360   | 1 413   | 1 449   | 1 543   | 1 706   | 1 878   | 2 009   | 2 119   | 2 297   | 2 528   | 2 858   | 2 844   | ..     |
| Israel             | 4 700   | 6 228   | 6 628   | 6 607   | 6 296   | 6 610   | 7 146   | 7 684   | 8 714   | 8 937   | 8 422   | 8 719   | ..     |
| Italy              | 15 474  | 16 411  | 17 376  | 18 110  | 17 766  | 17 920  | 17 999  | 19 095  | 20 204  | 20 527  | 20 337  | 20 606  | ..     |
| Japan              | 106 715 | 110 017 | 113 086 | 114 930 | 117 927 | 120 301 | 128 695 | 134 844 | 139 916 | 138 684 | 126 872 | 128 581 | ..     |
| Korea              | 17 574  | 20 213  | 22 641  | 23 586  | 25 067  | 28 305  | 30 618  | 34 712  | 38 923  | 41 685  | 44 311  | 49 394  | ..     |
| Luxembourg         | ..      | 441     | ..      | ..      | 476     | 492     | 495     | 554     | 561     | 562     | 563     | 569     | ..     |
| Mexico             | 4 334   | 4 011   | 4 239   | 4 727   | 4 769   | 5 014   | 5 346   | 5 266   | 5 215   | ..      | ..      | ..      | ..     |
| Netherlands        | 10 220  | 10 385  | 10 572  | 10 290  | 10 533  | 10 823  | 10 904  | 11 157  | 11 134  | 11 071  | 11 016  | 11 379  | ..     |
| New Zealand        | 831     | ..      | 1 006   | ..      | 1 144   | ..      | 1 189   | ..      | 1 304   | ..      | 1 427   | ..      | ..     |
| Norway             | 2 687   | ..      | 3 009   | 3 082   | 3 208   | 3 175   | 3 316   | 3 503   | 3 832   | 4 023   | 4 048   | 4 024   | ..     |
| Poland             | 2 989   | 2 912   | 2 850   | 2 595   | 2 606   | 2 831   | 2 982   | 3 107   | 3 384   | 3 790   | 4 304   | 4 876   | ..     |
| Portugal           | 1 429   | 1 574   | 1 704   | 1 627   | 1 565   | 1 663   | 1 755   | 2 256   | 2 728   | 3 519   | 3 728   | 3 667   | ..     |
| Slovak Republic    | 444     | 444     | 450     | 424     | 446     | 418     | 440     | 459     | 480     | 522     | 506     | 692     | ..     |
| Slovenia           | 513     | 543     | 605     | 616     | 549     | 629     | 675     | 775     | 769     | 911     | 942     | 1 081   | ..     |
| Spain              | 8 302   | 9 193   | 9 607   | 10 635  | 11 657  | 12 203  | 13 331  | 14 832  | 16 220  | 17 457  | 17 302  | 17 240  | ..     |
| Sweden             | 8 864   | ..      | 10 814  | ..      | 10 443  | 10 233  | 10 510  | 11 346  | 10 809  | 11 686  | 10 804  | 10 835  | ..     |
| Switzerland        | ..      | 6 308   | ..      | ..      | ..      | 7 525   | ..      | ..      | ..      | 8 728   | ..      | ..      | ..     |
| Turkey             | 2 739   | 2 996   | 3 171   | 3 293   | 3 184   | 3 735   | 4 617   | 4 845   | 6 314   | 6 380   | 7 110   | 7 664   | ..     |
| United Kingdom     | 29 856  | 31 056  | 31 594  | 32 399  | 32 759  | 32 524  | 34 081  | 35 331  | 37 219  | 37 018  | 36 731  | 35 615  | ..     |
| United States      | 282 775 | 302 231 | 306 683 | 300 510 | 307 769 | 310 261 | 325 936 | 339 956 | 355 488 | 371 813 | 365 994 | ..      | ..     |
| EU 27              | 197 094 | 208 068 | 215 363 | 219 609 | 221 669 | 223 960 | 229 931 | 242 058 | 251 118 | 262 891 | 262 780 | 267 201 | ..     |
| OECD               | 650 059 | 690 857 | 712 638 | 715 336 | 730 083 | 743 415 | 779 529 | 818 588 | 857 502 | 888 551 | 873 833 | ..      | ..     |
| Brazil             | ..      | ..      | ..      | ..      | ..      | ..      | ..      | ..      | ..      | ..      | ..      | ..      | ..     |
| China              | 23 512  | 30 401  | 34 673  | 42 570  | 49 618  | 59 264  | 71 055  | 83 902  | 96 304  | 111 183 | 140 637 | 161 552 | ..     |
| India              | ..      | ..      | ..      | ..      | ..      | ..      | ..      | ..      | ..      | ..      | ..      | ..      | ..     |
| Indonesia          | ..      | ..      | ..      | ..      | ..      | ..      | ..      | ..      | ..      | ..      | ..      | ..      | ..     |
| Russian Federation | 11 419  | 13 242  | 15 602  | 17 308  | 19 139  | 18 364  | 18 121  | 19 689  | 22 230  | 21 891  | 24 185  | 23 394  | ..     |
| South Africa       | ..      | ..      | 2 536   | ..      | 2 921   | 3 271   | 3 654   | 4 005   | 4 179   | 4 335   | ..      | ..      | ..     |

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## Gross domestic expenditure on R&amp;D

As a percentage of GDP

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