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I SURVEY OUTLINE





The Purpose of the Survey

- To supply basic data on Korea's R&D activities (R&D human resources and expenditure) that can be used in setting up the national R&D policy and to provide a reference to experts in various fields to help them better develop their R&D planning
- To provide the OECD with data on Korea's R&D activities that can be used in comparative studies among member countries, which contributes to enhancing the nation's credibility

The History and Basis of the Survey

- Since initiated as a project titled "A Status Survey of Research Institutes" in 1963, the survey has annually announced the previous year's research and development performances.
- 'Designated Statistics' under the Statistics Law: No. 10501 (July 16, 1982)

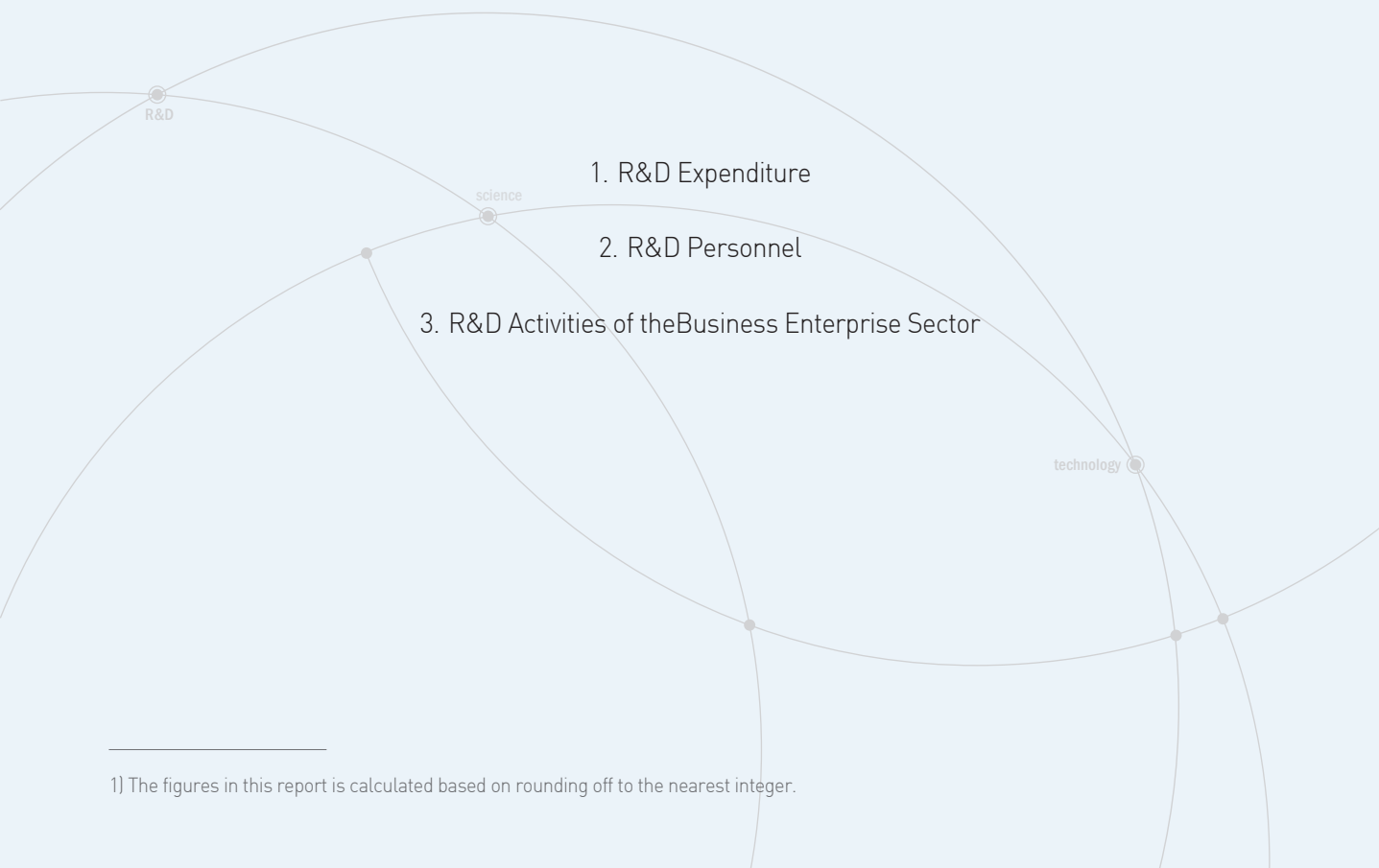
Survey Coverage and Methodology

- Research fields covered in the survey : natural sciences, engineering and technology, medical sciences, agricultural sciences, social sciences and humanities according to the "OECD Proposed Standard Practice for Surveys of Research and Experimental Development : FRASCATI MANUAL"
 ※ The 2008 Survey (results of 2007) started to include humanities and social sciences
- Methods used in the survey : self-reporting survey via mail or the Internet, supplemented by telephone survey
- Organizations covered in the survey : public research institutes, universities and colleges, medical institutes, business enterprises
 ※ The number of surveyed organizations

| Classification | Public Research Institutes | Univ. and Colleges | General Hospitals | Business Enterprises | Total |
|--|----------------------------|--------------------|-------------------|----------------------|----------------|
| Number of the Surveyed Org. | 737 | 420 | 563 | 34,995 | 36,715 |
| Number of the Retrieval Org. [Recovery Rate] | 724 [98.2%] | 411 [97.9%] | 554 [98.4%] | 28,939 [82.7%] | 30,628 [83.4%] |

- Survey base period : the number of personnel/researchers and the amount of capital are based on the last calendar date (December 31) of the previous year while sales and R&D expenditure are based on the whole previous calendar year (January 1– December 31)
- Survey items : general information, researcher(gender, degree, major), R&D expenditure (type of R&D, source of funds)

II KEY FIGURES¹⁾



1. R&D Expenditure

2. R&D Personnel

3. R&D Activities of the Business Enterprise Sector

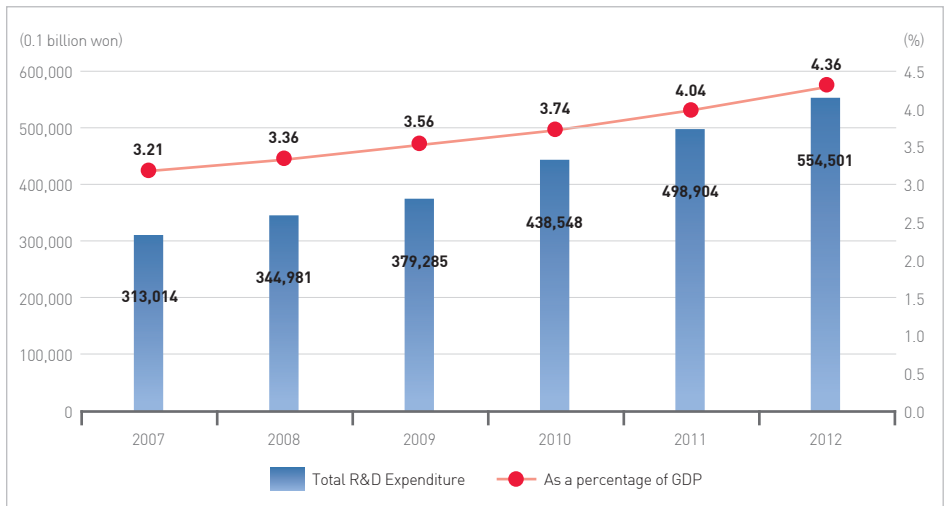
1) The figures in this report is calculated based on rounding off to the nearest integer.

1. R&D Expenditure

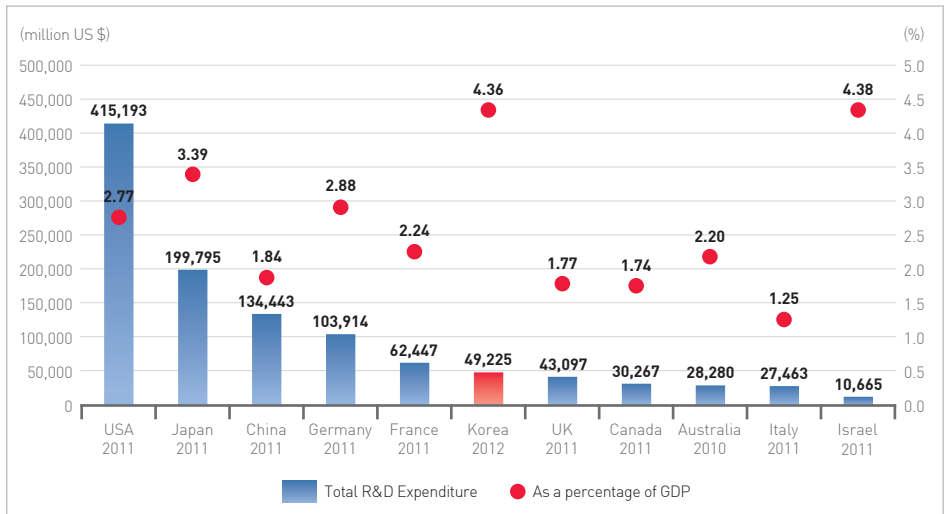
Total R&D expenditure

- Korea's total R&D expenditure in 2012 has increased by 5,559.7 billion won (11.1%) from the previous year to 55,450.1 billion won
 - R&D expenditure accounts for 4.36% of GDP, a 0.32 percentage points increase compared to 2011
- With R&D expenditure of 49,225 million USD, Korea is ranked 6th in the world while the nation's R&D expenditure accounts for 4.36% of GDP, which indicates the 2nd highest worldwide

〈Figure 1〉
R&D expenditure and as a percentage of GDP (Korea)



〈Figure 2〉
Total R&D expenditure by country

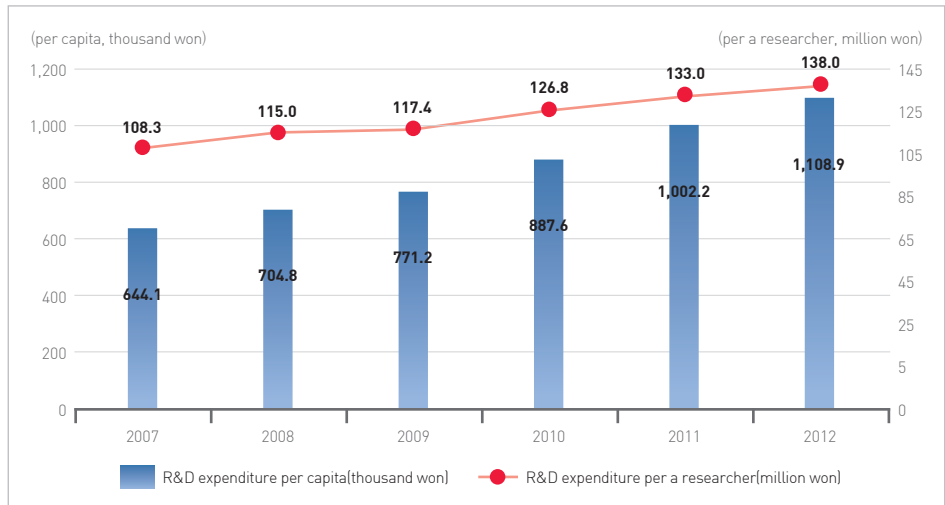


* Source : OECD, Main Science and Technology Indicators 2013-1

R&D expenditure per Capita and per Researcher

- Korea's R&D expenditure per capita and per researcher have continued to grow
 - R&D expenditure per capita has increased by 10,6% to 1,108,9 thousand won whereas R&D expenditure per researcher reaches 138,0 million won, a 3,8% increase from the previous year
- The nation's R&D expenditure per capita (984 USD) and per researcher(FTE) (156 thousand USD) are both less than those of the major developed nations (US, Japan, Germany), respectively
 - Japan shows the highest R&D expenditure per capita (1,563 USD in 2011), followed by the US (1,376 USD in 2011) and Germany (1,271 USD in 2011)
 - Nations with the highest R&D expenditure per researcher(FTE) are Japan (304 thousand USD in 2011), Germany (282 thousand USD in 2010), the US (269 thousand USD in 2007)

〈Figure 3〉
R&D expenditure per capita/
per researcher
(Korea)



〈Table 1〉
R&D expenditure per capita/per
researcher(FTE)
by country

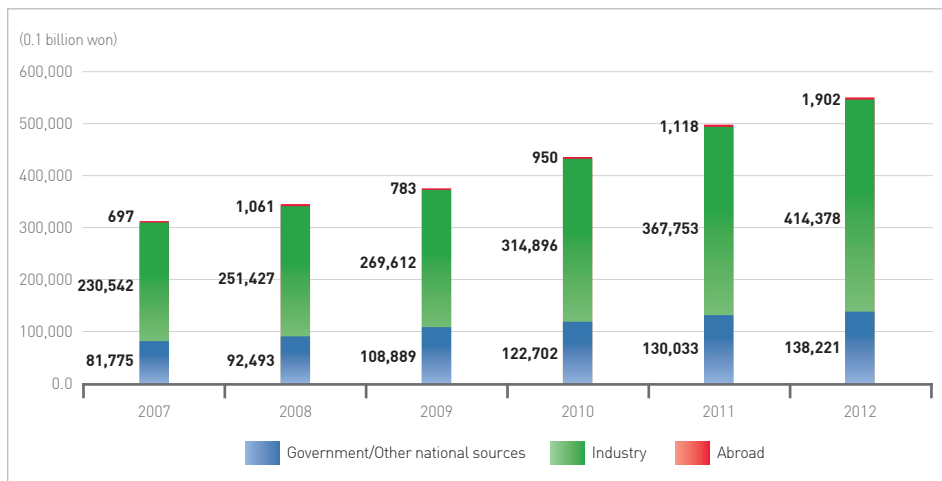
| | Germany | USA | UK (2011) | Japan (2011) | China (2011) | France | Korea (2012) |
|--|-------------|-------------|-----------|--------------|--------------|-----------|--------------|
| R&D expenditure per capita(US \$) | 1,271 ('11) | 1,331 ('11) | 687 | 1,563 | 100 | 959 ('11) | 984 |
| R&D expenditure per researcher (thousand US \$, FTE) | 282 ('10) | 269 ('07) | 164 | 304 | 102 | 240 ('10) | 156 |

* Source : OECD, Main Science and Technology Indicators 2013-1

R&D Expenditure by Source of Funds

- With an increase of 733 billion won (6.0%) from the previous year to a total of 13,822.1 billion won, funding from the government and other national sources accounts for 24.9% of the total source of funds in 2012
 - Funds from the industry and abroad are 41,437.8 billion won (74.7%) and 190.2 billion won (0.3%) respectively
- The percentage of public funds in Korea's total R&D expenditure is relatively lower than that of the US, France, and the UK
 - Public funds in the US(2011), France(2010), the UK(2011), and Germany(2010) account for 40.0%, 38.9%, 38.4% and 30.5% of the total R&D expenditure, respectively.

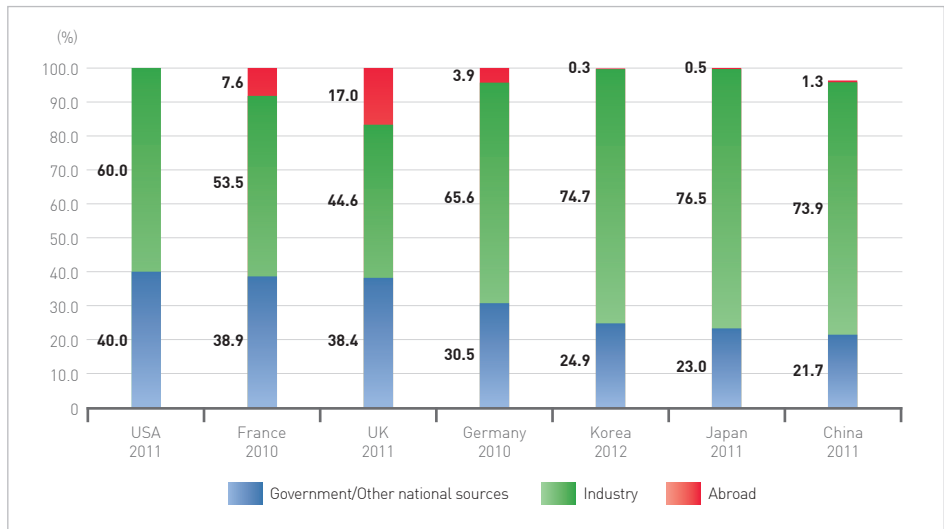
〈Figure 4〉
R&D expenditure by source of funds (Korea)



〈Figure 5〉
R&D expenditure rate by source of funds (Korea)



(Figure 6)
R&D
expenditure rate
by source
of funds
(major countries)

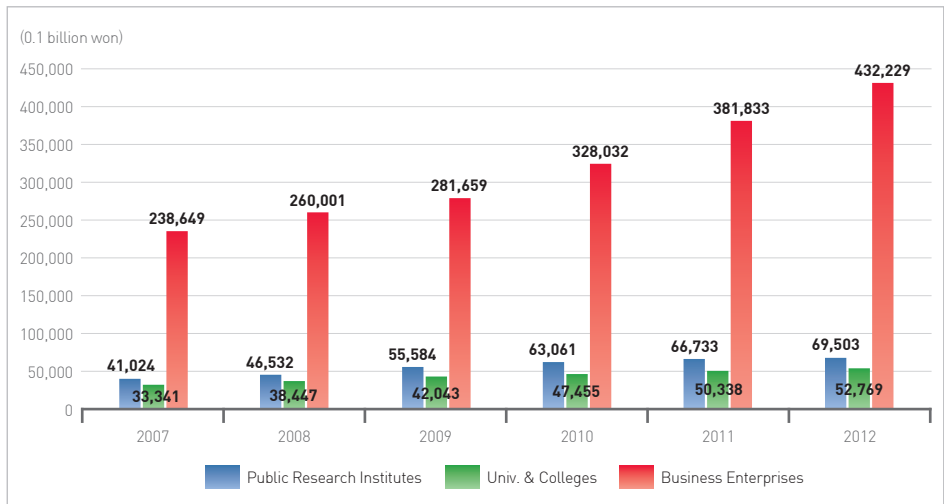


* Source : OECD, Main Science and Technology Indicators 2013-1
* Total sum of China is less than 100.0%

R&D Expenditure by Sector of Performance

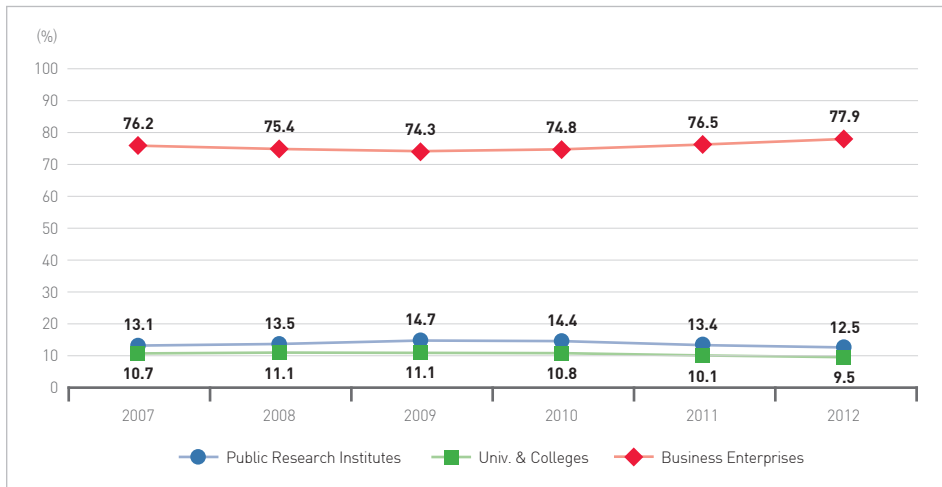
- 77.9% (43,222.9 billion won) of the total R&D expenditure is spent by business enterprises.
 - R&D expenditure by business enterprises has increased by 13.2% (5,039.6 billion won). Meanwhile, public research institutes and universities & colleges have spent 6,950.3 billion won and 5,276.9 billion won, respectively.
- Among the major countries, the percentage of R&D expenditure by business enterprises in Korea (77.9%) is higher than that of Japan, China, and the US.
 - On the contrary, the nation's R&D expenditure by universities and colleges represents 9.5%, which is only higher than that of China (7.9% in 2011).

(Figure 7)
R&D expenditure
by sector
of performance
(Korea)

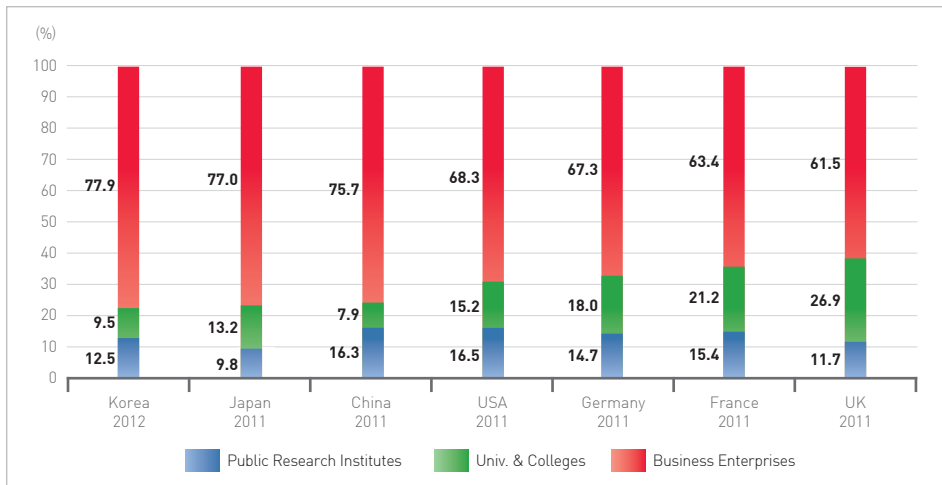


1. R&D Expenditure

(Figure 8)
R&D
expenditure rate
by sector
of performance
(Korea)



(Figure 9)
R&D
expenditure rate
by sector
of performance
(major countries)

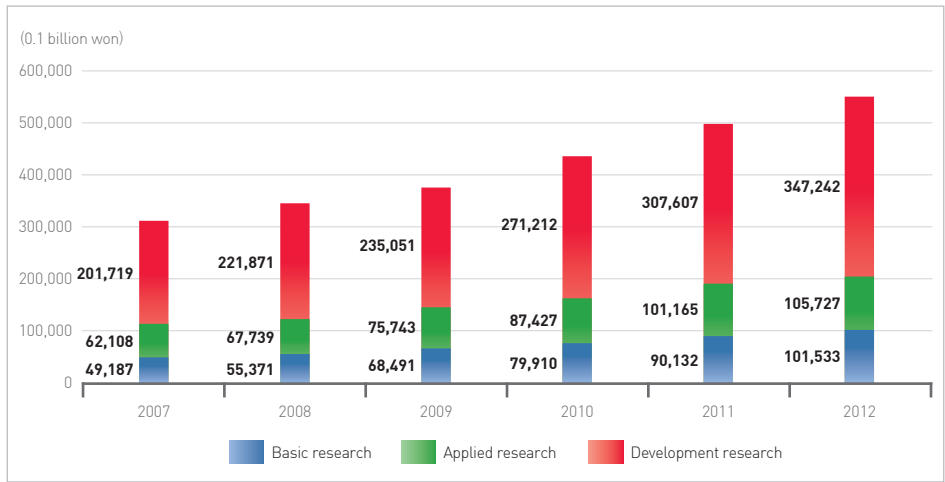


* Source : OECD, Main Science and Technology Indicators 2013-1

R&D Expenditure by type of R&D

- R&D expenditure spent on basic research has grown by 1,140.1 billion won to 10,153.3 billion won in 2012, a 12.6% increase from the previous year.
 - Spending on basic research accounts for 18.3%, a 0.2 percentage points increase compared to 2011.
 - R&D expenditure spent on applied research and development research account for 19.1% (10,572.7 billion won) and 62.6% (34,724.2 billion won), respectively.
- The percentage of expenditure on basic research in Korea (18.3%) is lower than that of France (25.3% in 2010) and the US (19.0% in 2009). However, it is higher than that of Japan (12.1% in 2010) and UK (8.9% in 2010).

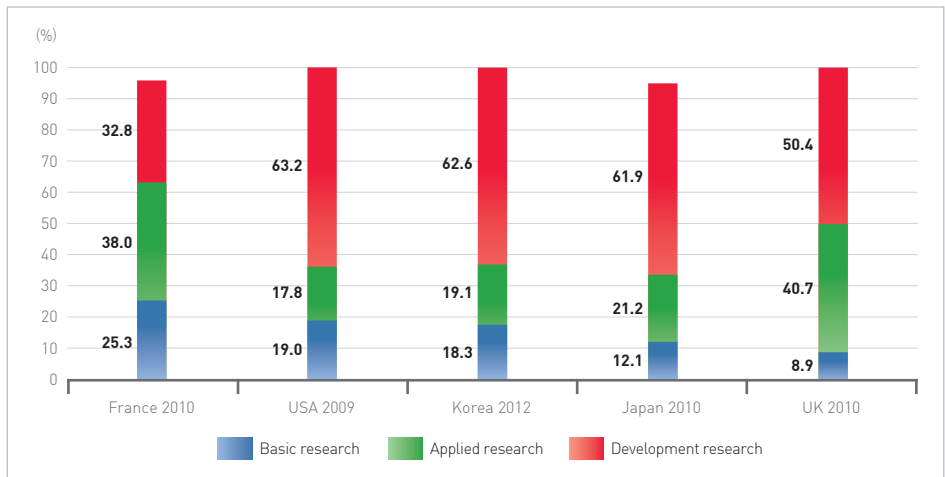
〈Figure 10〉
R&D expenditure
by type
of R&D (Korea)



〈Figure 11〉
R&D expenditure
rate by type
of R&D (Korea)



〈Figure 12〉
R&D expenditure
rate by type
of R&D
(major countries)

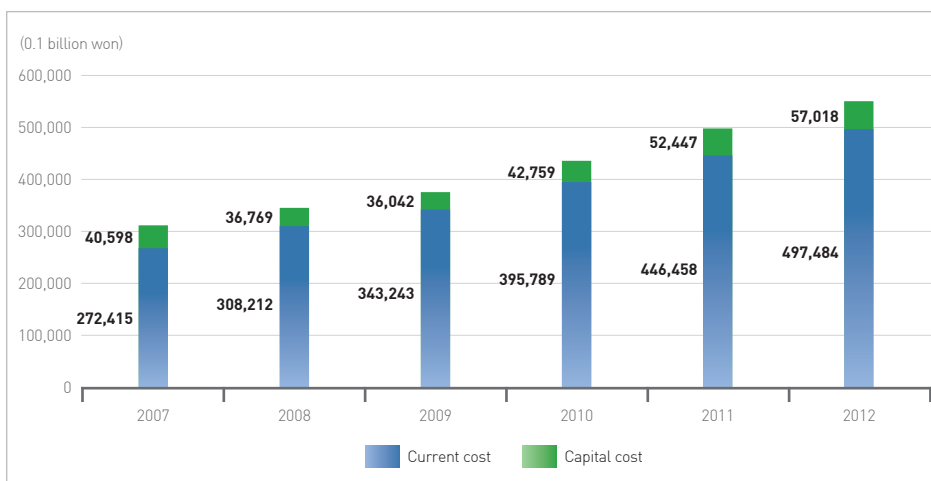


* Source : OECD, R&D Statistics 2013
* Total sum of France and Japan is less than 100.0%

R&D Expenditure by Type of Costs

- Of the total R&D expenditure in 2012, the current cost have increased by 11.4% (5,102.6 billion won) to reach 49,748.4 billion won.
 - The current costs account for 89.7% of the total R&D expenditure, a 0.2 percentage points increase from the previous year.
 - Of the total current costs, labor costs account for 40.7% (22,559.5 billion won) and other current costs account for 49.0% (27,188.8 billion won).
 - With 5,701.8 billion won, capital cost accounts for 10.3% of the total R&D expenditure.

〈Figure 13〉
R&D expenditure by type of costs (Korea)



〈Table 2〉
R&D expenditure by type of costs (Korea)

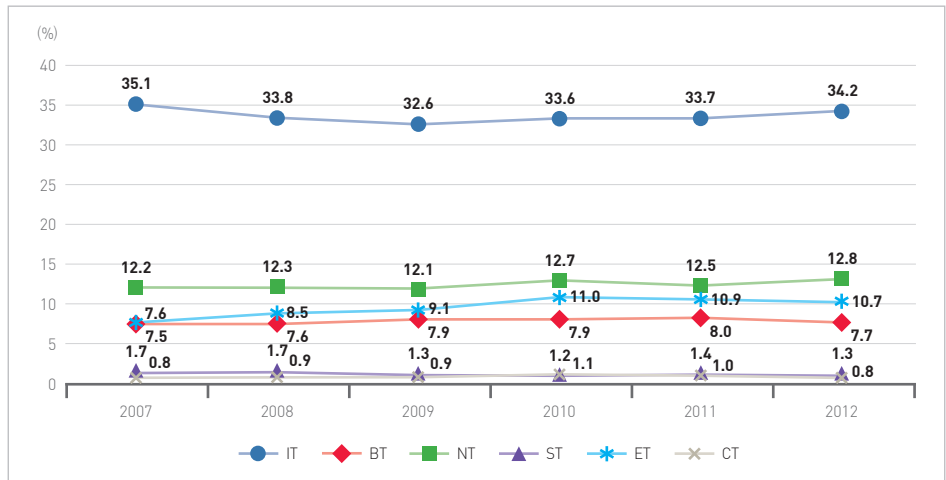
(Unit : 0.1 billion won, %)

| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|--------------|--------------------|----------|---------|---------|---------|---------|---------|---------|
| Current cost | Labor cost | R&D exp. | 128,041 | 139,877 | 145,239 | 173,420 | 196,498 | 225,595 |
| | | rate(%) | 40.9 | 40.5 | 38.3 | 39.5 | 39.4 | 40.7 |
| | Other current cost | R&D exp. | 144,375 | 168,335 | 198,005 | 222,369 | 249,959 | 271,888 |
| | | rate(%) | 46.1 | 48.8 | 52.2 | 50.7 | 50.1 | 49.0 |
| Sub total | | R&D exp. | 272,415 | 308,212 | 343,243 | 395,789 | 446,458 | 497,484 |
| | | rate(%) | 87.0 | 89.3 | 90.5 | 90.2 | 89.5 | 89.7 |
| Capital cost | Machinery | R&D exp. | 30,311 | 26,895 | 28,622 | 34,190 | 38,272 | 38,495 |
| | | rate(%) | 9.7 | 7.8 | 7.5 | 7.8 | 7.7 | 6.9 |
| | Land, Building | R&D exp. | 5,829 | 6,452 | 4,609 | 5,182 | 10,334 | 13,615 |
| | | rate(%) | 1.9 | 1.9 | 1.2 | 1.2 | 2.1 | 2.5 |
| | Computer software | R&D exp. | 4,458 | 3,422 | 2,811 | 3,388 | 3,840 | 4,907 |
| | | rate(%) | 1.4 | 1.0 | 0.7 | 0.8 | 0.8 | 0.9 |
| Sub total | | R&D exp. | 40,598 | 36,769 | 36,042 | 42,759 | 52,447 | 57,018 |
| | | rate(%) | 13.0 | 10.7 | 9.5 | 9.8 | 10.5 | 10.3 |
| Total | | | 313,014 | 344,981 | 379,285 | 438,548 | 498,904 | 554,501 |

R&D Expenditure of 6T

〈Figure 14〉
R&D Expenditure rate of 6T (Korea)

- IT accounts for 34.2% of the total R&D expenditure, a 0.4 percentage points increase in 2012.
 - R&D expenditure for IT has grown by 2,113.8 billion to reach 18,943.4 billion won.



〈Table 3〉
R&D Expenditure by 6T (Korea)

(Unit : 0.1 billion won)

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|--------|---------|---------|---------|---------|---------|---------|
| IT | 109,949 | 116,501 | 123,543 | 147,369 | 168,296 | 189,434 |
| BT | 23,537 | 26,349 | 30,089 | 34,591 | 40,048 | 42,459 |
| NT | 38,120 | 42,326 | 45,994 | 55,891 | 62,200 | 71,193 |
| ST | 5,331 | 5,949 | 4,878 | 5,481 | 6,809 | 7,058 |
| ET | 23,680 | 29,330 | 34,651 | 48,196 | 54,371 | 59,189 |
| CT | 2,406 | 2,986 | 3,574 | 5,029 | 5,054 | 4,525 |
| Others | 109,992 | 121,540 | 136,556 | 141,992 | 162,127 | 180,642 |
| Total | 313,014 | 344,981 | 379,285 | 438,548 | 498,904 | 554,501 |

1. R&D Expenditure

R&D Expenditure by Technology Type

- In 2012, electricity & electronics, information & communication, and machinery accounts for about 60.6% of the total R&D expenditure.
 - The share of electricity & electronics is the highest with 24.62%, followed by information & communication (19.07%), and machinery (16.88%).
- Public research institutes spend the largest amount of R&D expenditure in machinery (13.28%), while universities/colleges and business enterprises spend the largest in health science (17.26%) and in electricity & electronics (29.19%), respectively.

〈Table 4〉 2012 R&D Expenditure rate by the National S&T Standard Classification System (Korea)

(Unit : %)

| | Mathematics | Physics | Chemistry | Earth Science | Life Science | Agriculture, Fishery & food | Health Science |
|----------------------|-------------|---|----------------------|--|---------------------------|-----------------------------|----------------------|
| Public Research Ins. | 0.25 | 4.38 | 1.30 | 4.73 | 4.38 | 8.04 | 4.03 |
| Univ. & Colleges | 1.17 | 2.97 | 4.04 | 2.79 | 8.39 | 5.14 | 17.26 |
| Business Enterprises | 0.07 | 0.36 | 6.96 | 0.09 | 1.53 | 0.96 | 2.38 |
| Total | 0.20 | 1.12 | 5.97 | 0.93 | 2.54 | 2.24 | 4.01 |
| | Machinery | Materials | Chemical Eng. | Electricity & Electronics | Information/Communication | Energy/Resources | Nuclear Power |
| Public Research Ins. | 13.28 | 5.51 | 1.98 | 8.88 | 12.20 | 5.16 | 6.98 |
| Univ. & Colleges | 7.70 | 4.75 | 2.79 | 7.87 | 5.76 | 2.70 | 0.56 |
| Business Enterprises | 18.58 | 6.68 | 2.94 | 29.19 | 21.80 | 2.14 | 0.63 |
| Total | 16.88 | 6.35 | 2.80 | 24.62 | 19.07 | 2.57 | 1.42 |
| | Environment | Construction/Transportation | History/Archeology | Philosophy/Religion | Linguistics | Literature | Cultural/Arts/Sports |
| Public Research Ins. | 3.21 | 4.55 | 0.46 | 0.00 | 0.00 | 0.01 | 0.30 |
| Univ. & Colleges | 3.44 | 4.94 | 0.90 | 0.49 | 1.42 | 0.48 | 1.92 |
| Business Enterprises | 1.45 | 2.51 | 0.00 | 0.00 | 0.02 | 0.00 | 0.77 |
| Total | 1.86 | 3.00 | 0.14 | 0.05 | 0.15 | 0.05 | 0.82 |
| | Law | Politics/Public Administration | Economics/Management | Society, Anthropology, Welfare, Woman | Human Ecology | Geographical/Region/Tourism | Psychology |
| Public Research Ins. | 0.07 | 0.97 | 2.69 | 1.11 | 0.17 | 0.22 | 0.01 |
| Univ. & Colleges | 0.57 | 0.91 | 2.96 | 1.31 | 0.60 | 0.60 | 0.23 |
| Business Enterprises | 0.01 | 0.01 | 0.07 | 0.01 | 0.36 | 0.02 | 0.00 |
| Total | 0.07 | 0.21 | 0.68 | 0.27 | 0.36 | 0.10 | 0.02 |
| | Education | Media/Communication/Library & information | Brain Sciences | Cognitive/Emotion & Sensibility Sciences | S&T and Society | Total | |
| Public Research Ins. | 2.67 | 0.16 | 0.29 | 0.02 | 2.02 | 100.00 | |
| Univ. & Colleges | 2.27 | 0.65 | 0.48 | 0.21 | 1.73 | 100.00 | |
| Business Enterprises | 0.11 | 0.19 | 0.01 | 0.03 | 0.10 | 100.00 | |
| Total | 0.64 | 0.23 | 0.09 | 0.05 | 0.49 | 100.00 | |

R&D Expenditure by Socioeconomic Objectives

〈Table 5〉
2012 R&D
expenditure rate
by each sector and
socioeconomic
objectives
(Korea)

- Based on socioeconomic objectives, Korea's R&D expenditure in 2012 is invested as follows:
 - The largest amount (61.56%) is devoted to industrial production and technology, followed by transport, telecommunication and other infrastructure (7.82%), and energy (7.01%).
- Based on socioeconomic objectives, R&D expenditure used by each sector is as follows :
 - Business enterprises spend a significantly huge amount of R&D expenses (72.47%) in industrial production and technology, while public research institutes and universities/ colleges spend only 22.32% and 23.82% in the same category, respectively.
 - Meanwhile, universities and colleges invest relatively higher share of their R&D expenditure (22.71%) in health.

(Unit : %)

| | Public Research Ins. | Univ. & Colleges | Business Enterprises | Total |
|---|-------------------------|---------------------|-------------------------|-------|
| Exploration and Exploitation of the Earth | 3.90 | 1.50 | 0.23 | 0.81 |
| Environment | 3.96 | 4.15 | 3.22 | 3.40 |
| Exploration and Exploitation of Space | 3.73 | 1.35 | 0.05 | 0.64 |
| Transport, telecommunication and other infrastructures | 5.61 | 9.00 | 8.03 | 7.82 |
| Energy | 14.32 | 5.07 | 6.07 | 7.01 |
| Industrial production and technology | 22.32 | 23.82 | 72.47 | 61.56 |
| Health | 7.16 | 22.71 | 4.64 | 6.68 |
| Agriculture | 7.78 | 5.43 | 0.98 | 2.26 |
| Education | 2.71 | 3.76 | 0.31 | 0.94 |
| Culture, recreation, religion and mass media | 1.00 | 3.92 | 1.48 | 1.65 |
| Political and social systems, structures and processes | 4.15 | 4.29 | 0.14 | 1.04 |
| General advancement of knowledge | 3.88 | 13.68 | 0.82 | 2.42 |
| Defence | 19.50 | 1.31 | 1.55 | 3.78 |

- In 2012, Korea's R&D expenditure for science and technology accounts for 96.2 % (53,368.0 billion won) of the total R&D spending.
 - Regarding R&D investments to science and technology, expenditure spent on engineering and technology represents 68.8% (38,134.4 billion won), followed by natural science with 7,809.6 billion won (14.1%), and medical & health science with 6,255.3 billion won (11.3%).

R&D Expenditure by Field of Science

1. R&D Expenditure

- The share of R&D investments in science and technology is the highest in business enterprises(98.7%) and relatively low in universities and colleges (84.8%).

(Table 6)
R&D expenditure
by research field
(Korea)

(Unit : 0.1 billion won, %)

| | | 2010 | | 2011 | | 2012 | |
|--------------------------------|--------------------------|-------------|------|-------------|------|-------------|------|
| | | expenditure | rate | expenditure | rate | expenditure | rate |
| Science and Technology | Natural Science | 56,365 | 12.9 | 64,042 | 12.8 | 78,096 | 14.1 |
| | Engineering & Tech. | 306,281 | 69.8 | 349,551 | 70.1 | 381,344 | 68.8 |
| | Medical & Health Science | 47,482 | 10.8 | 54,227 | 10.9 | 62,553 | 11.3 |
| | Agricultural Science | 10,822 | 2.5 | 11,419 | 2.3 | 11,686 | 2.1 |
| | Sub-total | 420,949 | 96.0 | 479,239 | 96.1 | 533,680 | 96.2 |
| Humanities and Social Sciences | Humanities | 5,326 | 1.2 | 6,935 | 1.4 | 8,020 | 1.4 |
| | Social Science | 12,273 | 2.8 | 12,730 | 2.6 | 12,802 | 2.3 |
| | Sub-total | 17,599 | 4.0 | 19,665 | 3.9 | 20,822 | 3.8 |

(Table 7)
2012 R&D
expenditure by sector
of performance and
research field
(Korea)

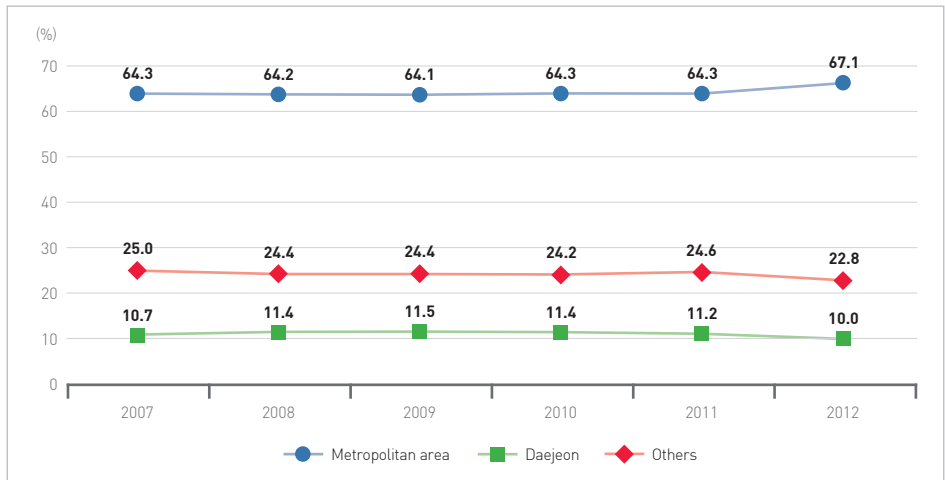
(Unit : 0.1 billion won, %)

| | | Public Research Ins. | | Univ. & Colleges | | Business Enterprises | | Total | |
|--------------------------------|--------------------------|----------------------|------|------------------|------|----------------------|------|---------|------|
| | | exp. | rate | exp. | rate | exp. | rate | exp. | rate |
| Science and Technology | Natural Science | 11,218 | 16.1 | 8,196 | 15.5 | 58,682 | 13.6 | 78,096 | 14.1 |
| | Engineering & Tech. | 42,462 | 61.1 | 23,340 | 44.2 | 315,542 | 73.0 | 381,344 | 68.8 |
| | Medical & Health Science | 3,261 | 4.7 | 10,298 | 19.5 | 48,994 | 11.3 | 62,553 | 11.3 |
| | Agricultural Science | 5,297 | 7.6 | 2,903 | 5.5 | 3,486 | 0.8 | 11,686 | 2.1 |
| | Sub-total | 62,238 | 89.5 | 44,737 | 84.8 | 426,704 | 98.7 | 533,680 | 96.2 |
| Humanities and Social Sciences | Humanities | 428 | 0.6 | 3,324 | 6.3 | 4,269 | 1.0 | 8,020 | 1.4 |
| | Social Science | 6,837 | 9.8 | 4,709 | 8.9 | 1,256 | 0.3 | 12,802 | 2.3 |
| | Sub-total | 7,264 | 10.5 | 8,032 | 15.2 | 5,525 | 1.3 | 20,822 | 3.8 |

R&D Expenditure by Region

- R&D expenditure of the Seoul Metropolitan Area in 2012 is 37,230.4 billion won, which accounts for 67.1% of the total R&D investments.
 - In the Metropolitan Area, R&D expenditure of Gyeonggi region reaches 25,181.8 billion won while that of Seoul is 9,916.7 billion won.

〈Figure 15〉
R&D
expenditure rate
in metropolitan area
(Korea)



- The percentage of R&D expenditure in Daejeon has decreased by 1.1 percentage points.
- The percentage of R&D expenditure has increased by 2.9 percentage points in the Metropolitan Area.

〈Table 8〉
R&D Expenditure
by region (Korea)

(Unit : 0.1 billion won, %)

| | 2010 | | 2011 | | 2012 | |
|-----------|-------------|------|-------------|------|-------------|------|
| | expenditure | rate | expenditure | rate | expenditure | rate |
| Seoul | 82,430 | 18.8 | 92,313 | 18.5 | 99,167 | 17.9 |
| Busan | 8,395 | 1.9 | 9,068 | 1.8 | 10,306 | 1.9 |
| Daegu | 5,900 | 1.3 | 6,784 | 1.4 | 8,394 | 1.5 |
| Incheon | 16,624 | 3.8 | 19,832 | 4.0 | 21,319 | 3.8 |
| Gwangju | 5,209 | 1.2 | 6,901 | 1.4 | 6,728 | 1.2 |
| Daejeon | 50,122 | 11.4 | 55,700 | 11.2 | 55,709 | 10.0 |
| Ulsan | 4,522 | 1.0 | 7,475 | 1.5 | 7,214 | 1.3 |
| Gyeonggi | 183,129 | 41.8 | 208,469 | 41.8 | 251,818 | 45.4 |
| Gangwon | 2,847 | 0.6 | 3,400 | 0.7 | 3,514 | 0.6 |
| Chungbuk | 7,829 | 1.8 | 8,813 | 1.8 | 9,548 | 1.7 |
| Chungnam | 26,866 | 6.1 | 29,427 | 5.9 | 25,428 | 4.6 |
| Jeonbuk | 5,308 | 1.2 | 6,560 | 1.3 | 7,969 | 1.4 |
| Jeonnam | 4,826 | 1.1 | 5,329 | 1.1 | 5,640 | 1.0 |
| Gyeongbuk | 18,286 | 4.2 | 20,988 | 4.2 | 21,367 | 3.9 |
| Gyeongnam | 15,137 | 3.5 | 16,492 | 3.3 | 19,171 | 3.5 |
| Jeju | 1,118 | 0.3 | 1,354 | 0.3 | 1,209 | 0.2 |

The Flow and Composition of R&D Expenditures

〈Table 9〉 2012 flow of R&D expenditures by sector of performance (Korea)

(Unit : million won, %)

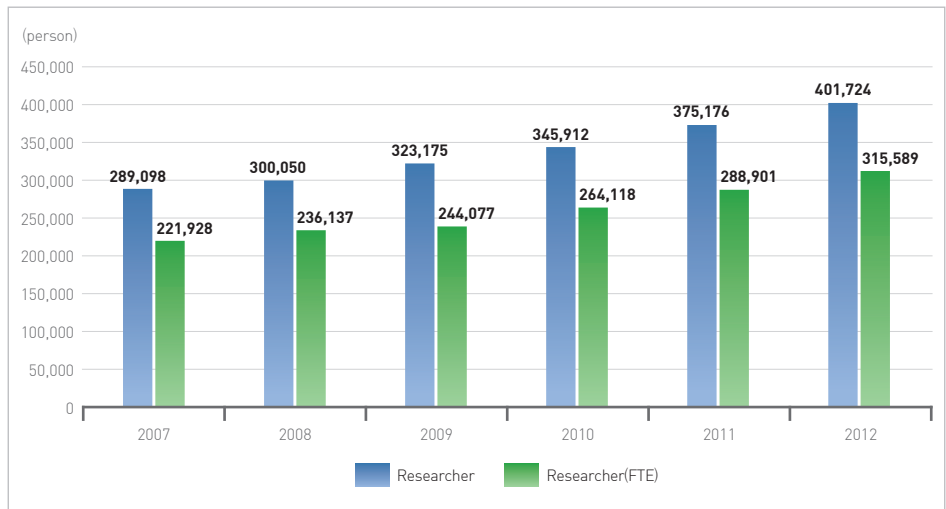
| Performance | | | Public research institutes | | | Univ. & Colleges | | Business Enterprises | | Total |
|-------------------------|-------------------------------|------------------|----------------------------|-----------------------------------|----------------------------|-----------------------|---------------|----------------------|-----------------|-----------|
| | | | Gov. Public Institute | Gov. supported Research institute | Other non-profit institute | National public univ. | Private univ. | Gov. -invested com. | Private company | |
| Source | Performance | | Source | | | | | | | |
| | Gov. & Other national sources | Gov. | Gov. | 630,776 | 4,590,616 | 416,208 | 1,710,270 | 2,068,915 | 142,396 | 1,726,340 |
| 99.1% | | | | 81.9% | 58.6% | 75.6% | 68.6% | 22.2% | 4.1% | 20.4% |
| Gov.-invested institute | | | 502 | 688,826 | 16,645 | 165,491 | 347,875 | 18,846 | 700,813 | 1,938,997 |
| | | | 0.1% | 12.3% | 2.3% | 7.3% | 11.5% | 2.9% | 1.6% | 3.5% |
| National public univ. | | | 209 | 4,189 | 210 | 115,546 | 8,919 | - | 9,097 | 138,170 |
| | | | 0.0% | 0.1% | 0.0% | 5.1% | 0.3% | 0.0% | 0.0% | 0.2% |
| Sub-total | | 631,486 | 5,283,631 | 433,063 | 1,991,307 | 2,425,709 | 161,242 | 2,436,250 | 13,362,688 | |
| | | 99.2% | 94.3% | 61.0% | 88.1% | 80.4% | 25.1% | 5.7% | 24.1% | |
| Other national sources | | Private univ. | 55 | 5,106 | 709 | 6,342 | 177,460 | 650 | 6,133 | 196,455 |
| | | | 0.0% | 0.1% | 0.1% | 0.3% | 5.9% | 0.1% | 0.0% | 0.4% |
| | | Non-profit corp. | 169 | 78,533 | 100,735 | 20,693 | 52,405 | - | 10,400 | 262,935 |
| | | | 0.0% | 1.4% | 14.2% | 0.9% | 1.7% | 0.0% | 0.0% | 0.5% |
| Sub-total | 224 | 83,639 | 101,444 | 27,035 | 229,865 | 650 | 16,533 | 459,390 | | |
| | | 0.0% | 1.5% | 14.3% | 1.2% | 7.6% | 0.1% | 0.0% | 0.8% | |
| Total | 631,710 | 5,367,270 | 534,507 | 2,018,342 | 2,655,573 | 161,892 | 2,452,782 | 13,822,078 | | |
| | 99.2% | 95.8% | 75.3% | 89.2% | 88.1% | 25.2% | 5.8% | 24.9% | | |
| Industry | Gov.-invested institute | 837 | 41,070 | 2,996 | 15,497 | 19,641 | 435,676 | 11,319 | 527,035 | |
| | | 0.1% | 0.7% | 0.4% | 0.7% | 0.7% | 67.8% | 0.0% | 1.0% | |
| | Private company | 4,230 | 172,346 | 147,715 | 219,632 | 323,569 | 21,558 | 40,021,708 | 40,910,760 | |
| | | 0.7% | 3.1% | 20.8% | 9.7% | 10.7% | 3.4% | 94.0% | 73.8% | |
| | Total | 5,067 | 213,416 | 150,711 | 235,129 | 343,210 | 457,234 | 40,033,026 | 41,437,795 | |
| | 0.8% | 3.8% | 21.2% | 10.4% | 11.4% | 71.2% | 94.0% | 74.7% | | |
| Abroad | - | 22,722 | 24,857 | 8,060 | 16,614 | 23,009 | 94,982 | 190,243 | | |
| | 0.0% | 0.4% | 3.5% | 0.4% | 0.6% | 3.6% | 0.2% | 0.3% | | |
| Total | 636,777 | 5,603,409 | 710,075 | 2,261,531 | 3,015,398 | 642,135 | 42,580,791 | 55,450,116 | | |
| | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | | |

2. R&D Personnel

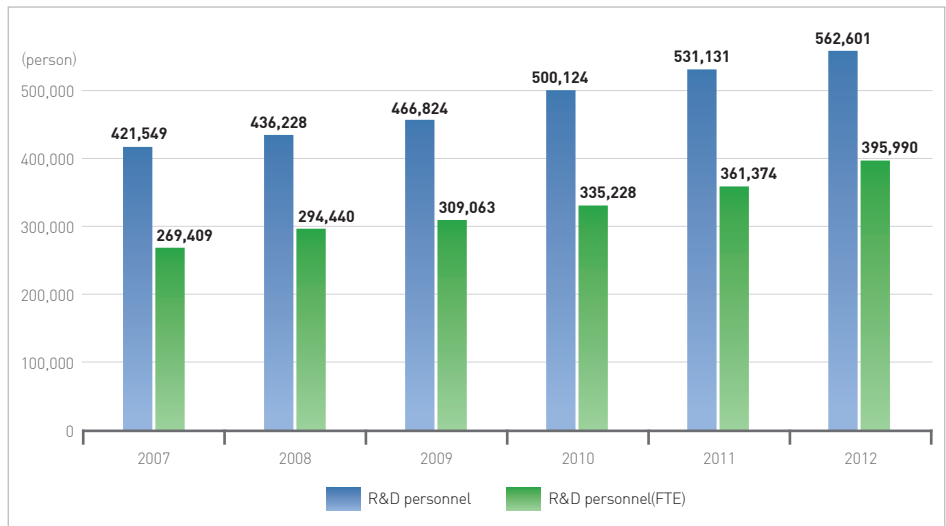
Total Number of Researchers

- In 2012, the total number of researchers in Korea has increased by 26,548 persons (7.1%) from the previous year to reach a total of 401,724 persons.
 - The total number of R&D personnel including research assistants has increased by 31,470 persons (5.9%) from the previous year to reach 562,601 persons.
 - With 315,589 persons, Korea is ranked 6th in the world in terms of the number of FTE²⁾ researchers. The total number of personnel (FTE) in Korea is estimated to be 395,990 persons.

〈Figure 16〉
Total number of researchers (Korea)



〈Figure 17〉
Total number of R&D personnel (Korea)

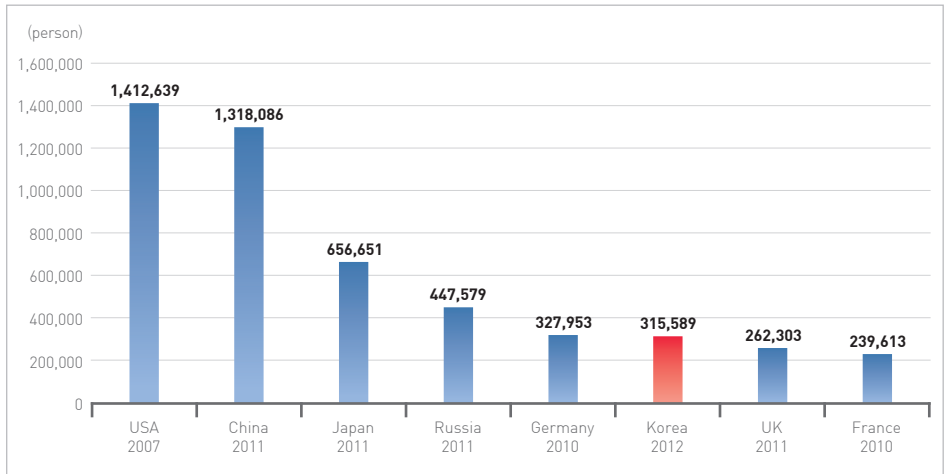


2) Unlike the 'Headcount', a simple aggregated number of researchers, FTE (Full Time Equivalent) takes into account the amount of their actual participation in research activities.

2. R&D Personnel



〈Figure 18〉
Total number of
researchers(FTE)
by country

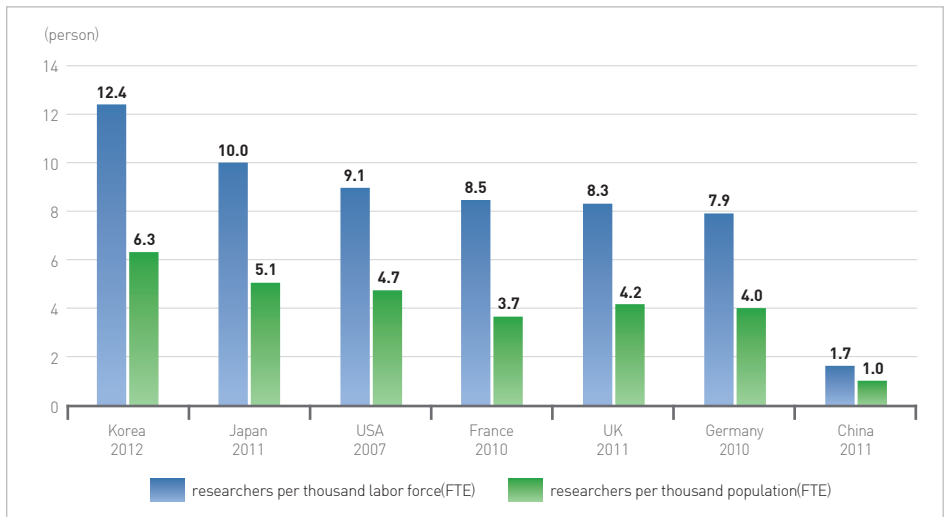


* Source : OECD, Main Science and Technology Indicators 2013-1

Researchers per Thousand Population /Labor Force

- Among the major economies, Korea's number of researchers(FTE) per thousand labor force is 12.4 persons
 - Countries with the biggest number of researchers (FTE) per thousand population is Korea (6.3 persons in 2012), Japan (5.1 persons in 2011), and the US (4.7 persons in 2007).

〈Figure 19〉
Researchers(FTE)
per thousand
population
/labor force
(major countries)

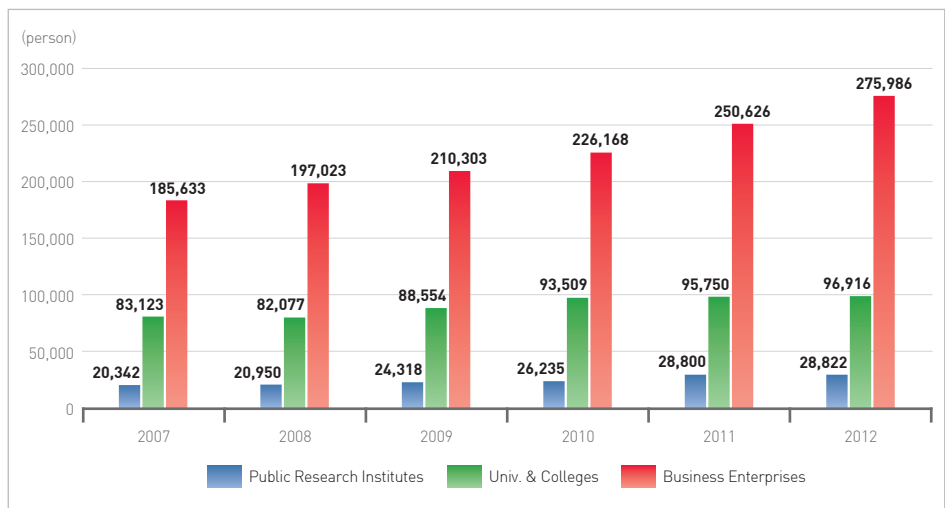


* Source : OECD, Main Science and Technology Indicators 2013-1

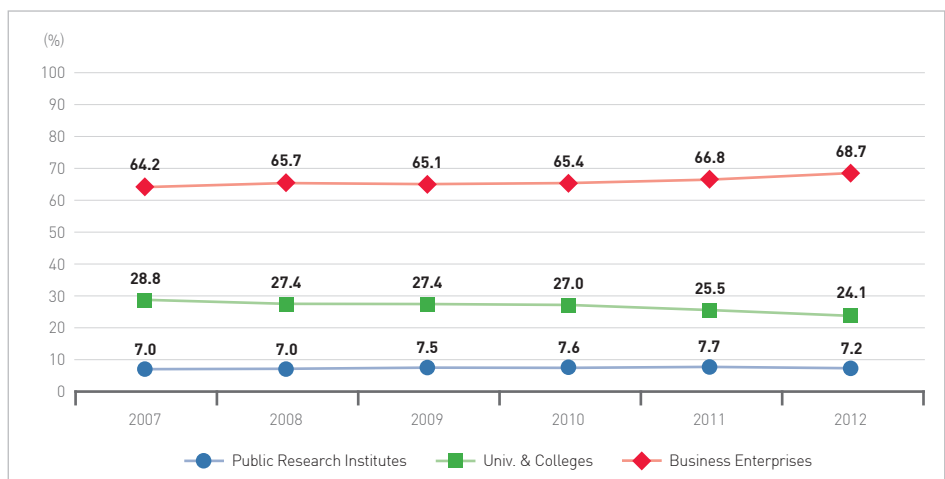
Researchers by Sector of Performance

- The number of researchers in business enterprises has grown by 10.1% (25,360 persons) from the previous year to reach 275,986 persons.
 - The share of researchers in business enterprises accounts for 68.7% of the total number of researchers.
 - The number of researchers in universities/colleges and public research institutes is 96,916 persons (24.1%) and 28,822 persons (7.2%), respectively.
- Based on FTE, the share of researchers in Korea's business enterprises (78.3%) is relatively high among the major economies.
 - Other nations with a high percentage of researchers in the business sector are Japan (74.8% in 2010) and China (62.1% in 2011).
 - Meanwhile, Korea has the lowest percentage of researchers in universities & colleges (13.9%) among the major countries.

〈Figure 20〉
The number of researchers by sector of performance (Korea)

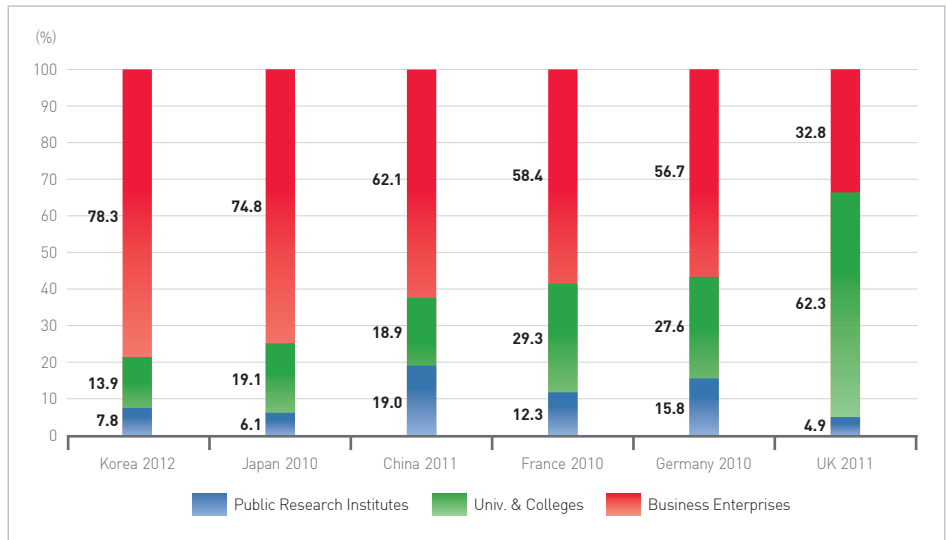


〈Figure 21〉
The rate of researchers by sector of performance (Korea)



2. R&D Personnel

〈Figure 22〉
The rate of researchers by sector of performance (major countries)

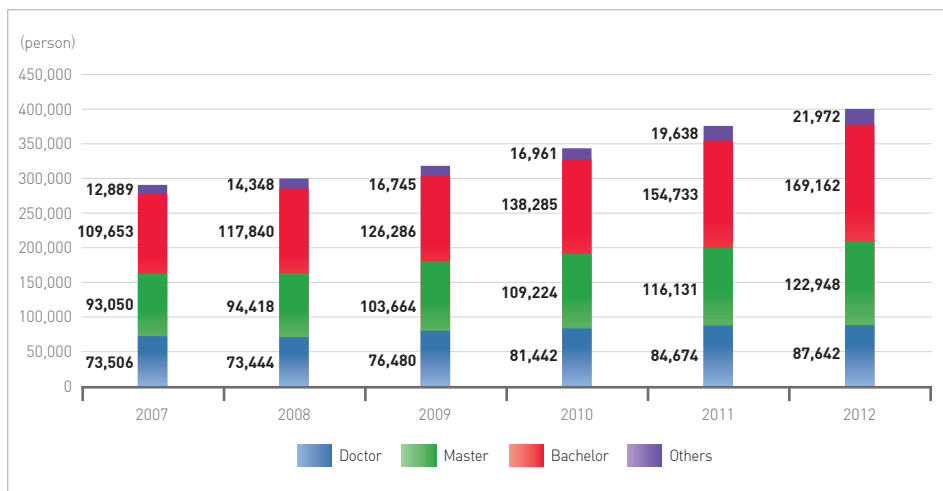


* Source : OECD, R&D Statistics 2013

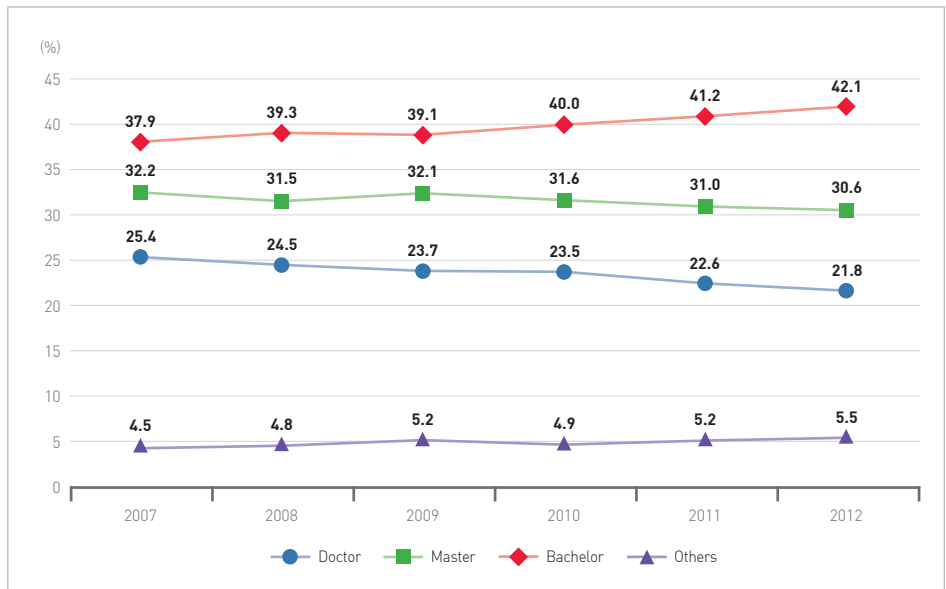
Researchers by Degree

- According to the 2012 results, there are 87,642 researchers with doctorate degrees, 122,948 researchers with master's degrees, 169,162 researchers with bachelor's degrees, and 21,972 researchers with other degrees.
 - The share of researchers with doctorate degrees has decreased by 0.8 percentage points to 21.8% and that with master's degrees also has decreased by 0.3 percentage points to 30.6%.
 - The share of researchers with bachelor's degrees has increased by 0.9 percentage points to 42.1%.

〈Figure 23〉
The number of researchers by degree (Korea)

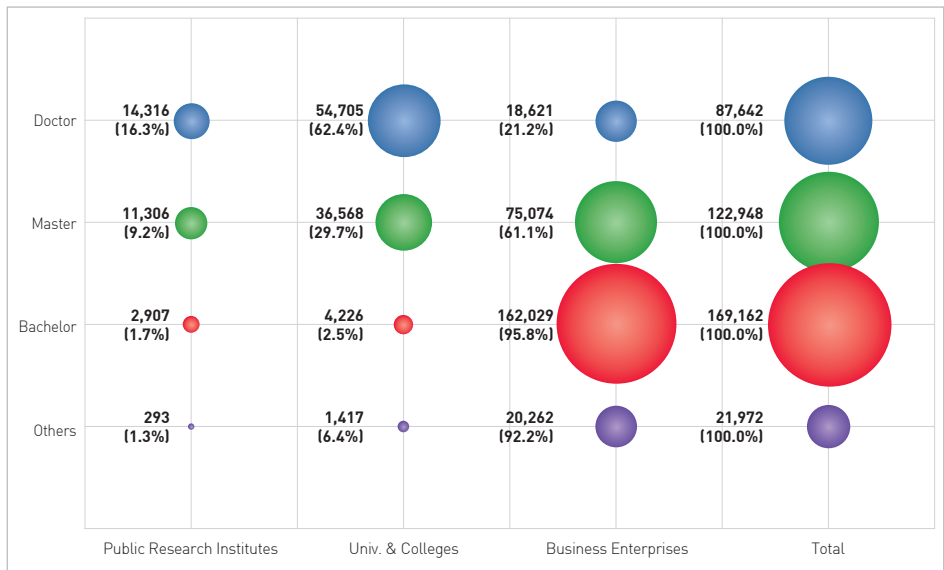


〈Figure 24〉
The rate
of researchers
by degree
(Korea)



- The survey shows that 62.4% of the total number of doctorate researchers (54,705 persons) are working at universities and colleges.
 - Among researchers working in universities/colleges and public research institutes, those with doctorate degrees take up the largest proportion, followed by with master's degrees, and bachelor's degrees, respectively.
 - Meanwhile, business enterprises have the highest percentage of researchers with bachelor's degree and a relatively low proportion of doctorate researchers.

〈Figure 25〉
2012 distribution
of researchers
by sector
of performance
and degree



Researchers by Major Fields of Study

- In 2012, 68.2% (273,839 persons) of the researchers in Korea have majored in engineering.
 - Other fields of study with a higher share of researchers include natural science with 53,654 researchers (13.4%) and social science with 23,961 researchers (6.0%).
- The major of 81.9% of the researchers in business enterprises is engineering & technology.
 - The Percentage of engineering and technology majors working in public research institutes and universities & colleges is 51.9 percent and 33.9 percent, respectively.

(Unit : person, %)

(Table 10)
The number of researchers by major field of study (Korea)

| | | 2010 | | 2011 | | 2012 | |
|--------------------------------|--------------------------|---------|------|---------|------|---------|------|
| | | number | rate | number | rate | number | rate |
| Science and Technology | Natural Science | 46,023 | 13.3 | 48,544 | 12.9 | 53,654 | 13.4 |
| | Engineering & Tech. | 231,913 | 67.0 | 253,445 | 67.6 | 273,839 | 68.2 |
| | Medical & Health Science | 18,926 | 5.5 | 20,473 | 5.5 | 19,945 | 5.0 |
| | Agricultural Science | 9,202 | 2.7 | 9,841 | 2.6 | 9,912 | 2.5 |
| | Sub-total | 306,064 | 88.5 | 332,303 | 88.6 | 357,350 | 89.0 |
| Humanities and Social Sciences | Humanities | 17,568 | 5.1 | 19,633 | 5.2 | 20,413 | 5.1 |
| | Social Science | 22,280 | 6.4 | 23,240 | 6.2 | 23,961 | 6.0 |
| | Sub-total | 39,848 | 11.5 | 42,873 | 11.4 | 44,374 | 11.0 |

(Unit : person, %)

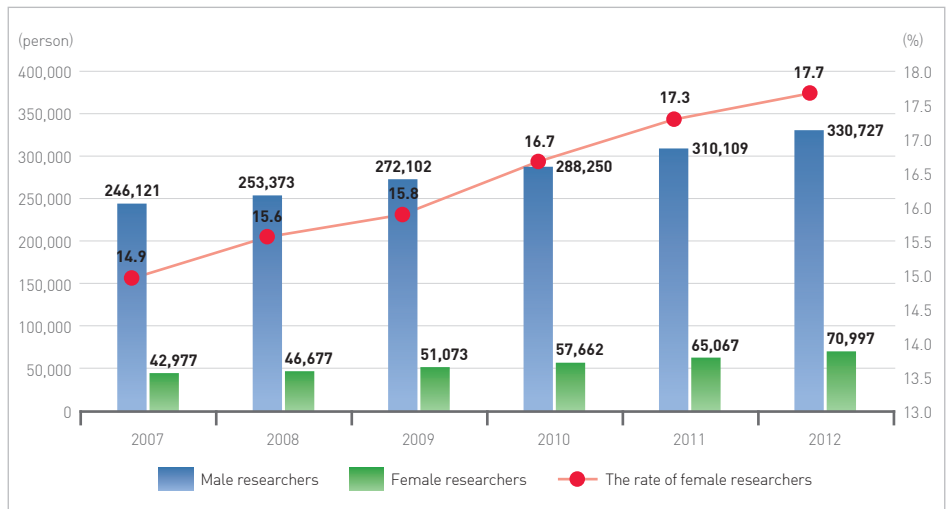
(Table 11)
2012 Researchers by sector of performance and major field of study (Korea)

| | | Public Research Ins. | | Univ. & Colleges | | Business Enterprises | | Total | |
|--------------------------------|--------------------------|----------------------|------|------------------|------|----------------------|------|---------|------|
| | | Num. | rate | Num. | rate | Num. | rate | Num. | rate |
| Science and Technology | Natural Science | 5,408 | 18.8 | 16,228 | 16.7 | 32,018 | 11.6 | 53,654 | 13.4 |
| | Engineering & Tech. | 14,968 | 51.9 | 32,823 | 33.9 | 226,048 | 81.9 | 273,839 | 68.2 |
| | Medical & Health Science | 1,394 | 4.8 | 16,022 | 16.5 | 2,529 | 0.9 | 19,945 | 5.0 |
| | Agricultural Science | 2,542 | 8.8 | 4,414 | 4.6 | 2,956 | 1.1 | 9,912 | 2.5 |
| | Sub-total | 24,312 | 84.4 | 69,487 | 71.7 | 263,551 | 95.5 | 357,350 | 89.0 |
| Humanities and Social Sciences | Humanities | 345 | 1.2 | 11,484 | 11.8 | 8,584 | 3.1 | 20,413 | 5.1 |
| | Social Science | 4,165 | 14.5 | 15,945 | 16.5 | 3,851 | 1.4 | 23,961 | 6.0 |
| | Sub-total | 4,510 | 15.6 | 27,429 | 28.3 | 12,435 | 4.5 | 44,374 | 11.0 |

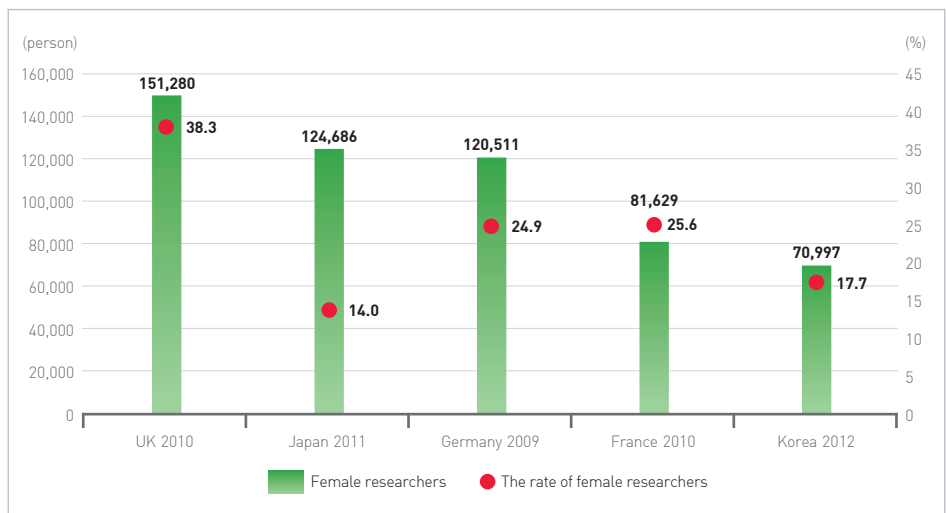
Researchers by Gender

- The number of female researchers has increased by 9.1% (5,930 persons) to reach 70,997 persons, which accounts for 17.7% of the total number of researchers.
- Compared to the major economies, the percentage of female researchers (17.7%) is relatively low in Korea.
 - The UK had the highest ratio of female researchers (38.3%) among the surveyed countries, followed by France (25.6% in 2010) and Germany (24.9% in 2009).

〈Figure 26〉
The number of researchers by gender (Korea)



〈Figure 27〉
The number of female researchers (major countries)

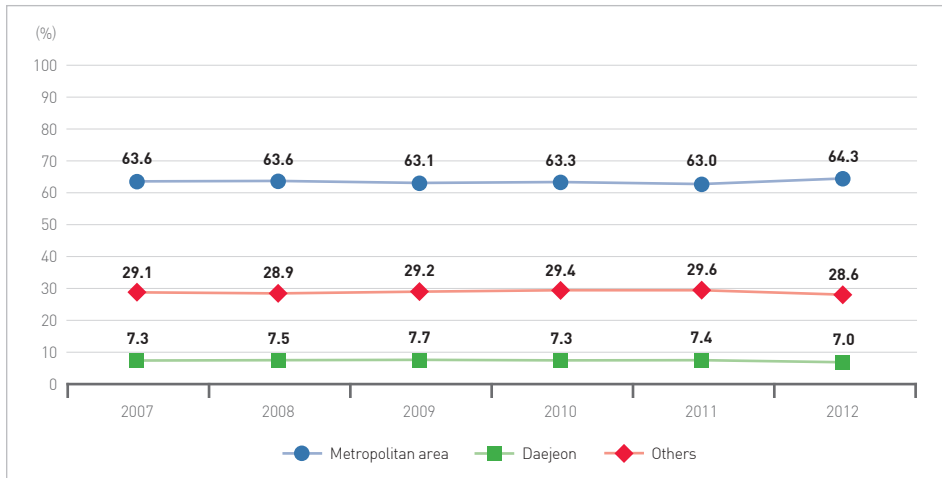


* Source : OECD, Main Science and Technology Indicators 2013-1

Researchers by Region

- The number of researchers in the Metropolitan Area reaches 258,454 persons (64.3%) in 2012.
 - It is revealed that there are 141,819 researchers (35.3%) in Gyeonggi area while 102,239 researchers (25.5%) in Seoul.
 - The percentage of researchers in Daejeon has decreased by 0.4 percentage points from the previous year.
 - In the Metropolitan Area, the percentage of researchers has increased by 1.3 percentage points from the previous year.

〈Figure 28〉
The rate of researchers in metropolitan area (Korea)



〈Table 12〉
The number of researchers by region (Korea)

(Unit : person, %)

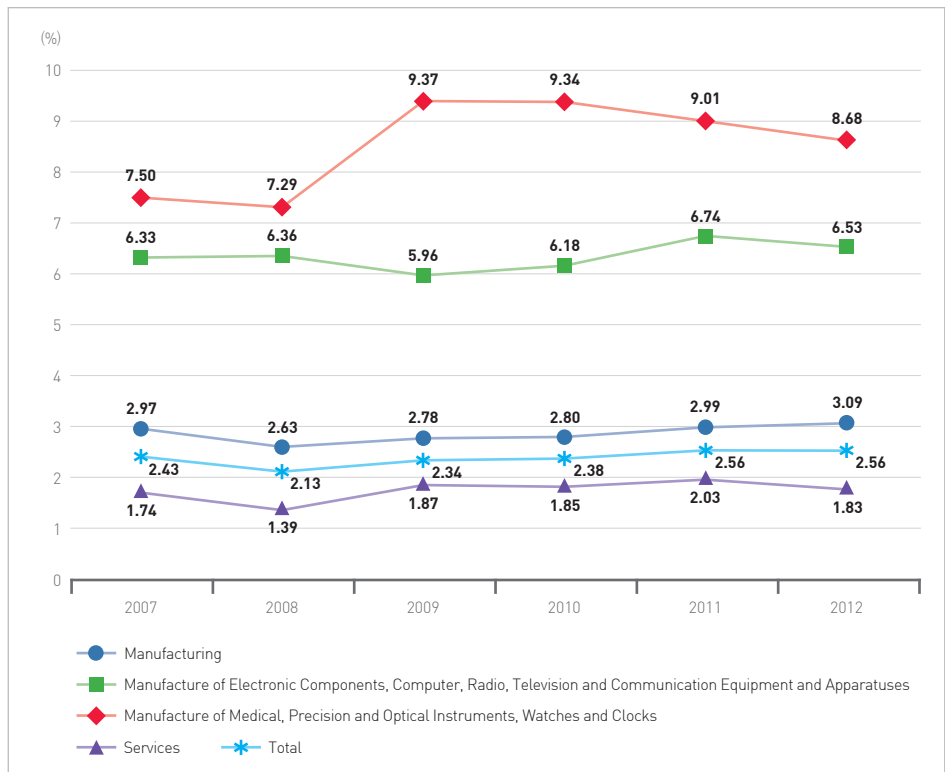
| | 2010 | | 2011 | | 2012 | |
|-----------|---------|------|---------|------|---------|------|
| | number | rate | number | rate | number | rate |
| Seoul | 91,193 | 26.4 | 96,372 | 25.7 | 102,239 | 25.5 |
| Busan | 10,763 | 3.1 | 12,237 | 3.3 | 15,564 | 3.9 |
| Daegu | 7,740 | 2.2 | 8,801 | 2.3 | 9,673 | 2.4 |
| Incheon | 12,767 | 3.7 | 13,573 | 3.6 | 14,396 | 3.6 |
| Gwangju | 6,788 | 2.0 | 7,072 | 1.9 | 7,128 | 1.8 |
| Daejeon | 25,277 | 7.3 | 27,909 | 7.4 | 28,285 | 7.0 |
| Ulsan | 3,982 | 1.2 | 4,919 | 1.3 | 5,505 | 1.4 |
| Gyeonggi | 114,858 | 33.2 | 126,449 | 33.7 | 141,819 | 35.3 |
| Gangwon | 4,818 | 1.4 | 5,412 | 1.4 | 5,607 | 1.4 |
| Chungbuk | 9,059 | 2.6 | 10,558 | 2.8 | 11,029 | 2.7 |
| Chungnam | 17,612 | 5.1 | 17,994 | 4.8 | 15,548 | 3.9 |
| Jeonbuk | 6,743 | 1.9 | 7,558 | 2.0 | 7,787 | 1.9 |
| Jeonnam | 3,606 | 1.0 | 3,784 | 1.0 | 3,838 | 1.0 |
| Gyeongbuk | 15,265 | 4.4 | 15,236 | 4.1 | 16,057 | 4.0 |
| Gyeongnam | 13,377 | 3.9 | 14,970 | 4.0 | 15,348 | 3.8 |
| Jeju | 2,064 | 0.6 | 2,332 | 0.6 | 1,901 | 0.5 |

3. R&D Activities of the Business Enterprise Sector

R&D Intensity (R&D Expenditure Relative to Sales)

- In 2012, Korean companies' R&D expenditure relative to sales is 2.56%.
 - In the manufacturing industry, the rate has risen by 0.1 percentage points from the previous year to reach 3.09%.
 - In the service industry, the rate has reduced by 0.2 percentage points to 1.83%.
- In the manufacturing industry, the highest R&D expenditure relative to sales is seen in the following sectors: manufacture of medical, precision, and optical instruments, watches and clocks.
 - Industries with a high R&D intensity include high-tech industries such as manufacture of medical, precision, and optical instruments, watches and clocks (8.68%) and manufacture of electronic components, computer, radio, television, and communication equipment and apparatuses (6.53%).
- In the service industry, the research and development industry shows the highest R&D expenditure rate to sales (26.22%).

〈Figure 29〉
R&D expenditure rate to sales of major industries (Korea)



3. R&D Activities of the Business Enterprise Sector

〈Table 13〉 R&D expenditure rate to sales by industry (Korea)

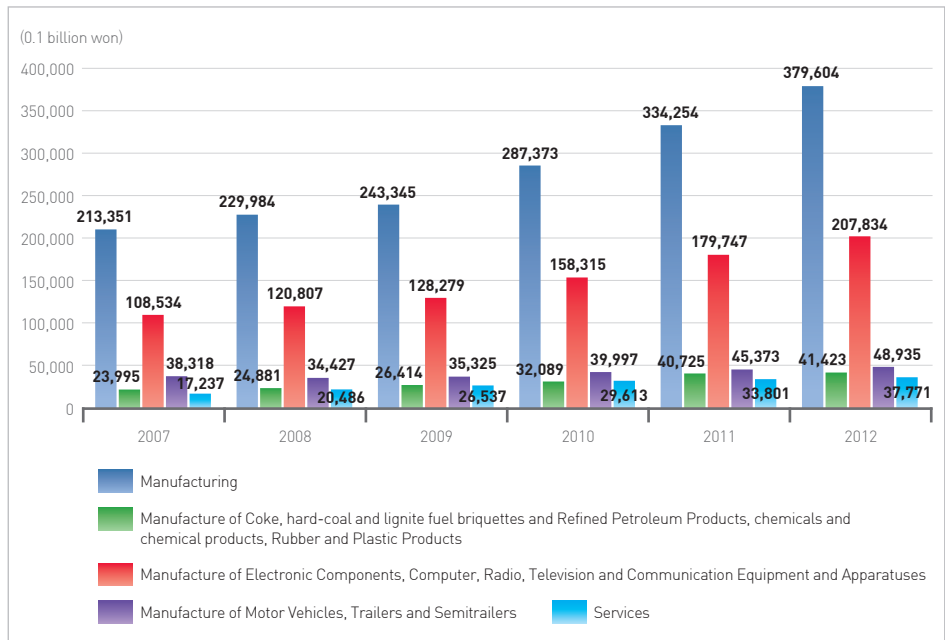
(Unit : %)

| Industry | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|-------|-------|-------|-------|-------|
| Total | 2.13 | 2.34 | 2.38 | 2.56 | 2.56 |
| Agriculture, Forestry and Fishing | 11.93 | 13.98 | 8.47 | 7.02 | 7.14 |
| Mining and Quarrying | 0.32 | 0.74 | 0.62 | 1.69 | 3.36 |
| Manufacturing | 2.63 | 2.78 | 2.80 | 2.99 | 3.09 |
| Manufacture of food products; beverages and tobacco products | 0.96 | 0.90 | 0.75 | 1.12 | 0.89 |
| Manufacture of textiles, wearing apparel, leather and related products | 0.72 | 1.45 | 1.42 | 1.37 | 1.30 |
| Manufacture of wood, paper, printing and reproduction | 0.76 | 1.02 | 1.07 | 0.70 | 1.04 |
| Manufacture of Coke, hard-coal and lignite fuel briquettes and Refined Petroleum Products, chemicals and chemical products, Rubber and Plastic Products | 1.06 | 1.22 | 1.21 | 1.58 | 1.56 |
| Manufacture of Coke, hard-coal and lignite fuel briquettes and Refined Petroleum Products | 0.10 | 0.15 | 0.20 | 0.41 | 0.32 |
| Manufacture of chemicals and chemical products | 2.02 | 1.94 | 1.92 | 2.16 | 2.13 |
| Manufacture of chemicals and chemical products except aceuticals, medicinal chemicals | 1.56 | 1.49 | 1.51 | 1.74 | 1.64 |
| Manufacture of Pharmaceuticals, Medicinal Chemicals and Botanical Products | 5.24 | 5.38 | 5.47 | 6.18 | 6.35 |
| Manufacture of Rubber and Plastic Products | 2.34 | 2.45 | 2.16 | 1.91 | 2.10 |
| Manufacture of Other Non-metallic Mineral Products | 1.04 | 1.41 | 1.25 | 1.32 | 1.81 |
| Manufacture of Basic Metal Products | 0.58 | 0.72 | 0.61 | 0.50 | 0.61 |
| Manufacture of Fabricated Metal Products, Except Machinery and Furniture | 2.04 | 2.19 | 1.87 | 3.09 | 2.36 |
| Manufacture of Electronic Components, Computer, Radio, Television and Communication Equipment and Apparatuses | 6.36 | 5.96 | 6.18 | 6.74 | 6.53 |
| Manufacture of Medical, Precision and Optical Instruments, Watches and Clocks | 7.29 | 9.37 | 9.34 | 9.01 | 8.68 |
| Manufacture of electrical equipment | 2.53 | 2.41 | 2.72 | 2.78 | 2.64 |
| Manufacture of Other Machinery and Equipment | 3.08 | 3.41 | 3.07 | 3.04 | 3.65 |
| Manufacture of Motor Vehicles, Trailers and Semitrailers | 2.83 | 3.03 | 2.71 | 2.59 | 2.57 |
| Manufacture of Other Transport Equipment | 0.89 | 0.73 | 0.83 | 0.85 | 1.03 |
| Manufacture of Furniture & Other manufacturing | 2.10 | 2.17 | 1.76 | 2.76 | 2.46 |
| Electricity, gas, steam and water supply | 0.39 | 0.38 | 0.35 | 0.40 | 0.35 |
| Sewerage, waste management, materials recovery and remediation activities | 2.53 | 2.06 | 2.05 | 1.90 | 1.28 |
| Construction | 0.50 | 0.74 | 0.71 | 0.85 | 0.75 |
| Services | 1.39 | 1.87 | 1.85 | 2.03 | 1.83 |
| Professional, scientific and technical activities | 3.84 | 3.54 | 3.41 | 3.26 | 3.16 |
| Research and Development | 32.31 | 40.80 | 40.38 | 27.53 | 26.22 |

R&D Expenditure by Industry

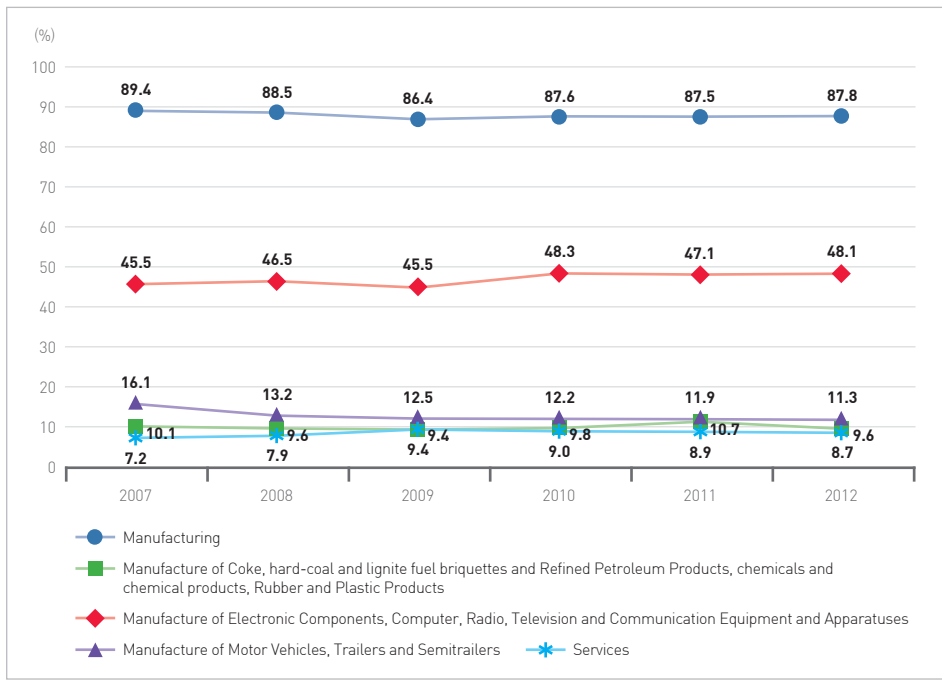
- Among the total R&D expenditure of the business enterprise sector in 2012, R&D investments of the manufacturing industry have increased by 4,535.0 billion won (13.6%) from the previous year to reach 37,960.4 billion won.
 - R&D expenditure of the manufacturing industry accounts for 87.8% of the total R&D investment made by the business sector. Among this, R&D investments made by the manufacture of electronic components, computer, radio, television and communication equipments & apparatus account for 48.1%.
- R&D expenditure of the service industry has risen by 397.0 billion won (11.7%) to 3,777.1 billion won.
 - The share of the service industry in the total R&D investment of the business enterprise sector has fallen by 0.1 percentage points from the previous year to reach 8.7%.
 - This percentage (8.7%) remains low compared to major economies such as the US (29.2% in 2008) and the UK (24.1% in 2009).

〈Figure 30〉
R&D expenditure rate of major industries (Korea)

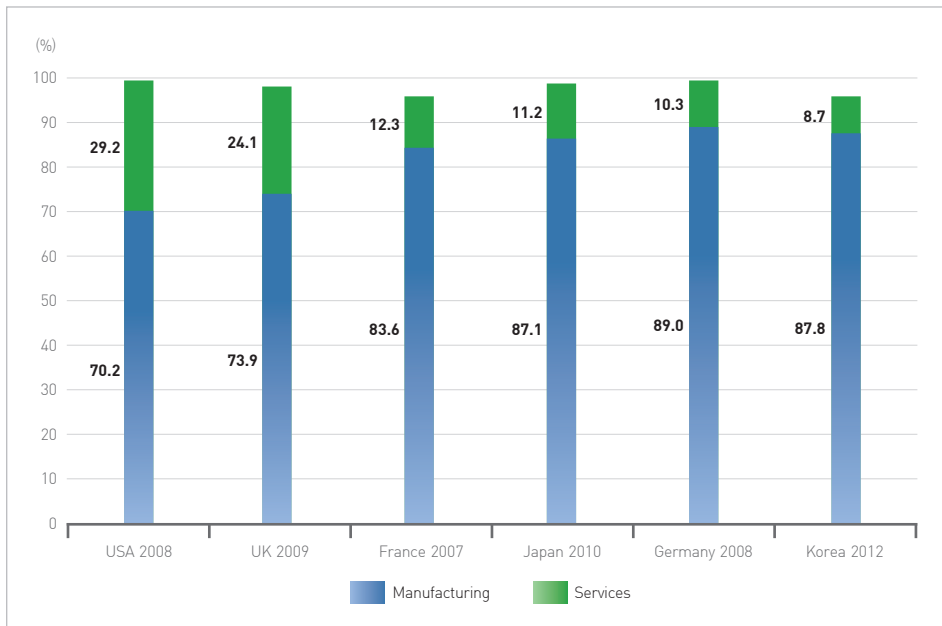


3. R&D Activities of the Business Enterprise Sector

〈Figure 31〉
R&D expenditure
of major industries
(Korea)



〈Figure 32〉
R&D
expenditure rate
of major industries
(major countries)



* Source : OECD, R&D Statistics 2013

〈Table 14〉 R&D expenditure by industry (Korea)

(Unit : 0.1 billion won)

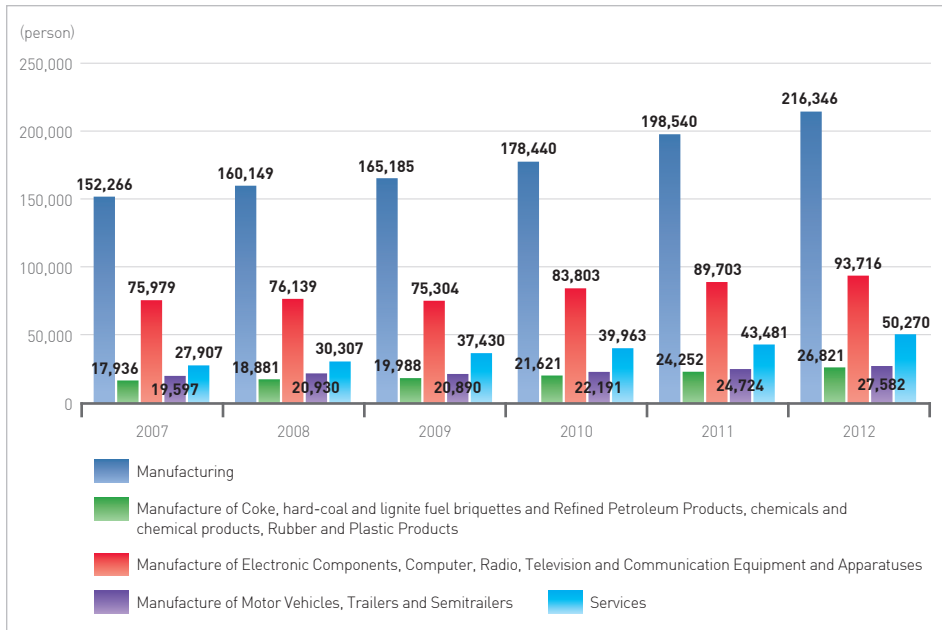
| Industry | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---------|---------|---------|---------|---------|
| Total | 260,001 | 281,659 | 328,032 | 381,833 | 432,229 |
| Agriculture, Forestry and Fishing | 205 | 204 | 260 | 362 | 266 |
| Mining and Quarrying | 61 | 144 | 188 | 219 | 351 |
| Manufacturing | 229,984 | 243,345 | 287,373 | 334,254 | 379,604 |
| Manufacture of food products; beverages and tobacco products | 3,497 | 3,713 | 3,037 | 4,034 | 4,709 |
| Manufacture of textiles, wearing apparel, leather and related products | 1,526 | 1,638 | 1,669 | 2,855 | 3,214 |
| Manufacture of wood, paper, printing and reproduction | 442 | 617 | 681 | 909 | 1,205 |
| Manufacture of Coke, hard-coal and lignite fuel briquettes and Refined Petroleum Products, chemicals and chemical products, Rubber and Plastic Products | 24,881 | 26,414 | 32,089 | 40,725 | 41,423 |
| Manufacture of Coke, hard-coal and lignite fuel briquettes and Refined Petroleum Products | 1,159 | 1,373 | 2,307 | 3,379 | 2,716 |
| Manufacture of chemicals and chemical products | 19,369 | 21,446 | 24,715 | 31,953 | 33,284 |
| Manufacture of chemicals and chemical products except pharmaceuticals, medicinal chemicals | 13,024 | 14,548 | 17,336 | 23,321 | 22,839 |
| Manufacture of Pharmaceuticals, Medicinal Chemicals and Botanical Products | 6,345 | 6,897 | 7,379 | 8,632 | 10,446 |
| Manufacture of Rubber and Plastic Products | 4,353 | 3,595 | 5,068 | 5,392 | 5,422 |
| Manufacture of Other Non-metallic Mineral Products | 1,437 | 2,372 | 2,081 | 2,368 | 3,250 |
| Manufacture of Basic Metal Products | 5,117 | 5,519 | 5,586 | 6,168 | 7,339 |
| Manufacture of Fabricated Metal Products, Except Machinery and Furniture | 2,338 | 2,910 | 2,584 | 5,341 | 4,990 |
| Manufacture of Electronic Components, Computer, Radio, Television and Communication Equipment and Apparatuses | 120,807 | 128,279 | 158,315 | 179,747 | 207,834 |
| Manufacture of Medical, Precision and Optical Instruments, Watches and Clocks | 6,885 | 6,942 | 8,020 | 9,010 | 9,781 |
| Manufacture of electrical equipment | 5,684 | 7,692 | 8,344 | 9,197 | 10,818 |
| Manufacture of Other Machinery and Equipment | 16,063 | 16,026 | 18,366 | 20,627 | 27,223 |
| Manufacture of Motor Vehicles, Trailers and Semitrailers | 34,427 | 35,325 | 39,997 | 45,373 | 48,935 |
| Manufacture of Other Transport Equipment | 5,453 | 5,195 | 5,807 | 6,235 | 7,621 |
| Manufacture of Furniture & Other manufacturing | 673 | 705 | 797 | 1,666 | 1,262 |
| Electricity, gas, steam and water supply | 2,588 | 2,729 | 2,940 | 3,795 | 4,074 |
| Sewerage, waste management, materials recovery and remediation activities | 227 | 206 | 203 | 316 | 279 |
| Construction | 6,449 | 8,493 | 7,455 | 9,086 | 9,883 |
| Services | 20,486 | 26,537 | 29,613 | 33,801 | 37,771 |
| Professional, scientific and technical activities | 5,220 | 7,271 | 7,035 | 8,414 | 8,921 |
| Research and Development | 1,157 | 1,504 | 1,702 | 2,609 | 2,349 |

3. R&D Activities of the Business Enterprise Sector

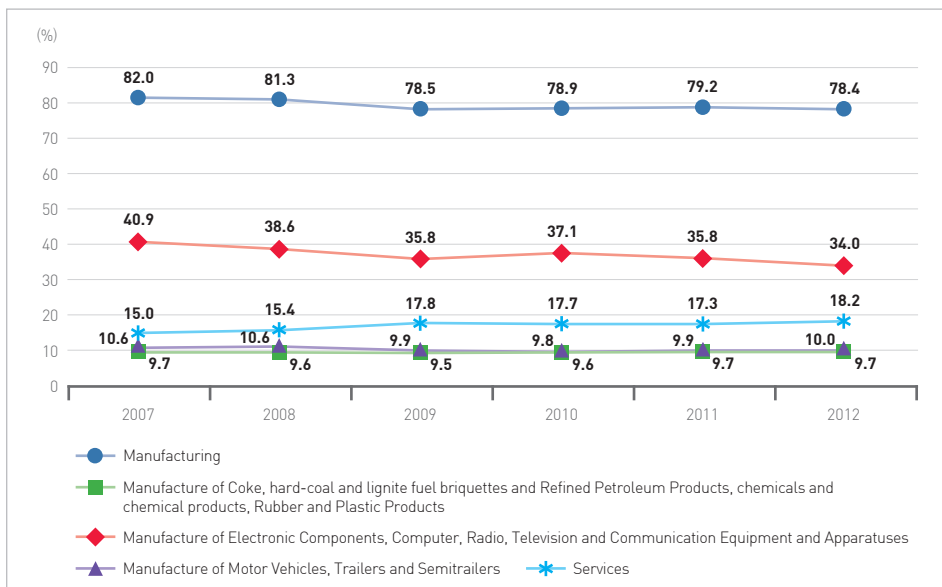
Number of Researchers by Industry

(Figure 33)
The number of researchers by industry (Korea)

- The number of researchers in the manufacturing industry has increased by 17,806 persons (9.0%) from the previous year to reach 216,346 persons, which accounts for 78.4% of the total number of researchers in the business sector.
- The number of researchers in the service industry has increased by 15.6% from the previous year to reach 50,270 persons.
 - In 2012, the service industry accounts for 18.2% of the total number of researchers in the business enterprise sector.



(Figure 34)
The rate of researchers by industry (Korea)



〈Table 15〉 The number of researchers by industry (Korea)

(Unit : person)

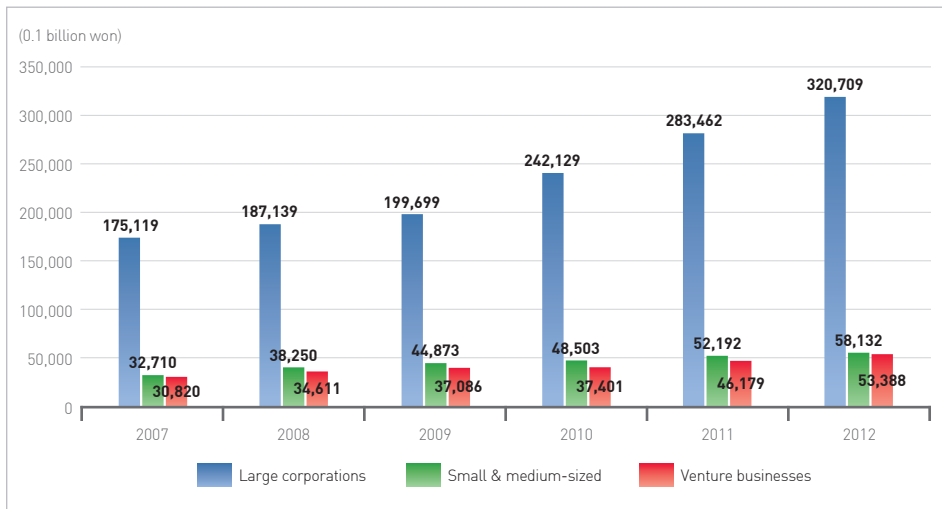
| Industry | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---------|---------|---------|---------|---------|
| Total | 197,023 | 210,303 | 226,168 | 250,626 | 275,986 |
| Agriculture, Forestry and Fishing | 114 | 128 | 156 | 211 | 157 |
| Mining and Quarrying | 59 | 84 | 97 | 95 | 48 |
| Manufacturing | 160,149 | 165,185 | 178,440 | 198,540 | 216,346 |
| Manufacture of food products; beverages and tobacco products | 3,556 | 3,638 | 3,491 | 4,242 | 5,003 |
| Manufacture of textiles, wearing apparel, leather and related products | 1,559 | 1,823 | 1,959 | 3,213 | 3,629 |
| Manufacture of wood, paper, printing and reproduction | 458 | 627 | 701 | 932 | 1,176 |
| Manufacture of Coke, hard-coal and lignite fuel briquettes and Refined Petroleum Products, chemicals and chemical products, Rubber and Plastic Products | 18,881 | 19,988 | 21,621 | 24,252 | 26,821 |
| Manufacture of Coke, hard-coal and lignite fuel briquettes and Refined Petroleum Products | 579 | 441 | 655 | 711 | 668 |
| Manufacture of chemicals and chemical products | 15,362 | 16,728 | 17,630 | 19,433 | 21,908 |
| Manufacture of chemicals and chemical products except pharmaceuticals, medicinal chemicals | 10,505 | 11,865 | 12,510 | 14,041 | 15,689 |
| Manufacture of Pharmaceuticals, Medicinal Chemicals and Botanical Products | 4,857 | 4,863 | 5,120 | 5,392 | 6,219 |
| Manufacture of Rubber and Plastic Products | 2,940 | 2,819 | 3,336 | 4,108 | 4,245 |
| Manufacture of Other Non-metallic Mineral Products | 1,292 | 1,438 | 1,595 | 1,843 | 2,009 |
| Manufacture of Basic Metal Products | 2,000 | 2,164 | 2,137 | 2,679 | 3,017 |
| Manufacture of Fabricated Metal Products, Except Machinery and Furniture | 3,006 | 3,799 | 3,773 | 4,595 | 5,236 |
| Manufacture of Electronic Components, Computer, Radio, Television and Communication Equipment and Apparatuses | 76,139 | 75,304 | 83,803 | 89,703 | 93,716 |
| Manufacture of Medical, Precision and Optical Instruments, Watches and Clocks | 6,119 | 7,081 | 7,724 | 8,104 | 9,162 |
| Manufacture of electrical equipment | 5,607 | 7,100 | 7,285 | 8,361 | 10,313 |
| Manufacture of Other Machinery and Equipment | 13,925 | 14,951 | 15,737 | 18,195 | 21,098 |
| Manufacture of Motor Vehicles, Trailers and Semitrailers | 20,930 | 20,890 | 22,191 | 24,724 | 27,582 |
| Manufacture of Other Transport Equipment | 4,906 | 5,546 | 5,373 | 5,608 | 6,033 |
| Manufacture of Furniture & Other manufacturing | 1,039 | 836 | 1,050 | 2,089 | 1,551 |
| Electricity, gas, steam and water supply | 810 | 930 | 926 | 1,000 | 1,008 |
| Sewerage, waste management, materials recovery and remediation activities | 354 | 274 | 269 | 438 | 402 |
| Construction | 5,230 | 6,272 | 6,317 | 6,861 | 7,755 |
| Services | 30,307 | 37,430 | 39,963 | 43,481 | 50,270 |
| Professional, scientific and technical activities | 7,738 | 9,735 | 9,857 | 11,398 | 11,936 |
| Research and Development | 1,372 | 1,878 | 1,819 | 2,743 | 2,390 |

3. R&D Activities of the Business Enterprise Sector

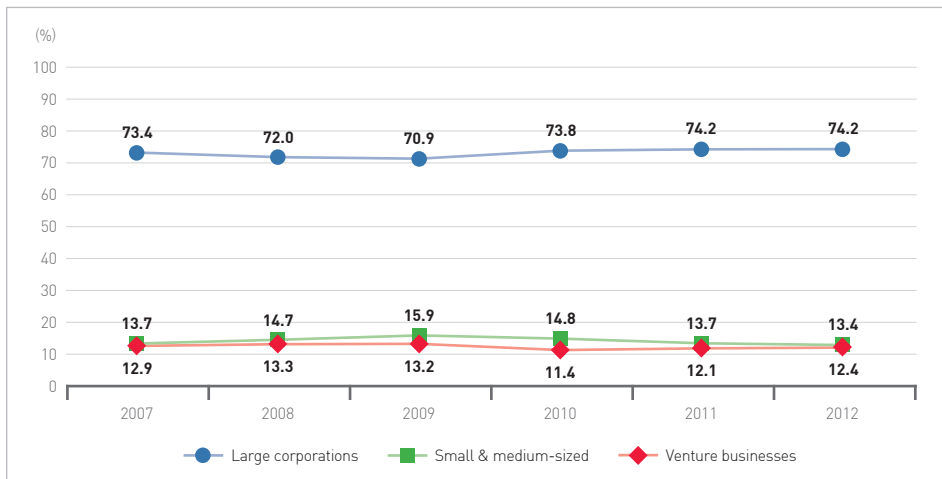
R&D Activity by Company Type

- R&D expenditure of Korean large corporations in 2012 has increased by 3,724.7 billion won (13.1%) from the previous year to reach 32,070.9 billion won.
 - The share of R&D investments in large corporations is 74.2% of the total R&D expenditure of business enterprises.
 - R&D investments of small & medium-sized businesses and venture businesses are 5,813.2 billion won (13.4%) and 5,338.8 billion won (12.4%), respectively.

〈Figure 35〉
R&D expenditure by company type [Korea]

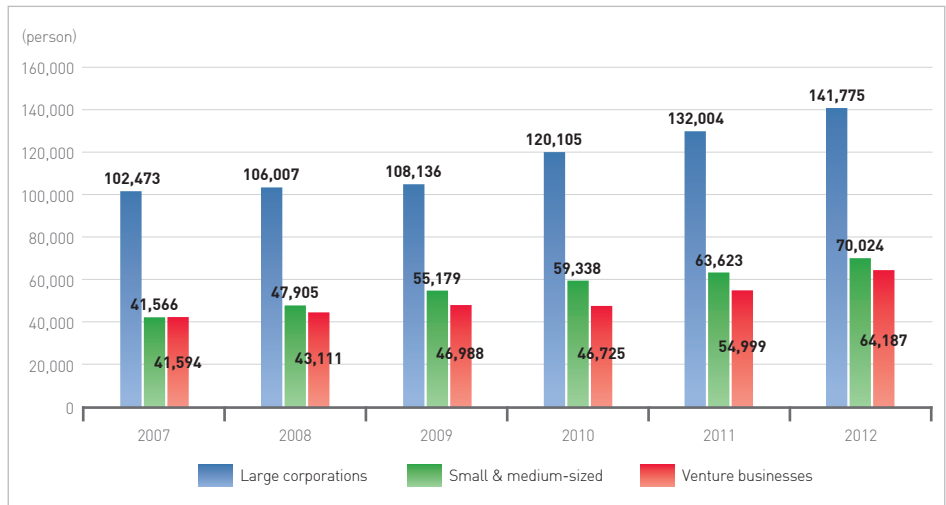


〈Figure 36〉
R&D expenditure rate by company type [Korea]

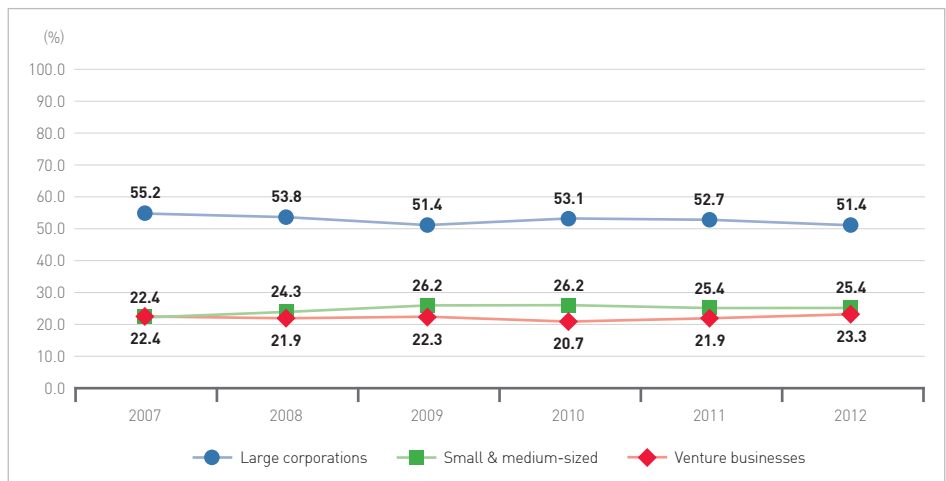


- The number of researchers employed by large corporations has increased by 9,771 persons(7.4%) from the previous year to reach 141,775 persons.
 - The share of researchers in large corporations among the business enterprise sector has decreased by 1.3 percentage points, representing 51.4%.
- The number of researchers employed by small & medium sized corporations and venture businesses is 70,024 persons and 64,187 persons, respectively.
 - The share of researchers in small & medium sized corporations and venture corporations among the business enterprise sector accounts for 25.4% and 23.3%, respectively.

〈Figure 37〉
The number
of researchers
by company type
(Korea)



〈Figure 38〉
The rate
of researchers
by company type
(Korea)

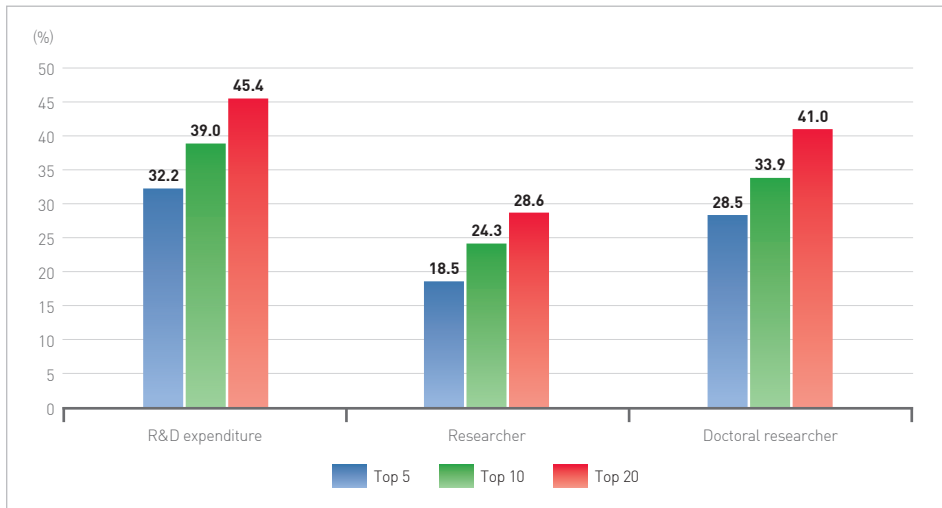


3. R&D Activities of the Business Enterprise Sector

R&D Intensity of Business Enterprises

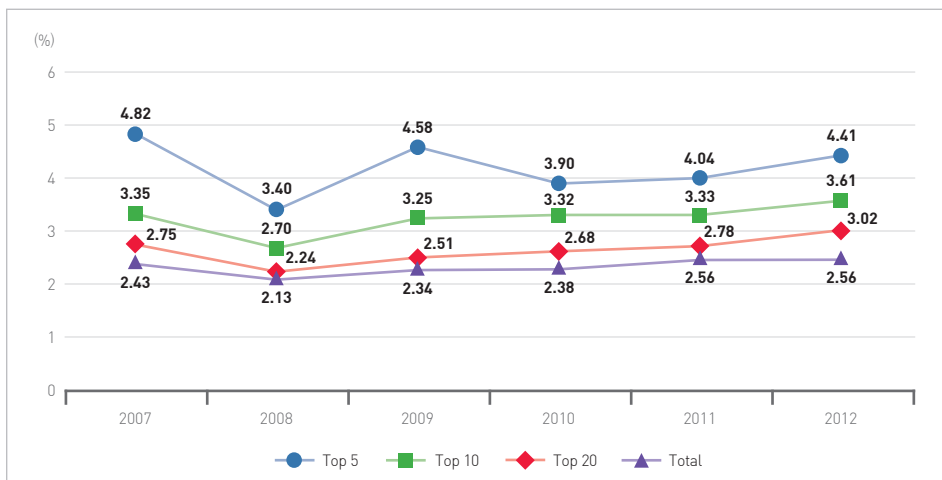
〈Figure 39〉
2012
R&D intensity
of the top sales
companies
(Korea)

- R&D expenditure of the top 5 companies with the highest sales accounts for 32.2% of the total business expenditure of the business sector.
 - Of the total R&D expenditure of business enterprises, the top 10 sales companies represent 39.0% while the top 20 sales companies account for 45.4%.
 - Researcher intensity of companies with the top 5 sales companies is 18.5% and the intensity of doctoral researchers is 28.5%.



- The survey results indicate that Korea's top sales companies are actively investing in R&D.
 - In 2012, the R&D expenditure rate to sales of the top 5 sales companies is 4.41%.

〈Figure 40〉
R&D expenditure
rate to sales
of the top sales
companies
(Korea)



● Analysis of R&D intensity by item³⁾ shows some trends:

- In 2012, the share of the top 5 R&D companies has increased slightly from the previous year to reach 41.0%. Their share in researchers has decreased by 1.4 percentage points to 25.1% and the share of doctoral researchers has decreased by 0.2 percentage points to 34.6%.

〈Table 16〉
R&D intensity
of the top companies
by item (Korea)

(Unit : %)

| | R&D expenditure | | | Researcher | | | Doctoral researcher | | |
|--------|-----------------|------|------|------------|------|------|---------------------|------|------|
| | 2010 | 2011 | 2012 | 2010 | 2011 | 2012 | 2010 | 2011 | 2012 |
| Top 5 | 40.9 | 39.7 | 41.0 | 27.6 | 26.5 | 25.1 | 37.7 | 34.8 | 34.6 |
| Top 10 | 46.2 | 45.2 | 46.3 | 31.2 | 30.1 | 28.7 | 43.9 | 41.3 | 41.3 |
| Top 20 | 52.0 | 51.2 | 52.5 | 35.3 | 34.3 | 32.6 | 50.2 | 48.0 | 47.4 |

R&D Expenditure by Type of Usage

● Korean business enterprises have made the largest R&D investments in developing new products.

- In 2012, investments made in new product development are 19,181.1 billion won, which accounts for 44.4% of total R&D expenditure of the business enterprise sector.
- R&D investments for other uses are devoted to improving existing products (10,047.9 billion won, 23.2%), developing new manufacturing processes (8,053.0 billion won, 18.6%), and improving existing manufacturing processes (5,940.9 billion won, 13.7%).

〈Table 17〉
R&D expenditure
by type of usage
(Korea)

(Unit : 0.1 billion won, %)

| | 2010 | | 2011 | | 2012 | |
|------------------|-------------|------|-------------|------|-------------|------|
| | expenditure | rate | expenditure | rate | expenditure | rate |
| New product | 153,847 | 46.9 | 172,998 | 45.3 | 191,811 | 44.4 |
| Existing product | 70,473 | 21.5 | 89,630 | 23.5 | 100,479 | 23.2 |
| New process | 60,292 | 18.4 | 69,891 | 18.3 | 80,530 | 18.6 |
| Existed process | 43,421 | 13.2 | 49,313 | 12.9 | 59,409 | 13.7 |

3) R&D intensity by item is the intensity of R&D institutions that is calculated by items such as R&D expenditure, researchers, and doctoral researchers. The statistic is different from the intensity of top sales companies.



APPENDIX



Exchange rates by Country

(Unit : national currency per dollar)

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|-------------------|---------|-----------|-----------|-----------|-----------|-----------|
| Australia | 1.195 | 1.192 | 1.282 | 1.090 | 0.969 | 0.966 |
| Austria | 0.731 | 0.683 | 0.720 | 0.755 | 0.719 | 0.778 |
| Belgium | 0.731 | 0.683 | 0.720 | 0.755 | 0.719 | 0.778 |
| Canada | 1.074 | 1.067 | 1.143 | 1.030 | 0.990 | 0.999 |
| Chile | 522.464 | 522.461 | 560.860 | 510.249 | 483.668 | 486.479 |
| Czech Republic | 20.294 | 17.072 | 19.063 | 19.098 | 17.696 | 19.578 |
| Denmark | 5.444 | 5.098 | 5.361 | 5.624 | 5.369 | 5.792 |
| Estonia | 0.731 | 0.683 | 0.719 | 0.755 | 0.719 | 0.778 |
| Finland | 0.731 | 0.683 | 0.720 | 0.755 | 0.719 | 0.778 |
| France | 0.731 | 0.683 | 0.720 | 0.755 | 0.719 | 0.778 |
| Germany | 0.731 | 0.683 | 0.720 | 0.755 | 0.719 | 0.778 |
| Greece | 0.731 | 0.683 | 0.720 | 0.755 | 0.719 | 0.778 |
| Hungary | 183.626 | 172.113 | 202.342 | 207.944 | 201.055 | 225.104 |
| Iceland | 64.055 | 87.948 | 123.638 | 122.242 | 115.954 | 125.083 |
| Ireland | 0.731 | 0.683 | 0.720 | 0.755 | 0.719 | 0.778 |
| Israel | 4.108 | 3.588 | 3.932 | 3.739 | 3.578 | 3.856 |
| Italy | 0.731 | 0.683 | 0.720 | 0.755 | 0.719 | 0.778 |
| Japan | 117.754 | 103.359 | 93.570 | 87.780 | 79.807 | 79.791 |
| Korea | 929.257 | 1,102.050 | 1,276.930 | 1,156.060 | 1,108.290 | 1,126.470 |
| Luxembourg | 0.731 | 0.683 | 0.720 | 0.755 | 0.719 | 0.778 |
| Mexico | 10.928 | 11.130 | 13.514 | 12.636 | 12.423 | 13.170 |
| Netherlands | 0.731 | 0.683 | 0.720 | 0.755 | 0.719 | 0.778 |
| New Zealand | 1.361 | 1.423 | 1.600 | 1.387 | 1.266 | 1.234 |
| Norway | 5.862 | 5.640 | 6.288 | 6.044 | 5.605 | 5.818 |
| Poland | 2.768 | 2.409 | 3.120 | 3.015 | 2.963 | 3.257 |
| Portugal | 0.731 | 0.683 | 0.720 | 0.755 | 0.719 | 0.778 |
| Slovak Republic | 0.820 | 0.709 | 0.720 | 0.755 | 0.719 | 0.778 |
| Slovenia | 0.731 | 0.683 | 0.720 | 0.755 | 0.719 | 0.778 |
| Spain | 0.731 | 0.683 | 0.720 | 0.755 | 0.719 | 0.778 |
| Sweden | 6.759 | 6.591 | 7.654 | 7.208 | 6.494 | 6.775 |
| Switzerland | 1.200 | 1.083 | 1.088 | 1.043 | 0.888 | 0.938 |
| Turkey | 1.303 | 1.302 | 1.550 | 1.503 | 1.675 | 1.796 |
| United Kingdom | 0.500 | 0.544 | 0.642 | 0.647 | 0.624 | 0.633 |
| United States | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Argentina | 3.096 | 3.144 | 3.710 | 3.896 | 4.110 | 4.537 |
| China | 7.608 | 6.949 | 6.831 | 6.770 | 6.461 | 6.312 |
| Romania | 2.438 | 2.519 | 3.049 | 3.178 | 3.049 | 3.468 |
| Russian ederation | 25.581 | 24.853 | 31.740 | 30.368 | 29.382 | 30.840 |
| Singapore | 1.507 | 1.415 | 1.455 | 1.364 | 1.258 | 1.250 |
| South Africa | 7.045 | 8.261 | 8.474 | 7.321 | 7.261 | 8.210 |
| Chinese Taipei | 32.842 | 31.517 | 33.049 | 31.642 | 29.464 | 29.614 |

* Source : OECD, Main Science and Technology Indicators 2013-1

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