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Survey of Research and Development in Korea, 2013

2. R&D Personnel

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Appendix

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.	739	421	574	40,135	41,869
Number of the Retrieval Org. (Recovery Rate)	722 (97.7%)	413 (98.1%)	564 (98.3%)	32,401 (80.7%)	34,100 (81.4%)

- 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 FIGURES[1)]

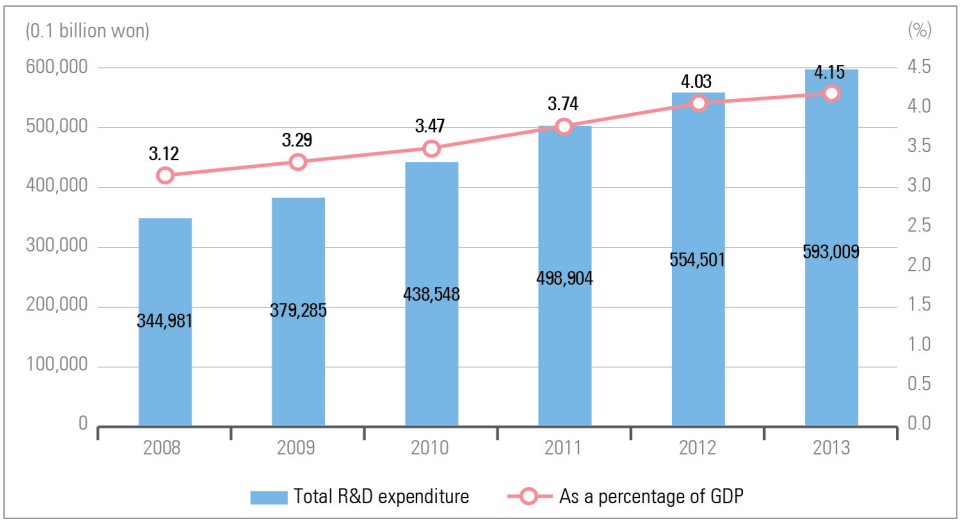
1) The figures in this report is calculated based on rounding off to the nearest integer.

1. R&D Expenditure

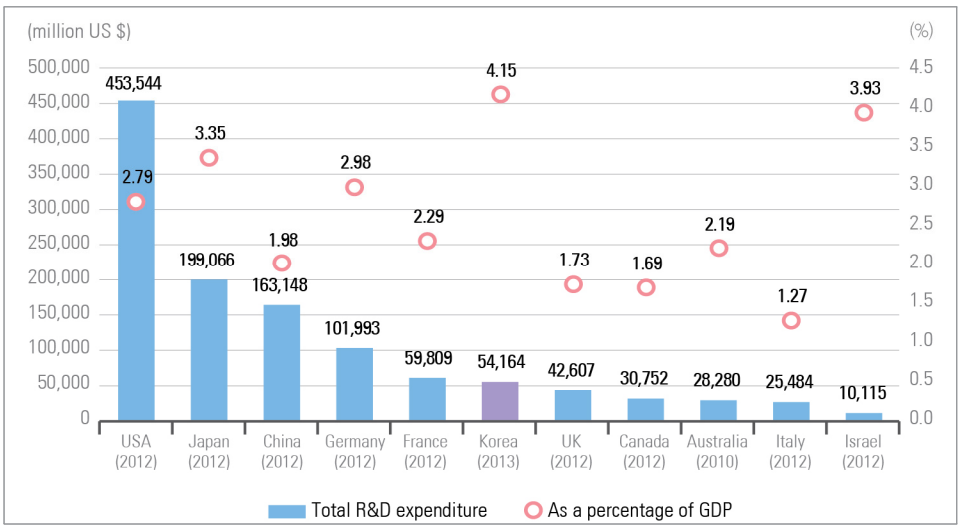
Total R&D expenditure

- Korea's total R&D expenditure in 2013 has increased by 3,850.8 billion won (6.9%) from the previous year to 59,300.9 billion won.
  - R&D expenditure accounts for 4.15% of GDP, a 0.13 percentage points increase compared to 2012.
- With R&D expenditure of 54,164 million USD, Korea is ranked 6th in the world while the nation's R&D expenditure accounts for 4.15% of GDP, which indicates the highest worldwide.

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



〈Figure 2〉
Total R&D expenditure by country

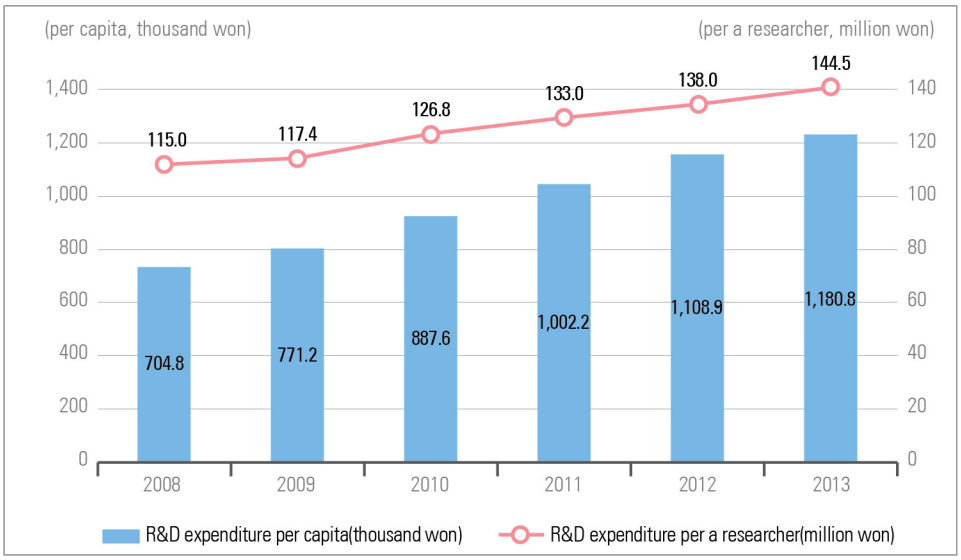


* Source : OECD, Main Science and Technology Indicators 2014-1

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 6.5% to 1,180.8 thousand won whereas R&D expenditure per researcher reaches 144.5 million won, a 4.7% increase from the previous year.
- The nation's R&D expenditure per capita (1,079 USD) and per researcher (FTE) (168 thousand USD) are both less than those of the major developed nations (US, Japan, Germany).
  - Japan shows the highest R&D expenditure per capita (1,561 USD in 2012), followed by the US (1,443 USD in 2012) and Germany (1,245 USD in 2012).
  - Nations with the highest R&D expenditure per researcher(FTE) are the US (343 thousand USD in 2011), Japan (308 thousand USD in 2012) and Germany (293 thousand USD in 2012).

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



* Source : OECD, Main Science and Technology Indicators 2014-1

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

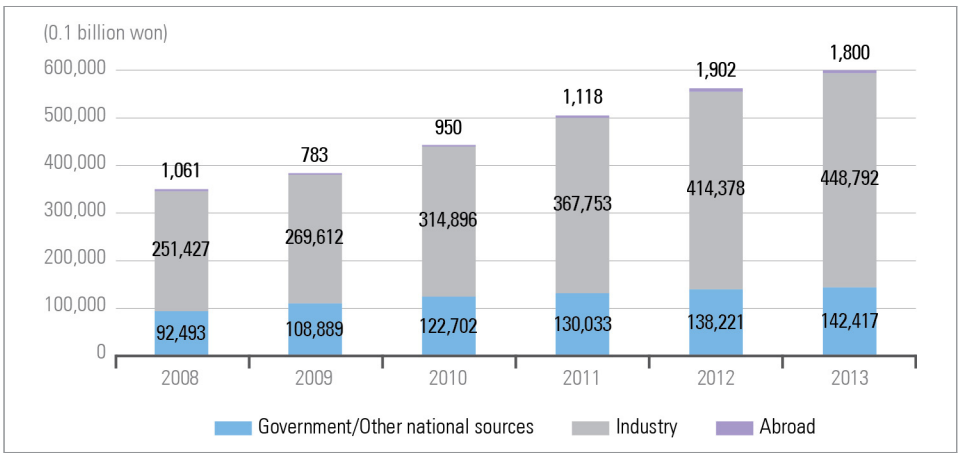
	Korea (2013)	USA	Japan (2012)	Germany (2012)	France	UK (2012)	China (2012)
R&D expenditure per capita (US $)	1,079	1,443 ('12)	1,561	1,245	914 ('12)	669	120
R&D expenditure per researcher (thousand US $, FTE)	168	343 ('11)	308	293	251 ('11)	169	116

* Source : OECD, Main Science and Technology Indicators 2014-1

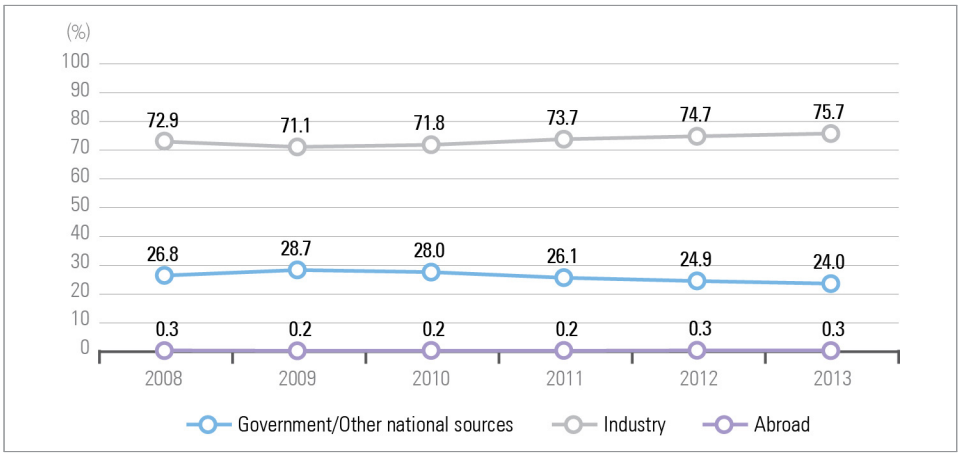
R&D Expenditure by Source of Funds

- With an increase of 419.7 billion won (3.0%) from the previous year to a total of 14,241.7 billion won, funding from the government and other national sources accounts for 24.0% of the total source of funds in 2013.
  - Funds from the industry and abroad are 44,879.2 billion won (75.7%) and 180.0 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, UK and Germany but relatively higher than Japan and China.
  - Public funds in the France(2011), the US(2012), UK(2012), and Germany(2011) account for 37.3%, 37.1%, 34.7% and 30.2% of the total R&D expenditure, respectively.

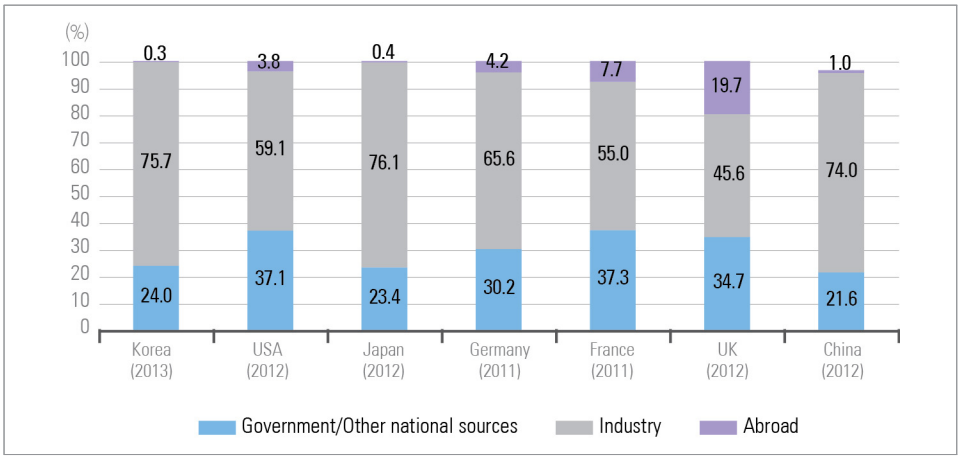
〈Figure 4〉
R&D expenditure by source of funds (Korea)



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



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

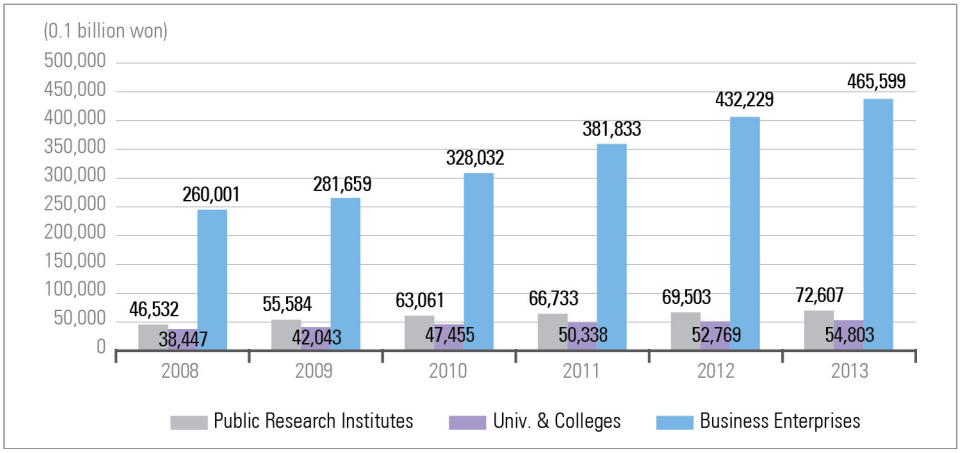


* Source : OECD, Main Science and Technology Indicators 2014-1
* Total sum of China is less than 100.0%

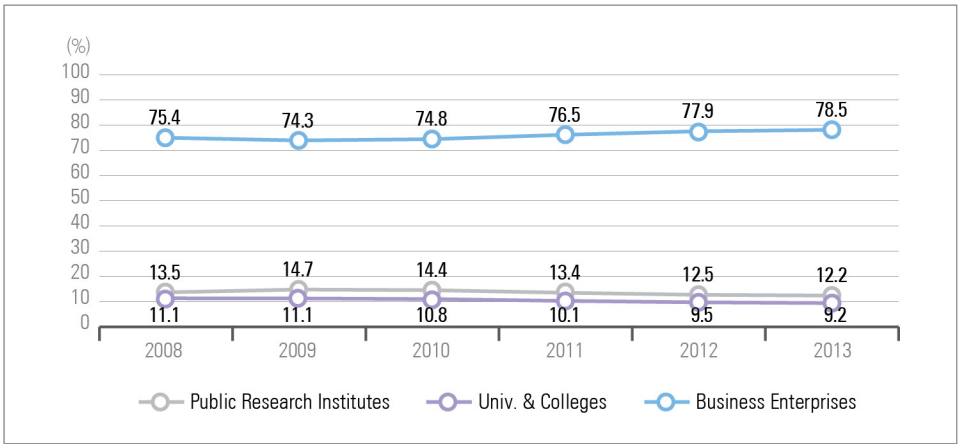
R&D Expenditure by Sector of Performance

- 78.5% (46,559.9 billion won) of the total R&D expenditure is spent by business enterprises.
  - R&D expenditure by business enterprises has increased by 7.7% (3,337.0 billion won). Meanwhile, public research institutes and universities & colleges have spent 7,260.7 billion won and 5,480.3 billion won, respectively.
- Among the major countries, the percentage of R&D expenditure by business enterprises in Korea (78.5%) is higher than that of Japan (76.6% in 2012), China (76.2% in 2012), and the US (69.8% in 2012).
  - On the contrary, the nation's R&D expenditure by universities and colleges represents 9.2%, which is only higher than that of China (7.6% in 2012).

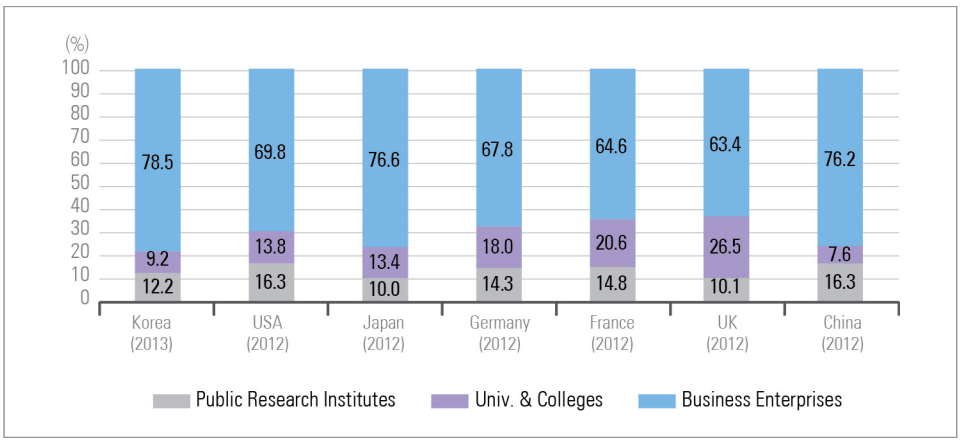
〈Figure 7〉
R&D expenditure by sector of performance (Korea)



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



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

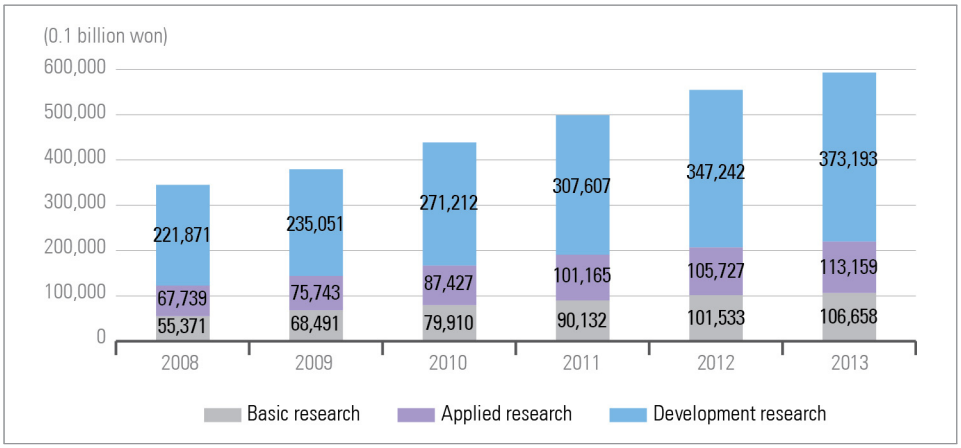


* Source : OECD, Main Science and Technology Indicators 2014-1

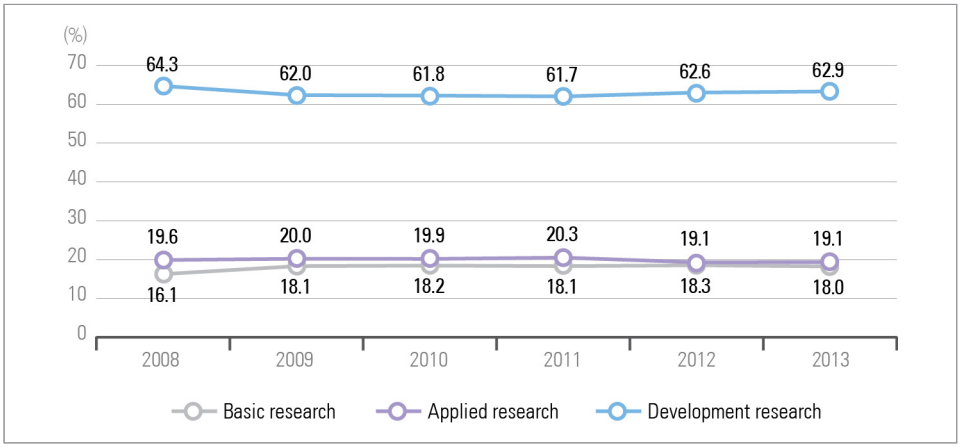
R&D Expenditure by type of R&D

- R&D expenditure spent on basic research has grown by 512.5 billion won to 10,665.8 billion won in 2013, a 5.0% increase from the previous year.
  - Spending on basic research accounts for 18.0%, a 0.3 percentage points decrease compared to 2012.
  - R&D expenditure spent on applied research and development research account for 19.1% (11,315.9 billion won) and 62.9% (37,319.3 billion won), respectively.
- The percentage of expenditure on basic research in Korea (18.0%) is lower than that of France (24.4% in 2011). However, it is higher than that of the US (16.5% in 2012), Japan (12.3% in 2011) and UK (14.9% in 2011).

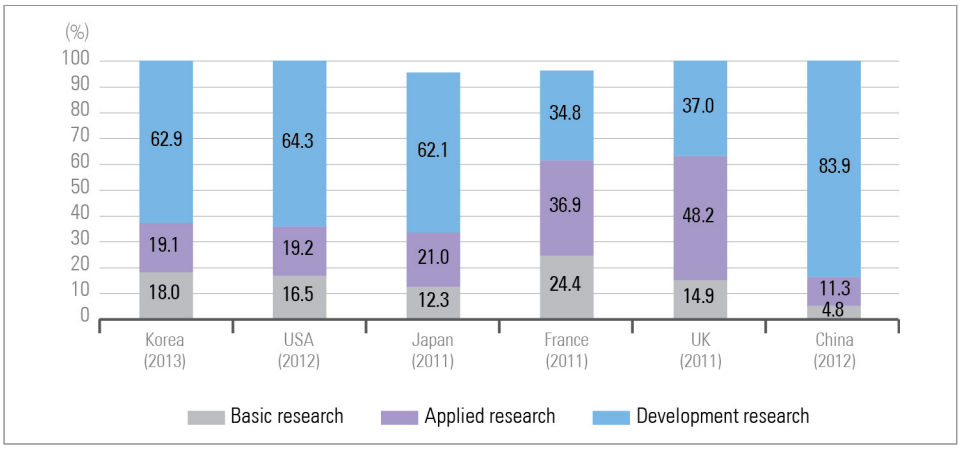
〈Figure 10〉
R&D expenditure by type of R&D (Korea)



〈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)

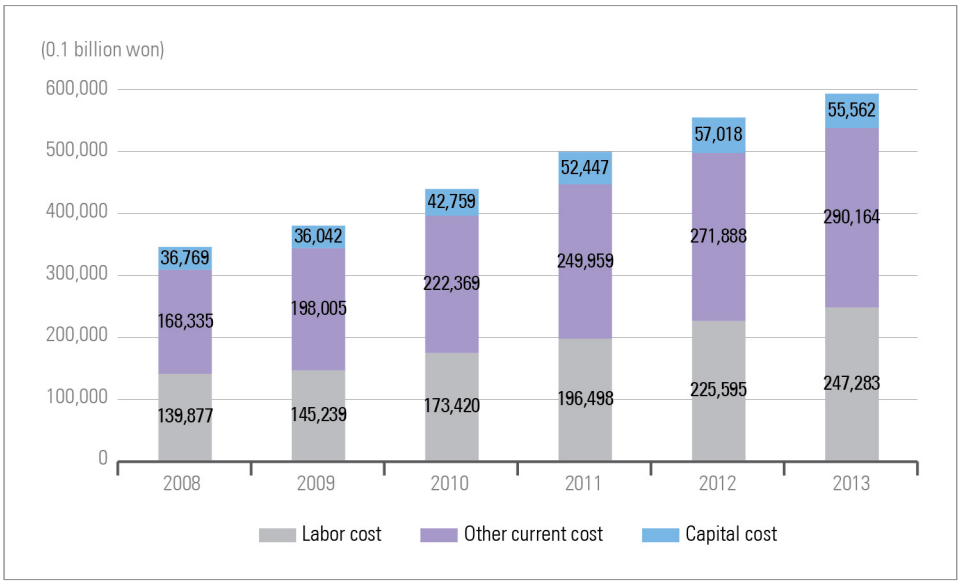


* Source : OECD, R&D Statistics 2014
* Total sum of France and Japan is less than 100.0%

R&D Expenditure by Type of Costs

- Of the total R&D expenditure in 2013, the current cost has increased by 8.0% (3,996.4 billion won) to reach 53,744.7 billion won.
  - The current costs account for 90.6% of the total R&D expenditure, a 0.9 percentage points increase from the previous year.
  - Of the total current costs, labor costs account for 41.7% (24,728.3 billion won) and other current costs account for 48.9% (29,016.4 billion won).
  - With 5,556.2 billion won, capital cost accounts for 9.4% of the total R&D expenditure.
- Compared to major countries, the percentage of expenditure on labor costs of Korea (41.7%) is higher than that of Japan (41.2% in 2011), and China (25.7% in 2012) but lower than Germany (57.7% in 2011) and France (59.8% in 2011).
  - Capital cost of Korea (9.4%) is lower than that of UK (18.7% in 2011) and China (14.5% in 2012), whereas higher than the US (0.2% in 2012).

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

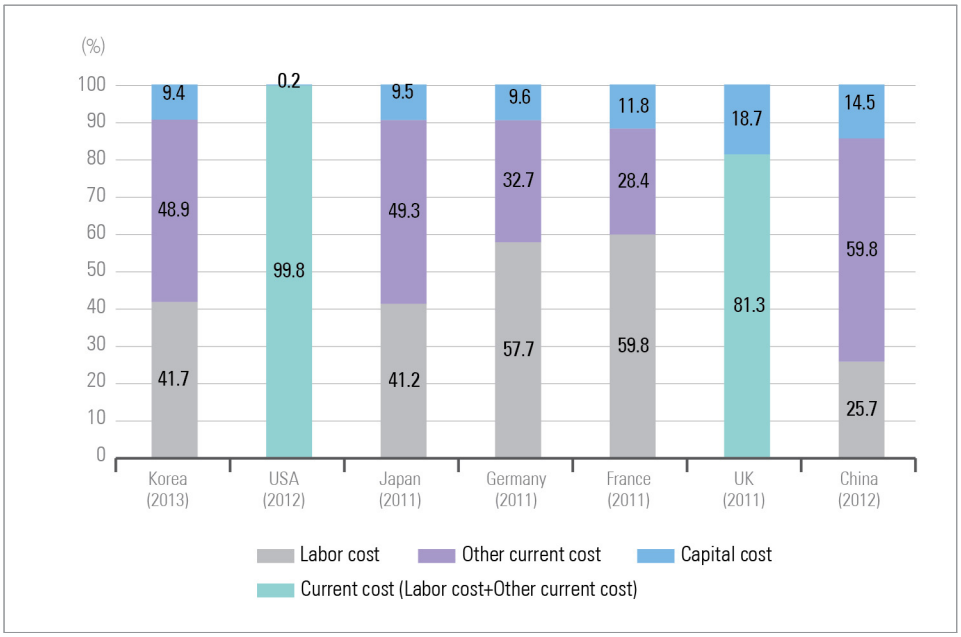


〈Table 2〉
R&D expenditure by type of costs (Korea)

(Unit : 0.1 billion won, %)

			2008	2009	2010	2011	2012	2013
Current cost	Labor cost	R&D exp.	139,877	145,239	173,420	196,498	225,595	247,283
		rate(%)	(40.5)	(38.3)	(39.5)	(39.4)	(40.7)	(41.7)
	Other current cost	R&D exp.	168,335	198,005	222,369	249,959	271,888	290,164
		rate(%)	(48.8)	(52.2)	(50.7)	(50.1)	(49.0)	(48.9)
	Sub total	R&D exp.	308,212	343,243	395,789	446,458	497,484	537,447
		rate(%)	(89.3)	(90.5)	(90.2)	(89.5)	(89.7)	(90.6)
Capital cost	Machinery	R&D exp.	26,895	28,622	34,190	38,272	38,495	40,523
		rate(%)	(7.8)	(7.5)	(7.8)	(7.7)	(6.9)	(6.8)
	Land, Building	R&D exp.	6,452	4,609	5,182	10,334	13,615	10,868
		rate(%)	(1.9)	(1.2)	(1.2)	(2.1)	(2.5)	(1.8)
	Computer software	R&D exp.	3,422	2,811	3,388	3,840	4,907	4,172
		rate(%)	(1.0)	(0.7)	(0.8)	(0.8)	(0.9)	(0.7)
	Sub total	R&D exp.	36,769	36,042	42,759	52,447	57,018	55,562
		rate(%)	(10.7)	(9.5)	(9.8)	(10.5)	(10.3)	(9.4)
Total			344,981	379,285	438,548	498,904	554,501	593,009
			(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)

〈Figure 14〉
R&D expenditure rate by type of costs (major countries)



* USA and UK do not classify current cost into labor cost and other current cost
* Source : OECD, R&D Statistics 2014.

R&D Expenditure of 6T

- IT accounts for 34.2% of the total R&D expenditure, and has grown by 1,317.8 billion won to reach 20,261.2 billion won.

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

(Unit : 0.1 billion won)

	2008	2009	2010	2011	2012	2013
IT	116,501	123,543	147,369	168,296	189,434	202,612
	(33.8)	(32.6)	(33.6)	(33.7)	(34.2)	(34.2)
BT	26,349	30,089	34,591	40,048	42,459	45,043
	(7.6)	(7.9)	(7.9)	(8.0)	(7.7)	(7.6)
NT	42,326	45,994	55,891	62,200	71,193	78,193
	(12.3)	(12.1)	(12.7)	(12.5)	(12.8)	(13.2)
ST	5,949	4,878	5,481	6,809	7,058	7,312
	(1.7)	(1.3)	(1.2)	(1.4)	(1.3)	(1.2)
ET	29,330	34,651	48,196	54,371	59,189	60,359
	(8.5)	(9.1)	(11.0)	(10.9)	(10.7)	(10.2)
CT	2,986	3,574	5,029	5,054	4,525	4,346
	(0.9)	(0.9)	(1.1)	(1.0)	(0.8)	(0.7)
Others	121,540	136,556	141,992	162,127	180,642	195,145
	(35.2)	(36.0)	(32.4)	(32.5)	(32.6)	(32.9)
Total	344,981	379,285	438,548	498,904	554,501	593,009
	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)

R&D Expenditure by Technology Type

- In 2013, electricity & electronics, information & communication, and machinery accounts for about 61.8% of the total R&D expenditure.
  - The share of electricity & electronics is the highest with 25.28%, followed by information & communication (19.40%), and machinery (17.16%).
- Public research institutes spend the largest amount of R&D expenditure in machinery (15.35%), while universities/colleges and business enterprises spend the largest in health science (19.71%) and in electricity & electronics (29.94%), respectively.

〈Table 4〉 2013 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.	0.41	2.15	1.15	4.61	3.92	7.16	4.49
Univ. & Colleges	1.06	2.65	4.03	2.72	7.65	5.65	19.71
Business Enterprises	0.13	0.51	7.33	0.10	1.59	0.96	2.24
Total	0.25	0.91	6.27	0.90	2.44	2.15	4.13
	Machinery	Materials	Chemical Eng.	Electricity & Electronics	Information/ Communication	Energy/ Resources	Nuclear Power
Public Research Ins.	15.35	4.85	2.04	8.81	11.53	7.27	6.40
Univ. & Colleges	7.43	4.65	2.54	7.55	6.01	2.84	0.83
Business Enterprises	18.59	5.40	3.04	29.94	22.20	1.85	0.45
Total	17.16	5.26	2.87	25.28	19.40	2.61	1.21
	Environment	Construction/ Transportation	History/ Archeology	Philosophy/ Religion	Linguistics	Literature	Cultural/ Arts/Sports
Public Research Ins.	3.34	3.77	0.55	0.00	0.00	0.02	0.36
Univ. & Colleges	2.92	4.14	0.91	0.60	1.16	0.51	1.66
Business Enterprises	1.22	2.34	0.00	0.01	0.02	0.00	1.03
Total	1.63	2.68	0.15	0.06	0.12	0.05	1.01
	Law	Politics/Public Administration	Economics/ Management	Society, Anthropology, Welfare, Woman	Human Ecology	Geographical/ Region/Tourism	Psychology
Public Research Ins.	0.16	0.99	3.12	0.94	0.19	0.24	0.00
Univ. & Colleges	0.52	0.97	2.55	1.44	0.57	0.55	0.26
Business Enterprises	0.00	0.01	0.09	0.01	0.34	0.02	0.00
Total	0.07	0.22	0.69	0.25	0.35	0.10	0.03
	Education	Media/Communication/Library & information	Brain Sciences	Cognitive/ Emotion & Sensibility Sciences	S&T and Society	Manpower and Infra	Total
Public Research Ins.	2.64	0.23	0.49	0.00	2.13	0.67	100.00
Univ. & Colleges	2.69	0.59	0.79	0.14	1.17	0.53	100.00
Business Enterprises	0.10	0.12	0.01	0.08	0.06	0.21	100.00
Total	0.65	0.18	0.14	0.07	0.42	0.29	100.00

R&D Expenditure by Socioeconomic Objectives

● Based on socioeconomic objectives, Korea's R&D expenditure used by each sector in 2013 is invested as follows:

- The largest amount (63.45%) is devoted to industrial production and technology, followed by health (6.56%), transport, telecommunication and other infrastructures (6.41%), and energy (6.13%).
- Business enterprises spend a significantly huge amount of R&D expenses (74.94%) in industrial production and technology, while universities and colleges invest relatively higher share of their R&D expenditure (23.13%) in health.

〈Table 5〉 2013 R&D expenditure rate by each sector and socioeconomic objectives (Korea)

(Unit : %)

	Public Research Ins.	Univ. & Colleges	Business Enterprises	Total
Exploration and Exploitation of the Earth	4.43	1.96	0.37	1.01
Environment	4.09	4.05	3.08	3.29
Exploration and Exploitation of Space	5.05	1.25	0.10	0.82
Transport, telecommunication and other infrastructures	5.25	8.03	6.40	6.41
Energy	12.04	5.66	5.26	6.13
Industrial production and technology	20.66	22.48	74.94	63.45
Health	7.60	23.13	4.45	6.56
Agriculture	7.51	5.81	0.89	2.15
Education	2.71	4.72	0.50	1.16
Culture, recreation, religion and mass media	1.19	3.99	1.02	1.32
Political and social systems, structures and processes	4.64	4.35	0.12	1.06
General advancement of knowledge	3.86	12.31	0.91	2.33
Defence	20.97	2.26	1.97	4.32
Total	100.00	100.00	100.00	100.00

R&D Expenditure by Field of Science

● In 2013, Korea's R&D expenditure for science and technology accounts for 96.2% (57,037.5 billion won) of the total R&D spending.

- Regarding R&D investments to science and technology, expenditure spent on engineering and technology represents 68.4% (40,561.0 billion won), followed by natural science with 8,236.8 billion won (13.9%), and medical & health science with 6,982.0 billion won (11.8%).

● The share of R&D investments in science and technology is the highest in business enterprises (98.6%) and relatively low in universities and colleges (85.4%).

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

(Unit : 0.1 billion won, %)

		2008	2009	2010	2011	2012	2013
Science and Technology	Natural Science	40,846	47,598	56,365	64,042	78,096	82,368
		(11.8)	(12.5)	(12.9)	(12.8)	(14.1)	(13.9)
	Engineering & Tech.	247,241	266,711	306,281	349,551	381,344	405,610
		(71.7)	(70.3)	(69.8)	(70.1)	(68.8)	(68.4)
	Medical & Health Science	35,294	40,095	47,482	54,227	62,553	69,820
		(10.2)	(10.6)	(10.8)	(10.9)	(11.3)	(11.8)
	Agricultural Science	7,478	9,201	10,822	11,419	11,686	12,577
		(2.2)	(2.4)	(2.5)	(2.3)	(2.1)	(2.1)
	Sub-total	330,859	363,604	420,949	479,239	533,680	570,375
		(95.9)	(95.9)	(96.0)	(96.1)	(96.2)	(96.2)
Humanities and Social Sciences	Humanities	4,708	5,147	5,326	6,935	8,020	9,335
		(1.4)	(1.4)	(1.2)	(1.4)	(1.4)	(1.6)
	Social Science	9,414	10,534	12,273	12,730	12,802	13,299
		(2.7)	(2.8)	(2.8)	(2.6)	(2.3)	(2.2)
	Sub-total	14,122	15,681	17,599	19,665	20,822	22,634
		(4.1)	(4.1)	(4.0)	(3.9)	(3.8)	(3.8)
Total		344,981	379,285	438,548	498,904	554,501	593,009
		(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)

〈Table 7〉
2013 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	11,414	(15.7)	8,863	(16.2)	62,091	(13.3)	82,368	(13.9)
	Engineering & Tech.	44,190	(60.9)	23,074	(42.1)	338,346	(72.7)	405,610	(68.4)
	Medical & Health Science	3,656	(5.0)	11,376	(20.8)	54,789	(11.8)	69,820	(11.8)
	Agricultural Science	5,384	(7.4)	3,471	(6.3)	3,722	(0.8)	12,577	(2.1)
	Sub-total	64,644	(89.0)	46,783	(85.4)	458,949	(98.6)	570,375	(96.2)
Humanities and Social Sciences	Humanities	623	(0.9)	3,287	(6.0)	5,426	(1.2)	9,335	(1.6)
	Social Science	7,341	(10.1)	4,734	(8.6)	1,225	(0.3)	13,299	(2.2)
	Sub-total	7,963	(11.0)	8,020	(14.6)	6,651	(1.4)	22,634	(3.8)

R&D Expenditure by Region

● R&D expenditure of the Seoul Metropolitan Area in 2013 is 40,144.9 billion won, which accounts for 67.7% of the total R&D investments.

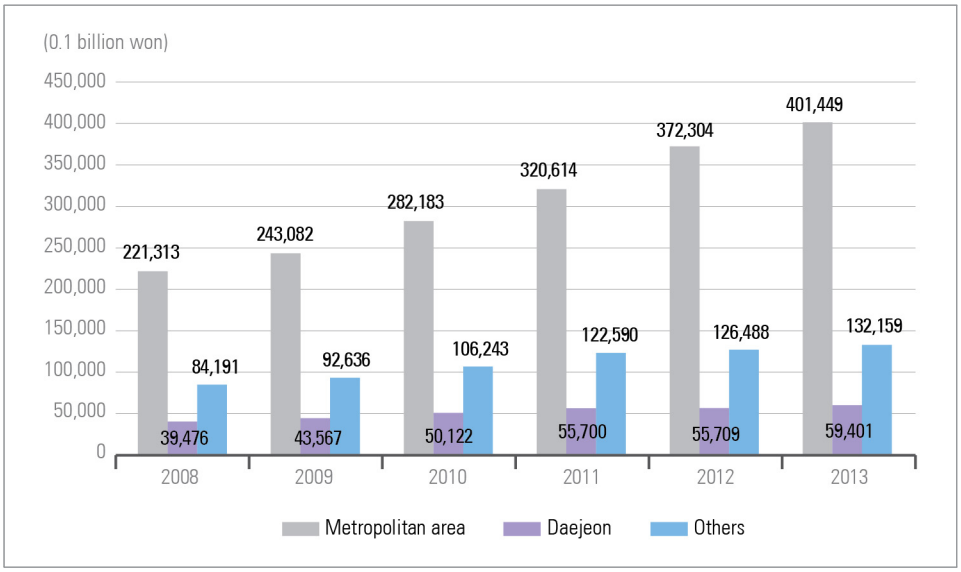
- In the Metropolitan Area, R&D expenditure of Gyeonggi region reaches 27,309.5 billion won while that of Seoul is 10,702.7 billion won.
- The percentage of R&D expenditure has increased by 0.6 percentage points in the Metropolitan Area.

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

(Unit : 0.1 billion won, %)

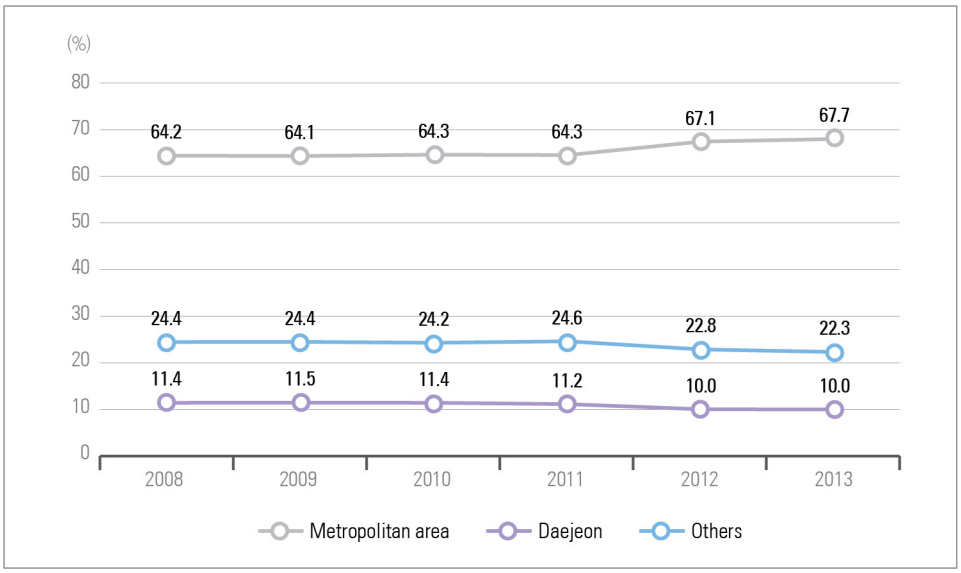
	2008	2009	2010	2011	2012	2013
Seoul	71,747	73,042	82,430	92,313	99,167	107,027
Busan	7,423	8,111	8,395	9,068	10,306	9,655
Daegu	5,080	5,308	5,900	6,784	8,394	8,212
Incheon	14,062	14,407	16,624	19,832	21,319	21,328
Gwangju	5,004	5,269	5,209	6,901	6,728	5,937
Daejeon	39,476	43,567	50,122	55,700	55,709	59,401
Ulsan	4,114	3,945	4,522	7,475	7,214	7,405
Sejong	-	-	-	-	-	1,881
Gyeonggi	135,505	155,632	183,129	208,469	251,818	273,095
Gangwon	2,576	2,772	2,847	3,400	3,514	3,565
Chungbuk	6,434	6,256	7,829	8,813	9,548	10,598
Chungnam	17,255	21,261	26,866	29,427	25,428	26,282
Jeonbuk	3,869	4,934	5,308	6,560	7,969	8,751
Jeonnam	3,287	3,898	4,826	5,329	5,640	6,456
Gyeongbuk	14,106	15,748	18,286	20,988	21,367	21,355
Gyeongnam	14,240	14,039	15,137	16,492	19,171	20,749
Jeju	803	1,095	1,118	1,354	1,209	1,313
Total	344,981	379,285	438,548	498,904	554,501	593,009

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



- R&D expenditure of the Seoul Metropolitan Area accounts for 67.7% and Daejeon accounts for 10.0% of the total R&D investments.
  - The percentage of R&D expenditure has increased by 0.6 percentage points in the Metropolitan Area while Daejeon remained the same.

〈Figure 16〉
R&D expenditure rate in metropolitan area (Korea)



The Flow and Composition of R&D Expenditures

〈Table 9〉 2013 flow of R&D expenditures by sector of performance (Korea)

(Unit : million won, %)

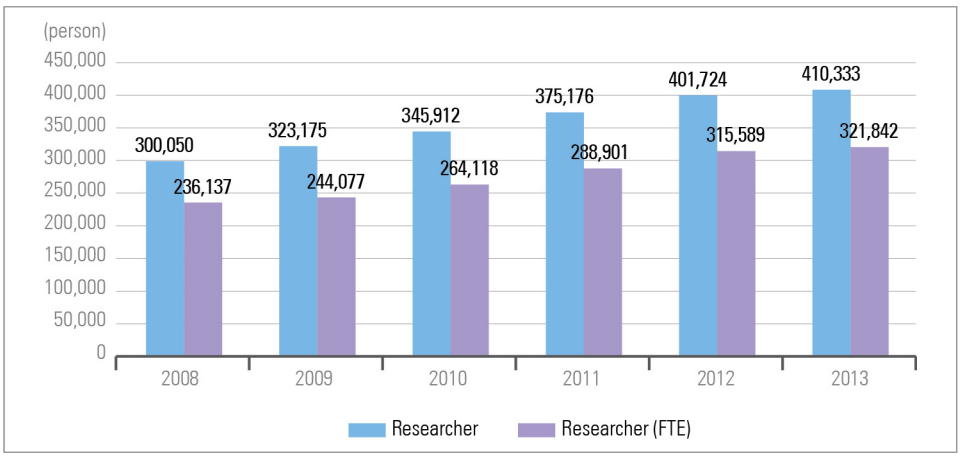
Source \ Performance			Public research institutes			Univ. & Colleges		Business Enterprises		Total
			Gov. Public Institute	Gov. supported Research institute	Other non-profit institute	National public univ.	Private univ.	Gov. -invested company	Private company	
Gov. & Other national sources	Gov.	Gov.	626,309	4,921,953	463,032	1,695,892	2,205,522	78,165	1,819,572	11,810,446
			99.1%	84.3%	58.7%	69.7%	72.4%	12.8%	4.0%	19.9%
		Gov.-invested institute	915	643,262	22,348	182,592	197,659	23,642	658,997	1,729,415
			0.1%	11.0%	2.8%	7.5%	6.5%	3.9%	1.4%	2.9%
		National public univ.	727	3,565	333	194,580	8,455	15	10,962	218,636
			0.1%	0.1%	0.0%	8.0%	0.3%	0.0%	0.0%	0.4%
		Sub-total	627,950	5,568,780	485,713	2,073,065	2,411,635	101,822	2,489,532	13,758,498
			99.4%	95.4%	61.6%	85.2%	79.1%	16.6%	5.4%	23.2%
	Other national sources	Private univ.	203	4,102	265	9,197	193,489	59	4,188	211,503
			0.0%	0.1%	0.0%	0.4%	6.3%	0.0%	0.0%	0.4%
		Non-profit corp.	85	80,472	90,483	41,084	46,710	30	12,880	271,744
			0.0%	1.4%	11.5%	1.7%	1.5%	0.0%	0.0%	0.5%
		Sub-total	288	84,574	90,747	50,281	240,199	89	17,068	483,247
			0.0%	1.4%	11.5%	2.1%	7.9%	0.0%	0.0%	0.8%
	Total		628,239	5,653,354	576,461	2,123,345	2,651,834	101,911	2,506,600	14,241,744
			99.4%	96.8%	73.1%	87.3%	87.0%	16.6%	5.5%	24.0%
Industry		Gov.-invested institute	508	58,432	7,228	17,164	14,963	391,238	9,826	499,358
			0.1%	1.0%	0.9%	0.7%	0.5%	63.9%	0.0%	0.8%
		Private company	3,220	120,006	170,171	281,071	361,502	117,469	43,326,396	44,379,835
			0.5%	2.1%	21.6%	11.6%	11.9%	19.2%	94.3%	74.8%
		Total	3,727	178,438	177,400	298,235	376,465	508,707	43,336,221	44,879,193
			0.6%	3.1%	22.5%	12.3%	12.4%	83.1%	94.3%	75.7%
Abroad			8,124	34,955	10,464	19,979	1,760	104,717	180,012	180,012
			0.0%	0.1%	4.4%	0.4%	0.7%	0.3%	0.2%	0.3%
Total			631,979	5,839,916	788,815	2,432,044	3,048,278	612,378	45,947,538	59,300,949
			100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

2. R&D Personnel

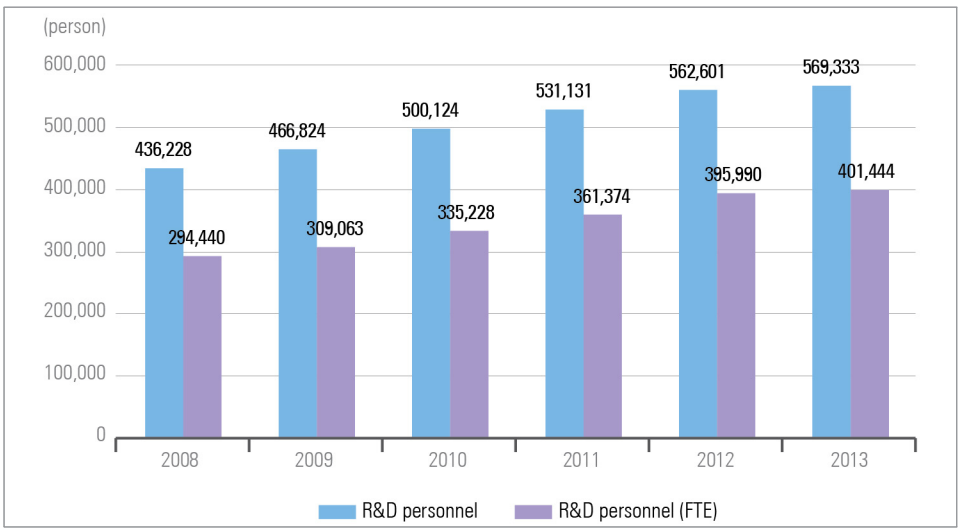
Total Number of Researchers

- In 2013, the total number of researchers in Korea has increased by 8,609 persons (2.1%) from the previous year to reach a total of 410,333 persons.
  - The total number of R&D personnel including research assistants has increased by 6,732 persons (1.2%) from the previous year to reach 569,333 persons.
  - With 321,842 persons, Korea is ranked 6th in the world in terms of the number of FTE[2] researchers. The total number of personnel (FTE) in Korea is estimated to be 401,444 persons.

〈Figure 17〉
Total number of researchers (Korea)

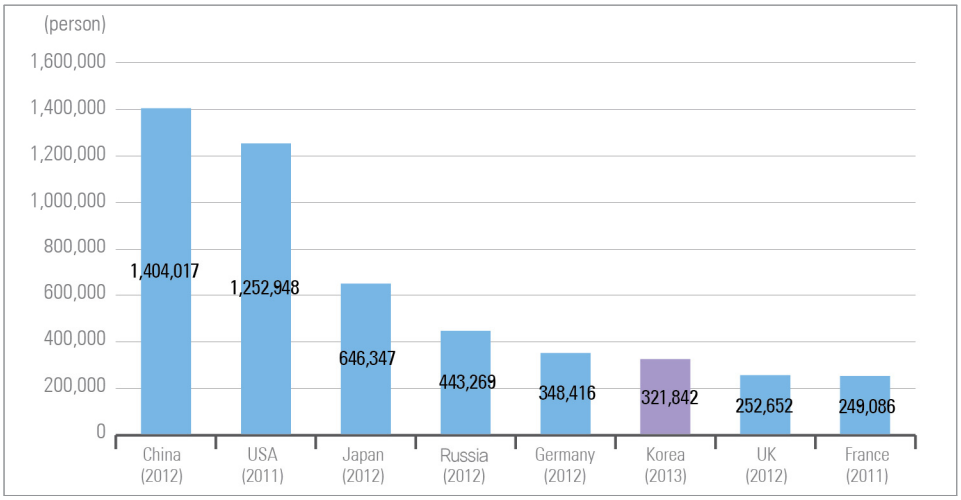


〈Figure 18〉
Total number of R&D personnel (Korea)



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.

〈Figure 19〉
Total number of researchers(FTE) by country

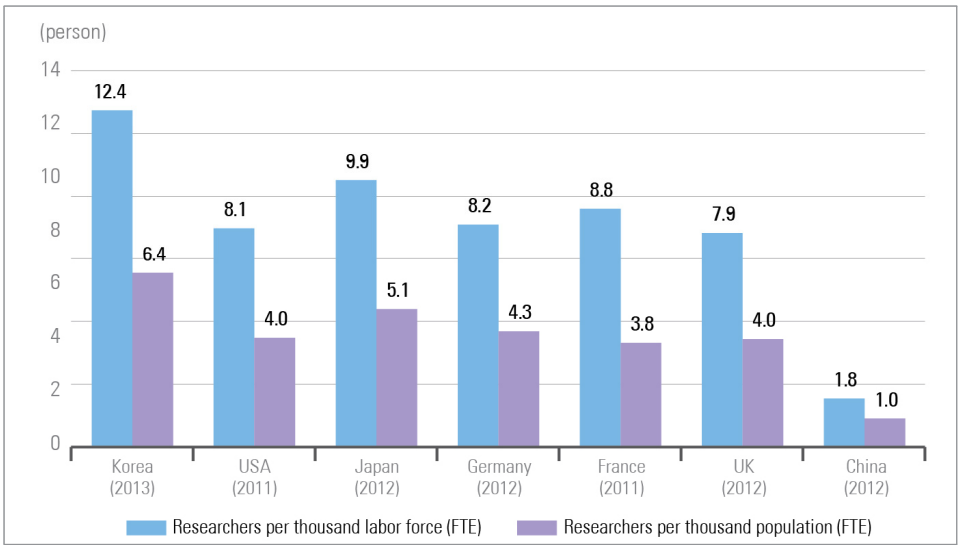


* Source : OECD, Main Science and Technology Indicators 2014-1

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(6.4 persons in 2013), Japan (5.1 persons in 2012), and Germany(4.3 persons in 2012).

〈Figure 20〉
Researchers(FTE) per thousand population /labor force (major countries)

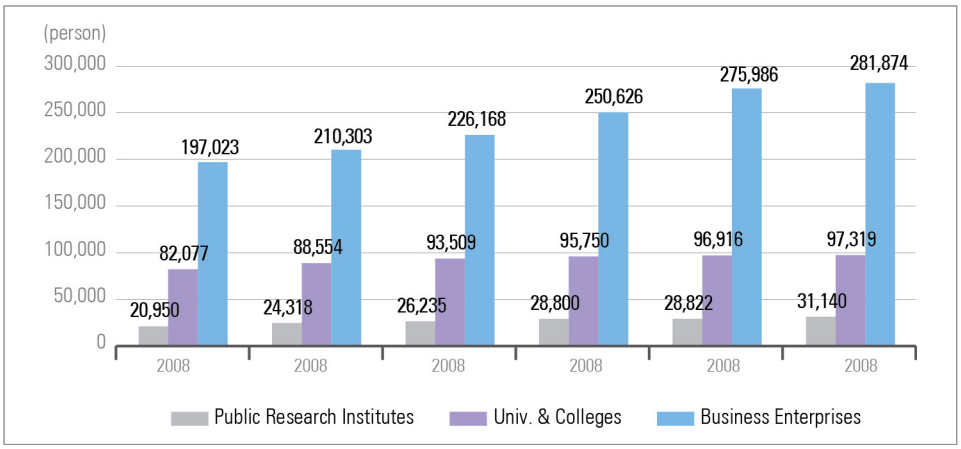


* Source : OECD, Main Science and Technology Indicators 2014-1

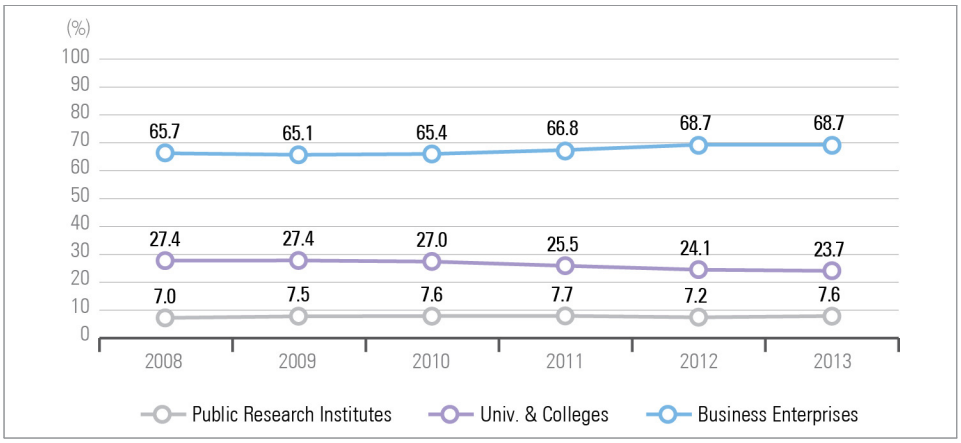
Researchers by Sector of Performance

- The number of researchers in business enterprises has grown by 2.1% (5,888 persons) from the previous year to reach 281,874 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 97,319 persons (23.7%) and 31,140 persons (7.6%), respectively.
- Based on FTE, the share of researchers in Korea's business enterprises (78.7%) is relatively high among the major economies.
  - Other nations with a high percentage of researchers in the business sector are Japan (74.8% in 2011) and China (62.1% in 2012).
  - Meanwhile, Korea has the lowest percentage of researchers in universities & colleges (13.0%) among the major countries.

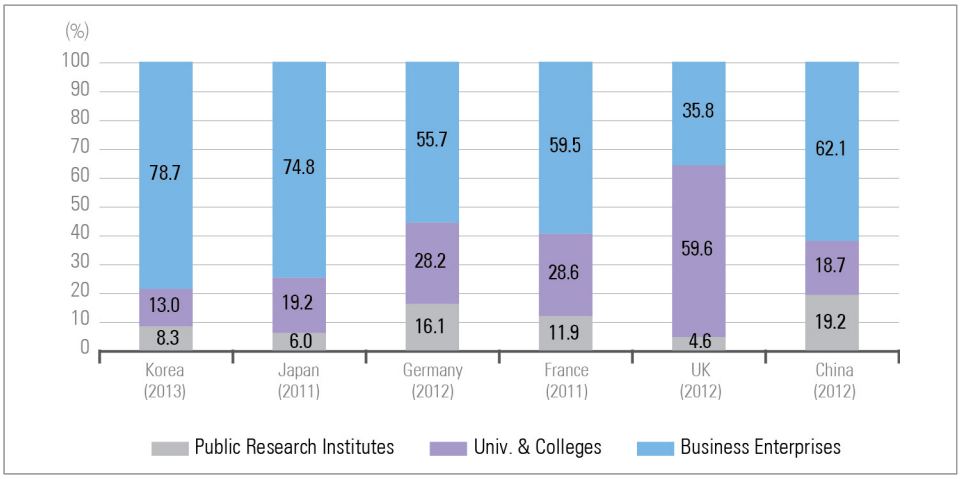
〈Figure 21〉 The number of researchers by sector of performance (Korea)



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



〈Figure 23〉
The rate of researchers (FTE) by sector of performance (major countries)

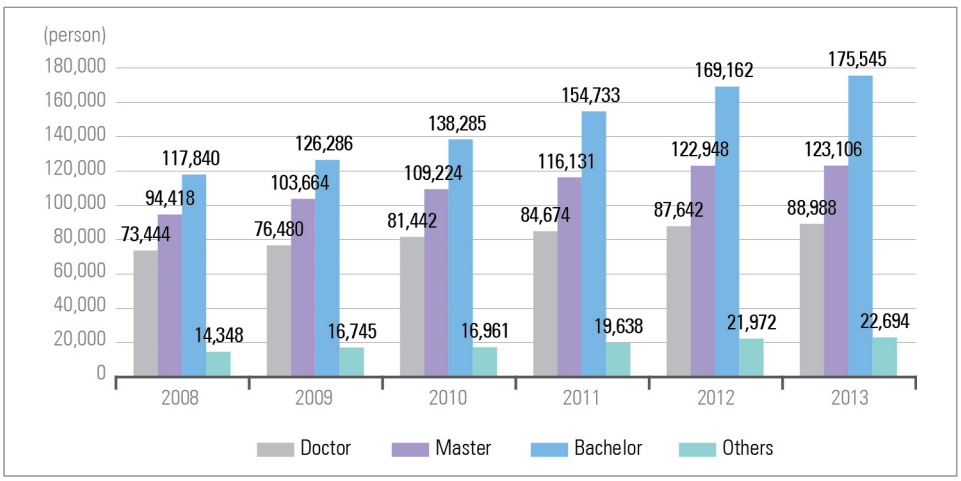


* Source : OECD, R&D Statistics 2014

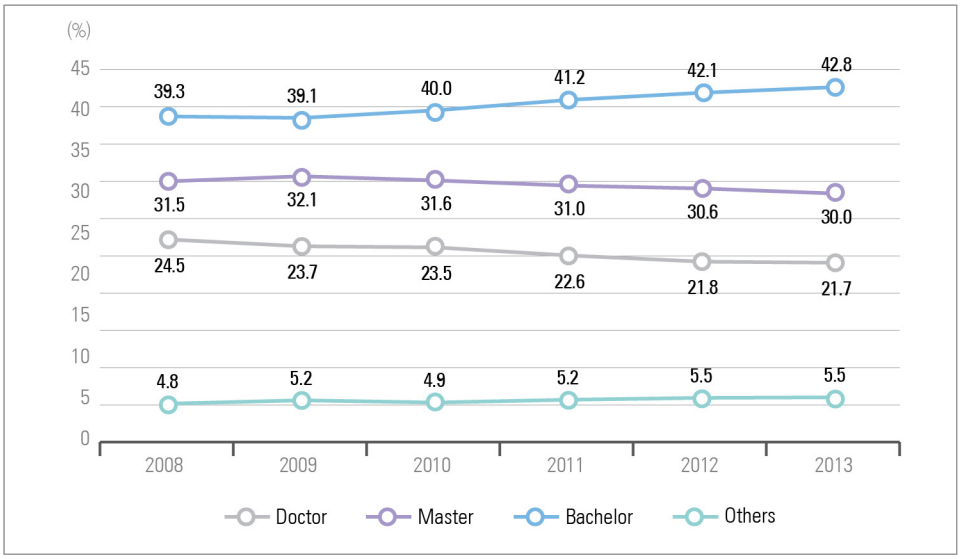
Researchers by Degree

- According to the 2013 results, there are 88,988 researchers with doctorate degrees, 123,106 researchers with master's degrees, 175,545 researchers with bachelor's degrees, and 22,694 researchers with other degrees.
  - The share of researchers with doctorate degrees has decreased by 0.1 percentage points to 21.7% and that with master's degrees also has decreased by 0.6 percentage points to 30.0%.
  - The share of researchers with bachelor's degrees has increased by 0.7 percentage points to 42.8%.

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

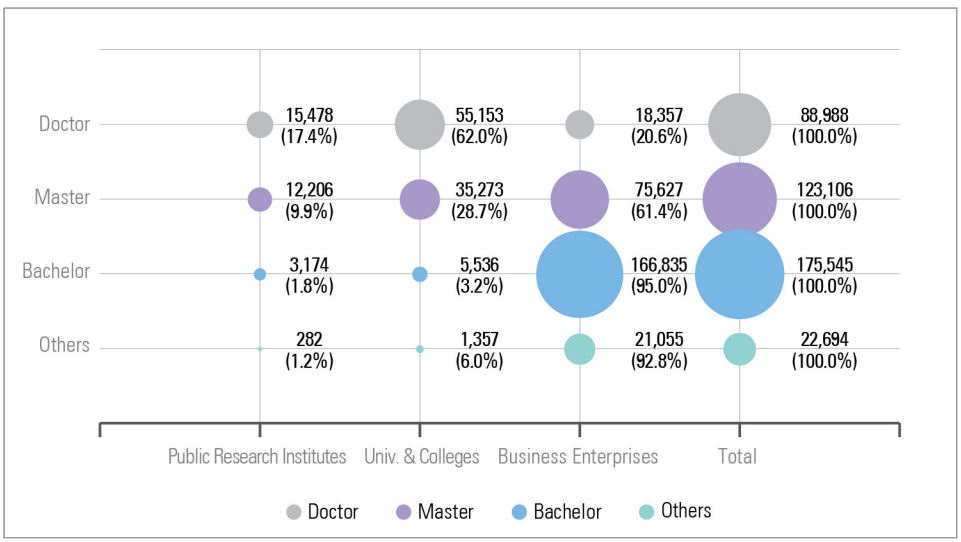


〈Figure 25〉
The rate of researchers by degree (Korea)



- The survey shows that 62.0% of the total number of doctorate researchers (55,153 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 26〉
2013 distribution of researchers by sector of performance and degree



Researchers by Major Fields of Study

- In 2013, 68.1% (279,388 persons) of the researchers in Korea have majored in engineering.
  - Other fields of study with a higher share of researchers include natural science with 51,494 researchers (12.5%) and social science with 25,223 researchers (6.1%).
- The major of 81.7% 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 51.1% (15,905 persons) and 34.2% (33,235 persons), respectively.

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

(Unit : person, %)

		2008	2009	2010	2011	2012	2013
Science and Technology	Natural Science	35,760	41,687	46,023	48,544	53,654	51,494
		(11.9)	(12.9)	(13.3)	(12.9)	(13.4)	(12.5)
	Engineering & Tech.	205,478	217,911	231,913	253,445	273,839	279,388
		(68.5)	(67.4)	(67.0)	(67.6)	(68.2)	(68.1)
	Medical & Health Science	17,247	17,227	18,926	20,473	19,945	23,292
		(5.7)	(5.3)	(5.5)	(5.5)	(5.0)	(5.7)
	Agricultural Science	6,853	8,713	9,202	9,841	9,912	10,102
		(2.3)	(2.7)	(2.7)	(2.6)	(2.5)	(2.5)
	Sub-total	265,338	285,538	306,064	332,303	357,350	364,276
		(88.4)	(88.4)	(88.5)	(88.6)	(89.0)	(88.8)
Humanities and Social Sciences	Humanities	15,457	16,372	17,568	19,633	20,413	20,834
		(5.2)	(5.1)	(5.1)	(5.2)	(5.1)	(5.1)
	Social Science	19,255	21,265	22,280	23,240	23,961	25,223
		(6.4)	(6.6)	(6.4)	(6.2)	(6.0)	(6.1)
	Sub-total	34,712	37,637	39,848	42,873	44,374	46,057
		(11.6)	(11.6)	(11.5)	(11.4)	(11.0)	(11.2)
Total		300,050	323,175	345,912	375,176	401,724	410,333
		(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)

〈Table 11〉
2013 Researchers by sector of performance and major field of study (Korea)

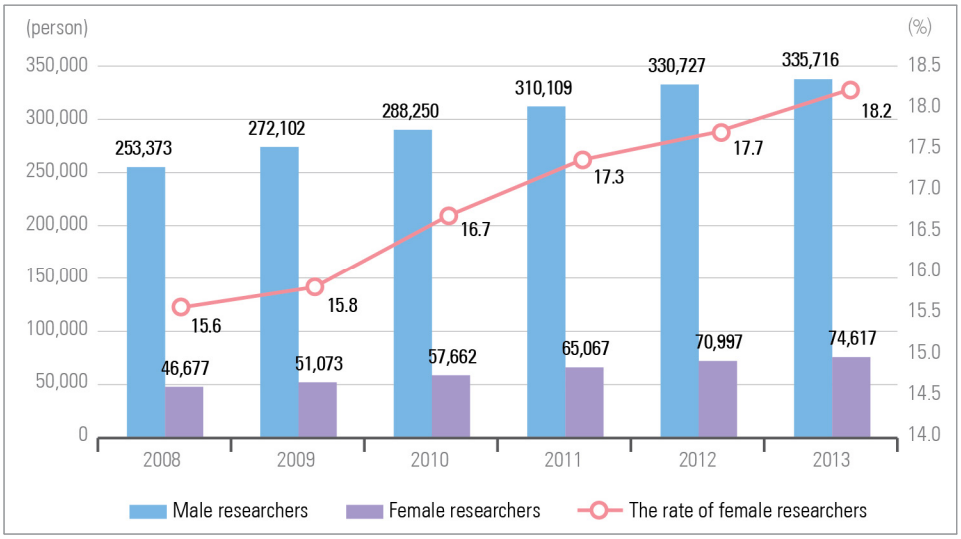
(Unit : person, %)

		Public Research Ins.		Univ. & Colleges		Business Enterprises		Total	
		Num.	rate	Num.	rate	Num.	rate	Num.	rate
Science and Technology	Natural Science	5,440	(17.5)	14,255	(14.6)	31,799	(11.3)	51,494	(12.5)
	Engineering & Tech.	15,905	(51.1)	33,235	(34.2)	230,248	(81.7)	279,388	(68.1)
	Medical & Health Science	1,777	(5.7)	18,693	(19.2)	2,822	(1.0)	23,292	(5.7)
	Agricultural Science	2,508	(8.1)	4,523	(4.6)	3,071	(1.1)	10,102	(2.5)
	Sub-total	25,630	(82.3)	70,706	(72.7)	267,940	(95.1)	364,276	(88.8)
Humanities and Social Sciences	Humanities	555	(1.8)	10,813	(11.1)	9,466	(3.4)	20,834	(5.1)
	Social Science	4,955	(15.9)	15,800	(16.2)	4,468	(1.6)	25,223	(6.1)
	Sub-total	5,510	(17.7)	26,613	(27.3)	13,934	(4.9)	46,057	(11.2)
Total		31,140	(100.0)	97,319	(100.0)	281,874	(100.0)	410,333	(100.0)

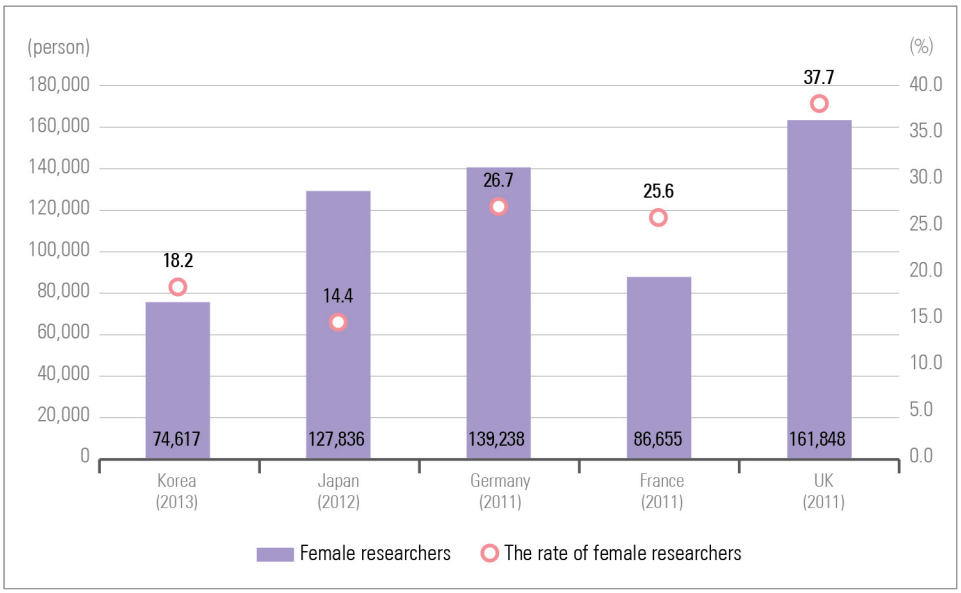
Researchers by Gender

- The number of female researchers has increased by 5.1% (3,620 persons) to reach 74,617 persons, which accounts for 18.2% of the total number of researchers.
- Compared to the major countries, the percentage of female researchers (18.2%) is relatively low in Korea.
  - The UK had the highest ratio of female researchers (37.7% in 2011) among the surveyed countries, followed by Germany (26.7% in 2011) and France (25.6% in 2011).

〈Figure 27〉
The number of researchers by gender (Korea)



〈Figure 28〉
The number of female researchers (major countries)



* Source : OECD, Main Science and Technology Indicators 2014-1

Researchers by Region

- The number of researchers in the Metropolitan Area reaches 264,044 persons (64.3%) in 2013.
  - It is revealed that there are 143,975 researchers (35.2%) in Gyeonggi area while 105,045 researchers (25.7%) in Seoul.

● Researchers working in public research institutes placed in Daejeon, take up the largest portion (32.1%), and researchers working in universities/ colleges have the highest percentage of researchers in Seoul.

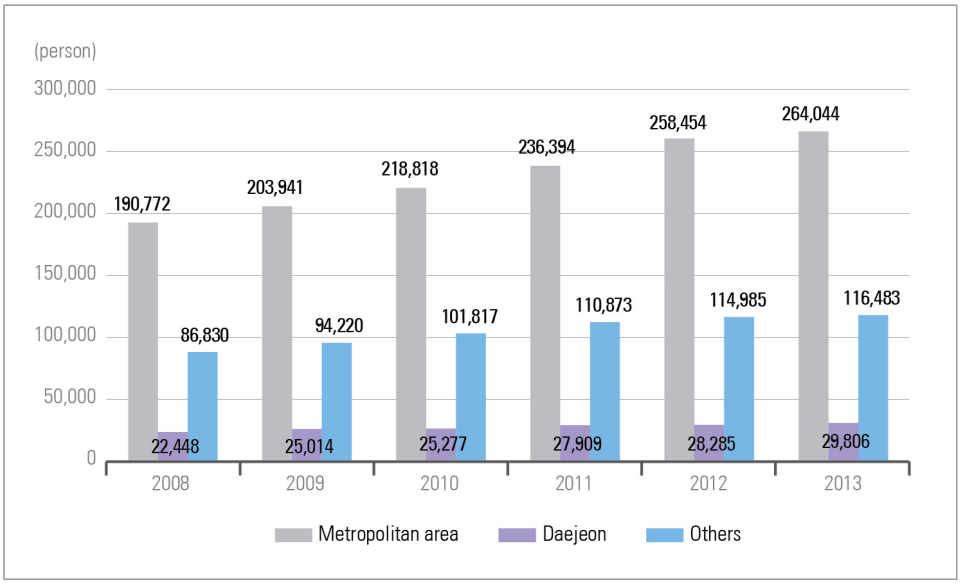
- In the Metropolitan Area, the percentage of researchers has remained the same but the percentage of researchers in Daejeon has increased by 0.3 percentage points from the previous year.

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

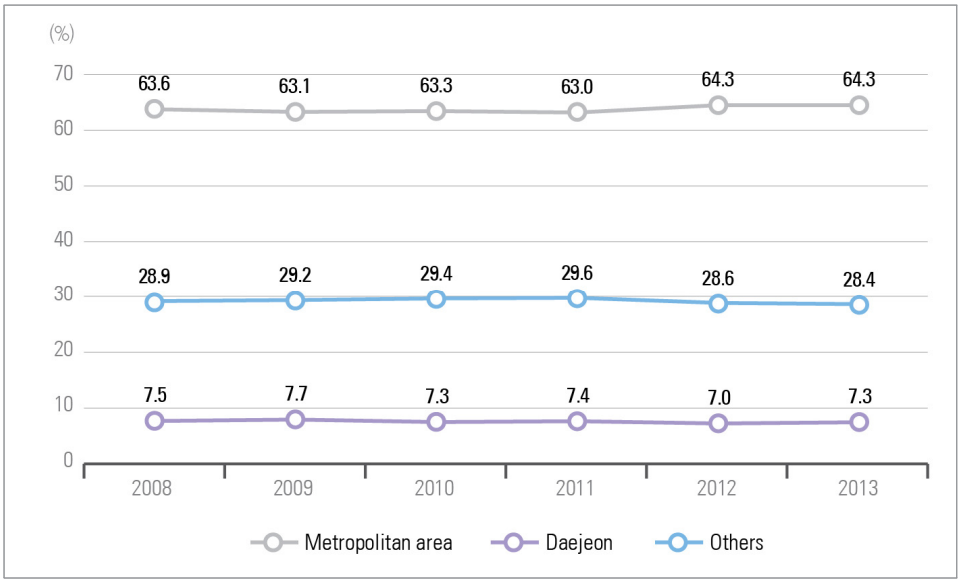
(Unit : person, %)

	2008	2009	2010	2011	2012	2013
Seoul	82,928	86,852	91,193	96,372	102,239	105,045
Busan	10,204	10,107	10,763	12,237	15,564	13,335
Daegu	7,442	7,592	7,740	8,801	9,673	9,002
Incheon	11,097	11,629	12,767	13,573	14,396	15,024
Gwangju	5,696	6,651	6,788	7,072	7,128	7,182
Daejeon	22,448	25,014	25,277	27,909	28,285	29,806
Ulsan	3,480	3,678	3,982	4,919	5,505	5,600
Sejong	-	-	-	-	-	1,551
Gyeonggi	96,747	105,460	114,858	126,449	141,819	143,975
Gangwon	4,143	4,354	4,818	5,412	5,607	5,594
Chungbuk	7,696	7,803	9,059	10,558	11,029	10,369
Chungnam	13,772	15,878	17,612	17,994	15,548	17,243
Jeonbuk	5,283	6,268	6,743	7,558	7,787	8,157
Jeonnam	2,683	3,093	3,606	3,784	3,838	3,945
Gyeongbuk	12,916	13,302	15,265	15,236	16,057	15,618
Gyeongnam	12,596	13,763	13,377	14,970	15,348	17,355
Jeju	919	1,731	2,064	2,332	1,901	1,532
Total	300,050	323,175	345,912	375,176	401,724	410,333

〈Figure 29〉
The number of researchers in metropolitan area (Korea)



〈Figure 30〉
The rate of researchers in metropolitan area (Korea)

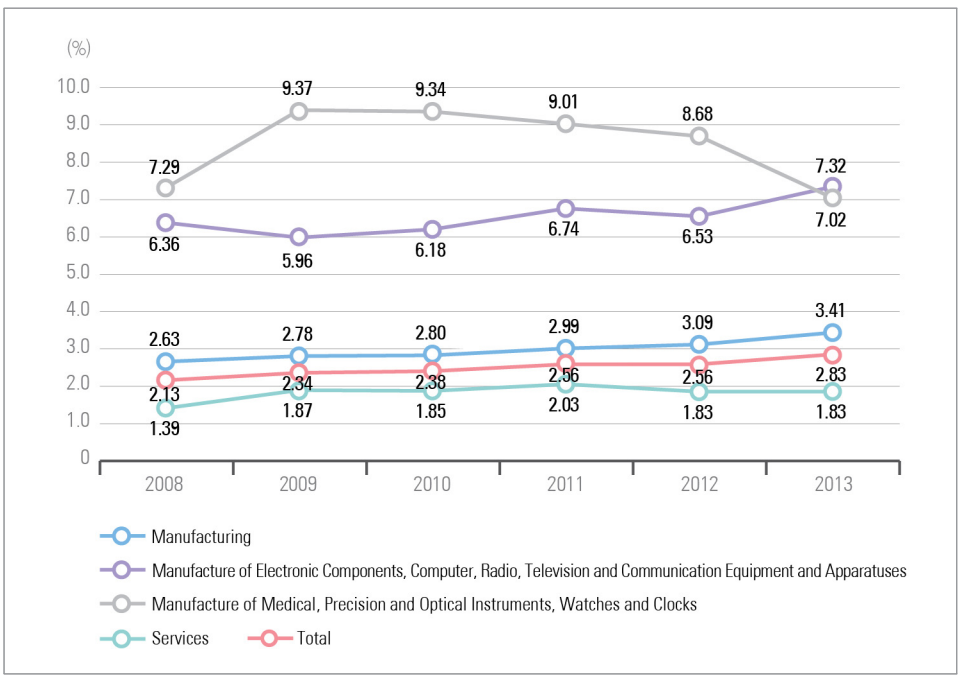


3. R&D Activities of the Business Enterprise Sector

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

- In 2013, Korean companies' R&D expenditure relative to sales is 2.83%.
  - In the manufacturing industry, the rate has risen by 0.32 percentage points from the previous year to reach 3.41% and the rate of service industry remained the same and reach 1.83%
- In the manufacturing industry, the highest R&D expenditure relative to sales is seen in the following sectors: manufacture of electronic components, computer, radio, television, and communication equipment and apparatuses
  - Industries with a high R&D intensity include high-tech industries such as manufacture of electronic components, computer, radio, television, and communication equipment and apparatuses (7.32%).
- In the service industry, the research and development industry shows the highest R&D expenditure rate to sales (22.81%).

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



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

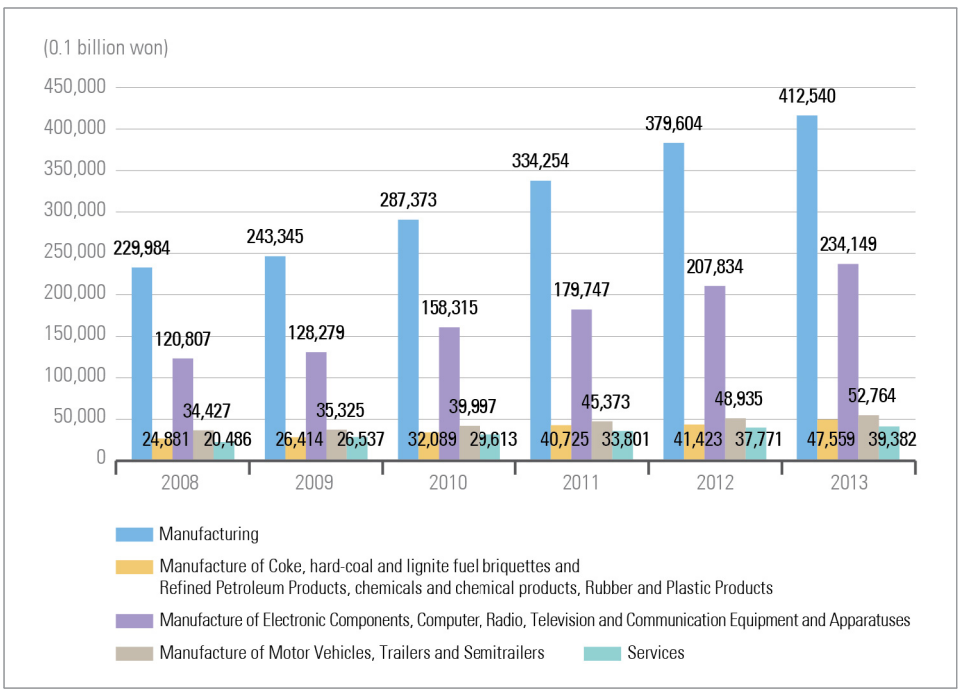
(Unit : %)

Industry	2009	2010	2011	2012	2013
Total	2.34	2.38	2.56	2.56	2.83
Agriculture, Forestry and Fishing	13.98	8.47	7.02	7.14	6.85
Mining and Quarrying	0.74	0.62	1.69	3.36	2.17
Manufacturing	2.78	2.80	2.99	3.09	3.41
Manufacture of food products; beverages and tobacco products	0.90	0.75	1.12	0.89	0.95
Manufacture of textiles, wearing apparel, leather and related products	1.45	1.42	1.37	1.30	1.44
Manufacture of wood, paper, printing and reproduction	1.02	1.07	0.70	1.04	0.89
Manufacture of Coke, hard-coal and lignite fuel briquettes and Refined Petroleum Products, chemicals and chemical products, Rubber and Plastic Products	1.22	1.21	1.58	1.56	1.68
Manufacture of Coke, hard-coal and lignite fuel briquettes and Refined Petroleum Products	0.15	0.20	0.41	0.32	0.30
Manufacture of chemicals and chemical products	1.94	1.92	2.16	2.13	2.45
Manufacture of chemicals and chemical products except pharmaceuticals, medicinal chemicals	1.49	1.51	1.74	1.64	1.94
Manufacture of Pharmaceuticals, Medicinal Chemicals and Botanical Products	5.38	5.47	6.18	6.35	6.72
Manufacture of Rubber and Plastic Products	2.45	2.16	1.91	2.10	2.30
Manufacture of Other Non-metallic Mineral Products	1.41	1.25	1.32	1.81	1.95
Manufacture of Basic Metal Products	0.72	0.61	0.50	0.61	0.62
Manufacture of Fabricated Metal Products, Except Machinery and Furniture	2.19	1.87	3.09	2.36	2.95
Manufacture of Electronic Components, Computer, Radio, Television and Communication Equipment and Apparatuses	5.96	6.18	6.74	6.53	7.32
Manufacture of Medical, Precision and Optical Instruments, Watches and Clocks	9.37	9.34	9.01	8.68	7.02
Manufacture of electrical equipment	2.41	2.72	2.78	2.64	2.50
Manufacture of Other Machinery and Equipment	3.41	3.07	3.04	3.65	3.64
Manufacture of Motor Vehicles, Trailers and Semitrailers	3.03	2.71	2.59	2.57	2.87
Manufacture of Other Transport Equipment	0.73	0.83	0.85	1.03	1.03
Manufacture of Furniture & Other manufacturing	2.17	1.76	2.76	2.46	2.35
Electricity, gas, steam and water supply	0.38	0.35	0.40	0.35	0.28
Sewerage, waste management, materials recovery and remediation activities	2.06	2.05	1.90	1.28	1.63
Construction	0.74	0.71	0.85	0.75	0.95
Services	1.87	1.85	2.03	1.83	1.83
Professional, scientific and technical activities	3.54	3.41	3.26	3.16	3.91
Research and Development	40.80	40.38	27.53	26.22	22.81

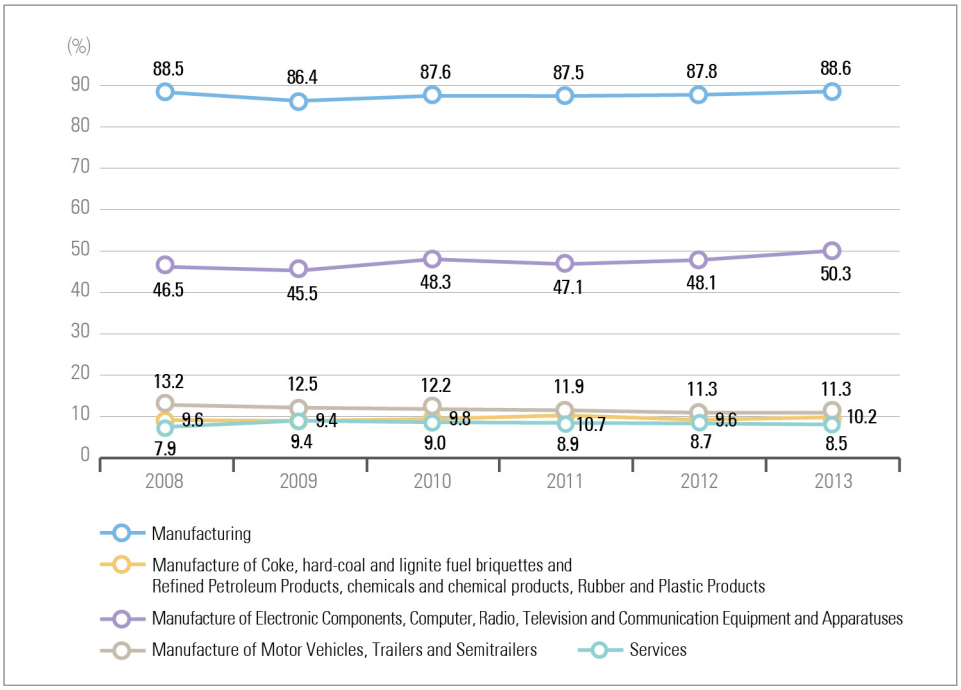
R&D Expenditure by Industry

- Among the total R&D expenditure of the business enterprise sector in 2013, R&D investments of the manufacturing industry have increased by 3,293.6 billion won (8.7%) from the previous year to reach 41,254.0 billion won.
  - R&D expenditure of the manufacturing industry accounts for 88.6% 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 50.3%.
- R&D expenditure of the service industry has risen by 161.0 billion won (4.3%) to 3,938.2 billion won.
  - The share of the service industry in the total R&D investment of the business enterprise sector has fallen by 0.2 percentage points from the previous year to reach 8.5%.
  - This percentage (8.5%) remains low compared to major economies such as the US (29.2% in 2008) and the UK (24.1% in 2009).

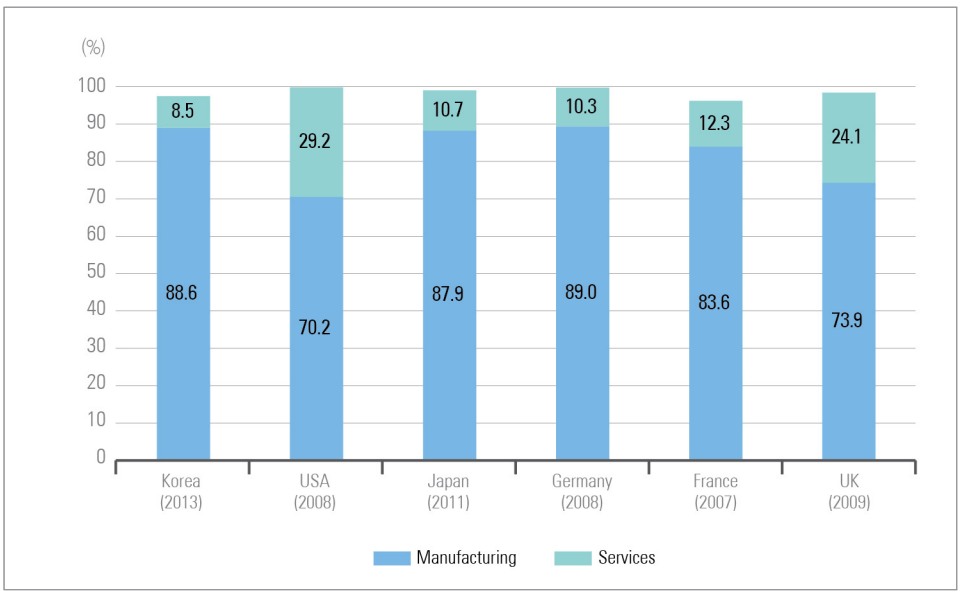
〈Figure 32〉
R&D expenditure rate of major industries (Korea)



〈Figure 33〉
R&D expenditure of major industries (Korea)



〈Figure 34〉
R&D expenditure rate of major industries (major countries)



* Source : OECD, R&D Statistics 2014

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

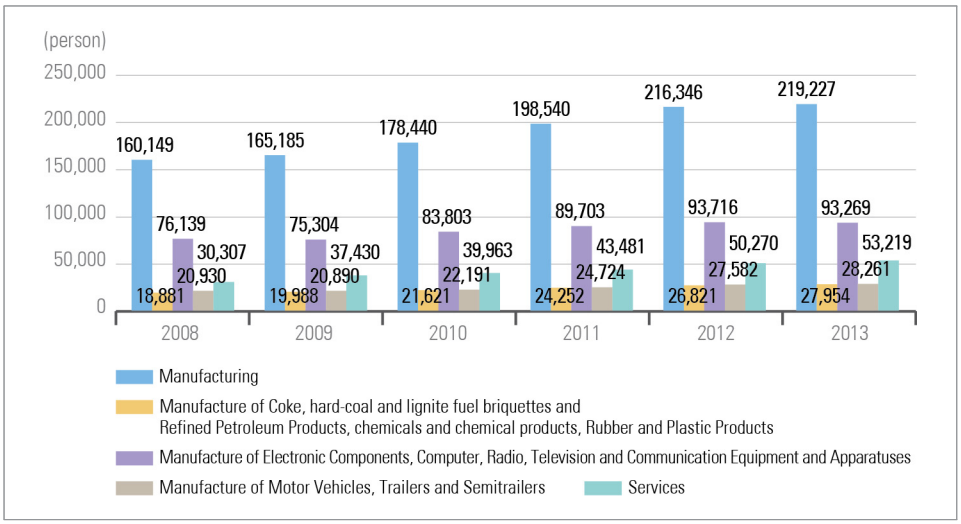
(Unit : 0.1 billion won)

Industry	2009	2010	2011	2012	2013
Total	281,659	328,032	381,833	432,229	465,599
Agriculture, Forestry and Fishing	204	260	362	266	262
Mining and Quarrying	144	188	219	351	253
Manufacturing	243,345	287,373	334,254	379,604	412,540
Manufacture of food products; beverages and tobacco products	3,713	3,037	4,034	4,709	4,625
Manufacture of textiles, wearing apparel, leather and related products	1,638	1,669	2,855	3,214	3,638
Manufacture of wood, paper, printing and reproduction	617	681	909	1,205	1,038
Manufacture of Coke, hard-coal and lignite fuel briquettes and Refined Petroleum Products, chemicals and chemical products, Rubber and Plastic Products	26,414	32,089	40,725	41,423	47,559
Manufacture of Coke, hard-coal and lignite fuel briquettes and Refined Petroleum Products	1,373	2,307	3,379	2,716	2,914
Manufacture of chemicals and chemical products	21,446	24,715	31,953	33,284	37,397
Manufacture of chemicals and chemical products except pharmaceuticals, medicinal chemicals	14,548	17,336	23,321	22,839	26,569
Manufacture of Pharmaceuticals, Medicinal Chemicals and Botanical Products	6,897	7,379	8,632	10,446	10,828
Manufacture of Rubber and Plastic Products	3,595	5,068	5,392	5,422	7,248
Manufacture of Other Non-metallic Mineral Products	2,372	2,081	2,368	3,250	3,169
Manufacture of Basic Metal Products	5,519	5,586	6,168	7,339	6,195
Manufacture of Fabricated Metal Products, Except Machinery and Furniture	2,910	2,584	5,341	4,990	5,485
Manufacture of Electronic Components, Computer, Radio, Television and Communication Equipment and Apparatuses	128,279	158,315	179,747	207,834	234,149
Manufacture of Medical, Precision and Optical Instruments, Watches and Clocks	6,942	8,020	9,010	9,781	8,229
Manufacture of electrical equipment	7,692	8,344	9,197	10,818	10,328
Manufacture of Other Machinery and Equipment	16,026	18,366	20,627	27,223	26,648
Manufacture of Motor Vehicles, Trailers and Semitrailers	35,325	39,997	45,373	48,935	52,764
Manufacture of Other Transport Equipment	5,195	5,807	6,235	7,621	7,350
Manufacture of Furniture & Other manufacturing	705	797	1,666	1,262	1,361
Electricity, gas, steam and water supply	2,729	2,940	3,795	4,074	3,227
Sewerage, waste management, materials recovery and remediation activities	206	203	316	279	334
Construction	8,493	7,455	9,086	9,883	9,601
Services	26,537	29,613	33,801	37,771	39,382
Professional, scientific and technical activities	7,271	7,035	8,414	8,921	10,409
Research and Development	1,504	1,702	2,609	2,349	3,536

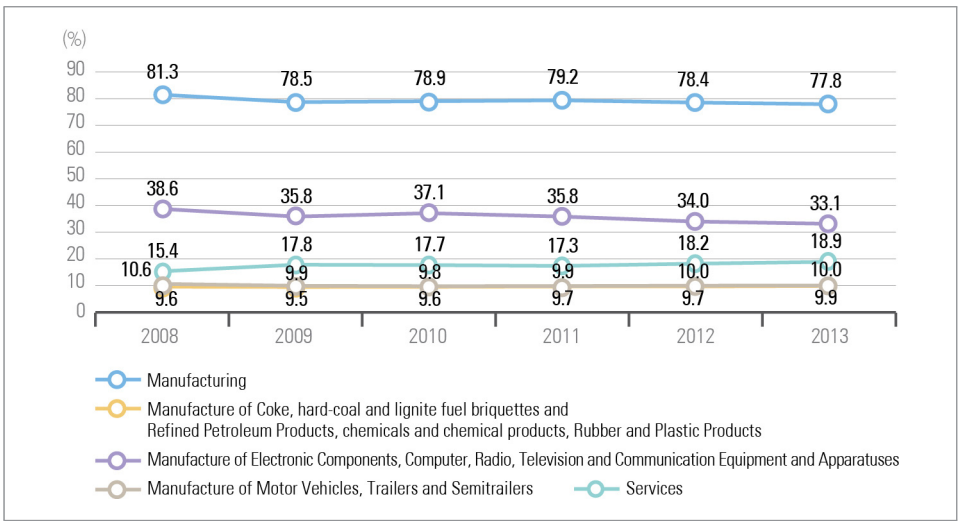
Number of Researchers by Industry

- The number of researchers in the manufacturing industry has increased by 2,881 persons (1.3%) from the previous year to reach 219,227 persons, which accounts for 77.8% of the total number of researchers in the business sector.
- The number of researchers in the service industry has increased by 5.9% from the previous year to reach 53,219 persons.
  - In 2013, the service industry accounts for 18.9% of the total number of researchers in the business enterprise sector.

〈Figure 35〉 The number of researchers by industry (Korea)



〈Figure 36〉 The rate of researchers by industry (Korea)



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

(Unit : person)

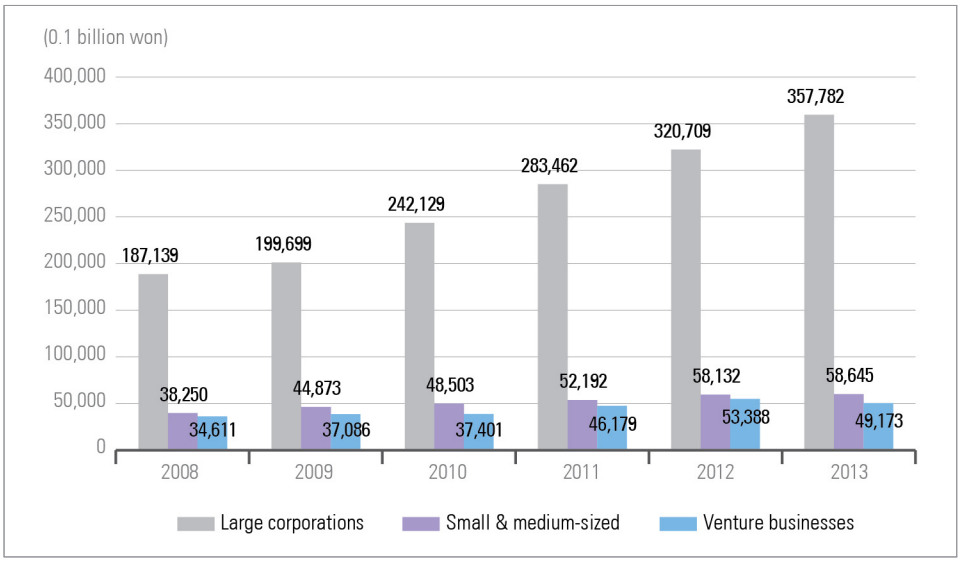
Industry	2009	2010	2011	2012	2013
Total	210,303	226,168	250,626	275,986	281,874
Agriculture, Forestry and Fishing	128	156	211	157	188
Mining and Quarrying	84	97	95	48	48
Manufacturing	165,185	178,440	198,540	216,346	219,227
Manufacture of food products; beverages and tobacco products	3,638	3,491	4,242	5,003	5,005
Manufacture of textiles, wearing apparel, leather and related products	1,823	1,959	3,213	3,629	4,026
Manufacture of wood, paper, printing and reproduction	627	701	932	1,176	1,298
Manufacture of Coke, hard-coal and lignite fuel briquettes and Refined Petroleum Products, chemicals and chemical products, Rubber and Plastic Products	19,988	21,621	24,252	26,821	27,954
Manufacture of Coke, hard-coal and lignite fuel briquettes and Refined Petroleum Products	441	655	711	668	713
Manufacture of chemicals and chemical products	16,728	17,630	19,433	21,908	22,489
Manufacture of chemicals and chemical products except pharmaceuticals, medicinal chemicals	11,865	12,510	14,041	15,689	16,194
Manufacture of Pharmaceuticals, Medicinal Chemicals and Botanical Products	4,863	5,120	5,392	6,219	6,295
Manufacture of Rubber and Plastic Products	2,819	3,336	4,108	4,245	4,752
Manufacture of Other Non-metallic Mineral Products	1,438	1,595	1,843	2,009	2,008
Manufacture of Basic Metal Products	2,164	2,137	2,679	3,017	3,024
Manufacture of Fabricated Metal Products, Except Machinery and Furniture	3,799	3,773	4,595	5,236	5,281
Manufacture of Electronic Components, Computer, Radio, Television and Communication Equipment and Apparatuses	75,304	83,803	89,703	93,716	93,269
Manufacture of Medical, Precision and Optical Instruments, Watches and Clocks	7,081	7,724	8,104	9,162	9,129
Manufacture of electrical equipment	7,100	7,285	8,361	10,313	10,565
Manufacture of Other Machinery and Equipment	14,951	15,737	18,195	21,098	21,971
Manufacture of Motor Vehicles, Trailers and Semitrailers	20,890	22,191	24,724	27,582	28,261
Manufacture of Other Transport Equipment	5,546	5,373	5,608	6,033	5,729
Manufacture of Furniture & Other manufacturing	836	1,050	2,089	1,551	1,707
Electricity, gas, steam and water supply	930	926	1,000	1,008	1,035
Sewerage, waste management, materials recovery and remediation activities	274	269	438	402	437
Construction	6,272	6,317	6,861	7,755	7,720
Services	37,430	39,963	43,481	50,270	53,219
Professional, scientific and technical activities	9,735	9,857	11,398	11,936	12,965
Research and Development	1,878	1,819	2,743	2,390	2,611

R&D Activity by Company Type

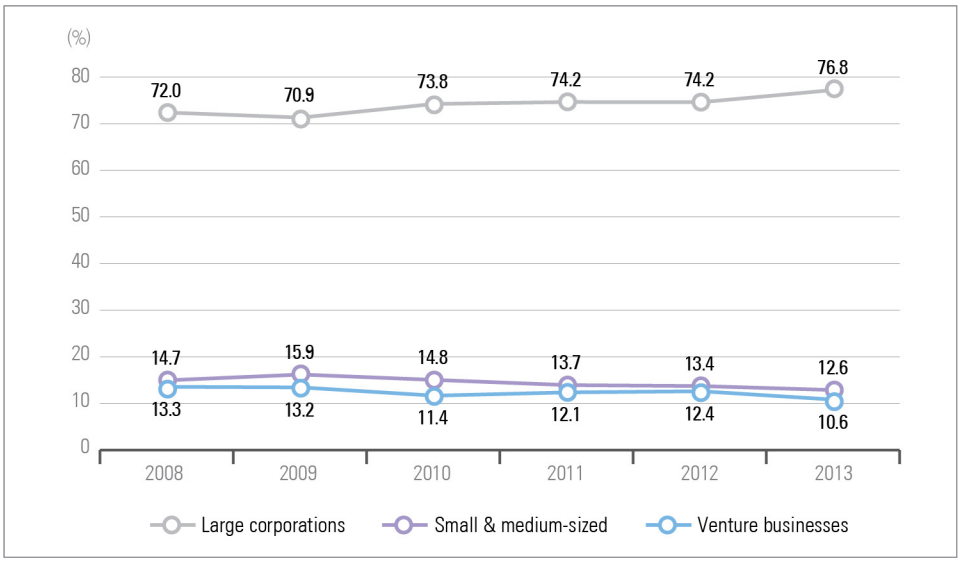
● R&D expenditure of Korean large corporations in 2013 has increased by 3,707.3 billion won (11.6%) from the previous year to reach 35,778.2 billion won.

- The share of R&D investments in large corporations is 76.8% of the total R&D expenditure of business enterprises.
- R&D investments of small & medium-sized businesses and venture businesses are 5,864.5 billion won (12.6%) and 4,917.3 billion won (10.6%), respectively.

〈Figure 37〉
R&D expenditure by company type (Korea)

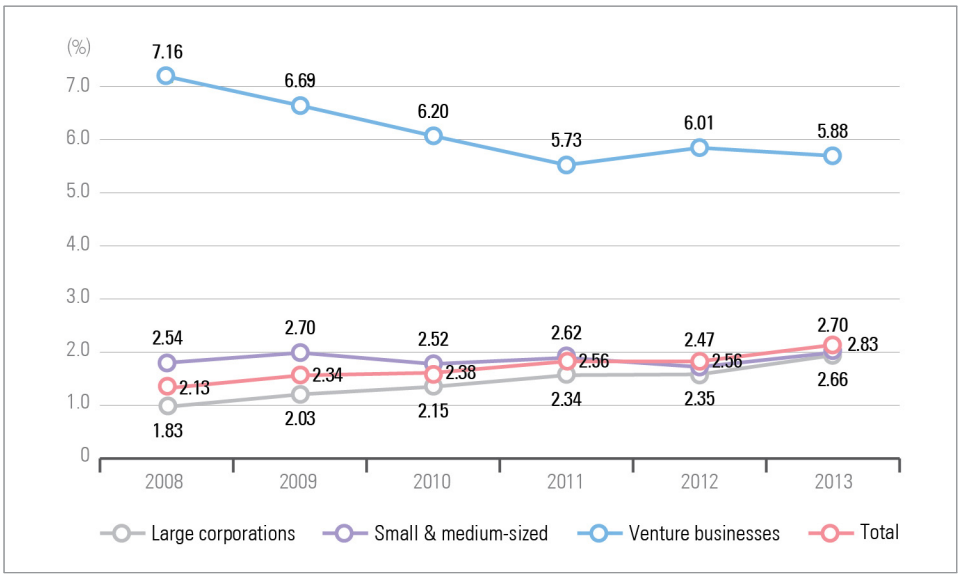


〈Figure 38〉
R&D expenditure rate by company type (Korea)



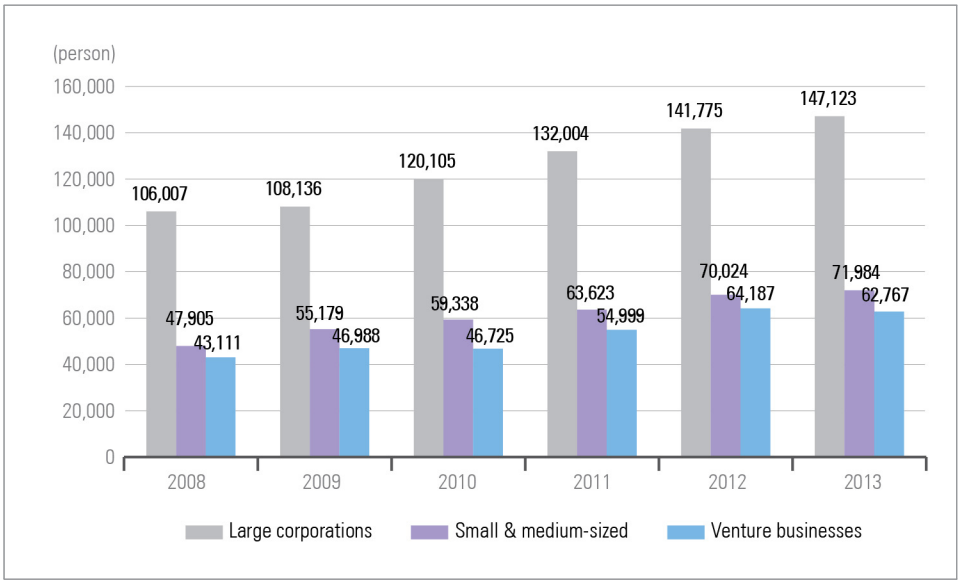
- Large corporation, small & medium sized corporations and venture businesses' R&D expenditure relative to sales is 2.66%, 2.70% and 5.88%, respectively.
  - R&D expenditure relative to sales of large corporations and small & medium sized corporations has increased by 0.31% and 0.23%. Meanwhile, venture businesses' R&D expenditure relative to sales has decreased by 0.13%.

〈Figure 39〉 R&D expenditure rate relative to sales by company type

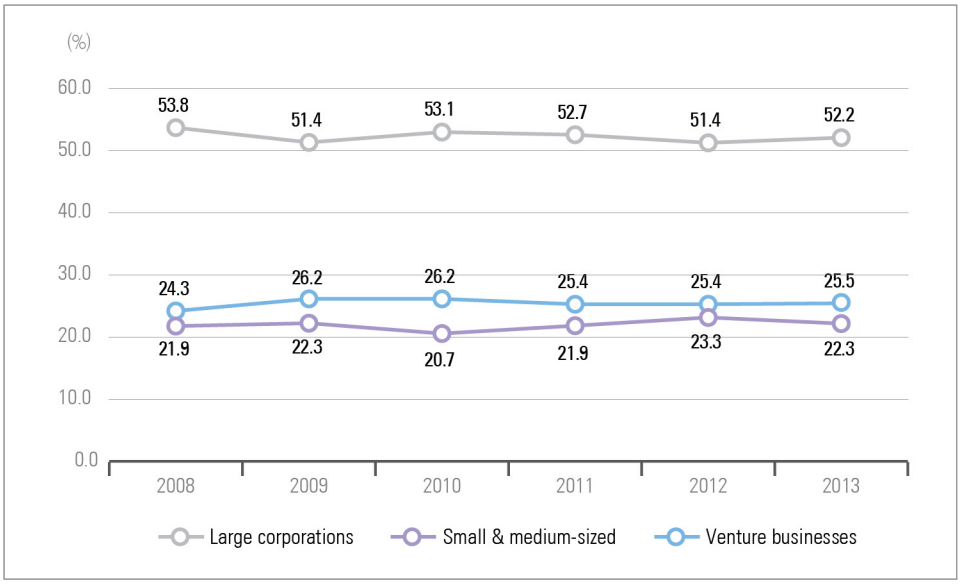


- The number of researchers employed by large corporations has increased by 5,348 persons (3.8%) from the previous year to reach 147,123 persons.
  - The share of researchers in large corporations among the business enterprise sector has increased by 0.8 percentage points, representing 52.2%.
- The number of researchers employed by small & medium sized corporations and venture businesses is 71,984 persons and 62,767 persons, respectively.
  - The share of researchers in small & medium sized corporations and venture corporations among the business enterprise sector accounts for 25.5% and 22.3%, respectively.

〈Figure 40〉
The number of researchers by company type (Korea)



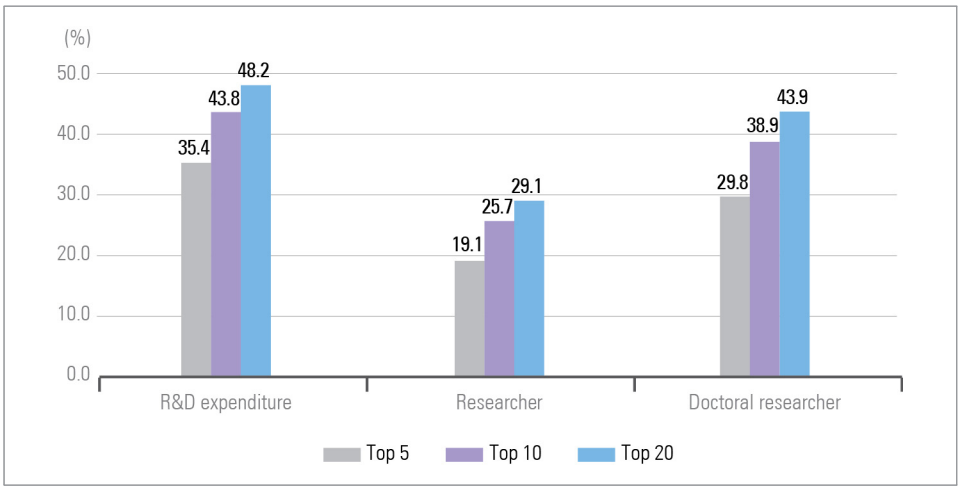
〈Figure 41〉
The rate of researchers by company type (Korea)



R&D Intensity of Business Enterprises

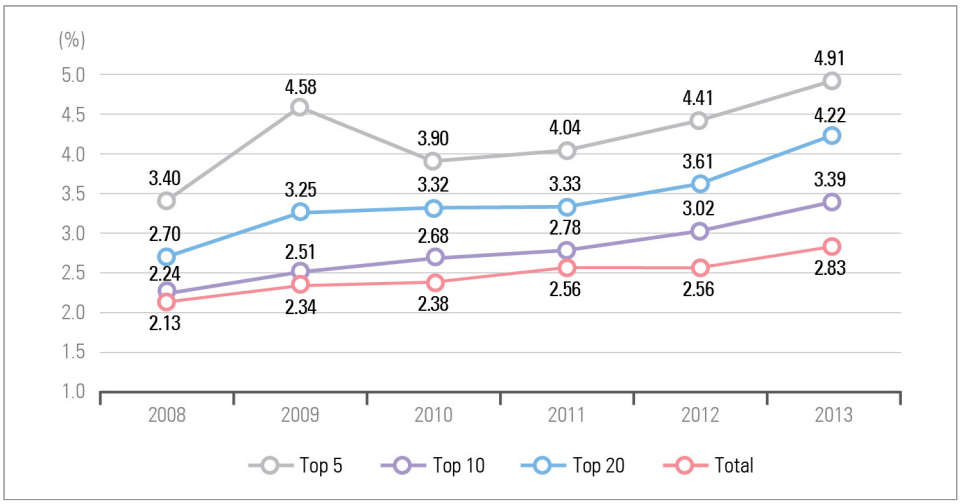
- R&D expenditure of the top 5 companies with the highest sales accounts for 35.4% of the total business expenditure of the business sector.
  - Of the total R&D expenditure of business enterprises, the top 10 sales companies represent 43.8% while the top 20 sales companies account for 48.2%.
  - Researcher intensity of companies with the top 5 sales companies is 19.1% and the intensity of doctoral researchers is 29.8%.

〈Figure 42〉 2013 R&D intensity of the top sales companies (Korea)



- The survey results indicate that Korea's top sales companies are actively investing in R&D.
  - In 2013, the R&D expenditure rate to sales of the top 5 sales companies is 4.91%.

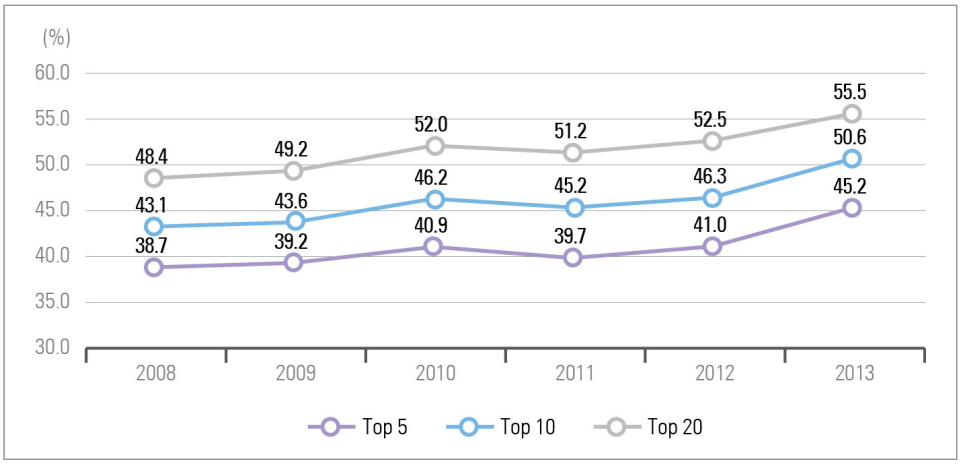
〈Figure 43〉 R&D expenditure rate to sales of the top sales companies (Korea)



● Analysis of R&D intensity by item[3] shows some trends:

- In 2013, the share of the top 5 R&D companies has increased slightly from the previous year to reach 55.5%. Their share in researchers has increased by 0.6 percentage points to 33.2% and the share of doctoral researchers has also increased by 3.9 percentage points to 51.3%.

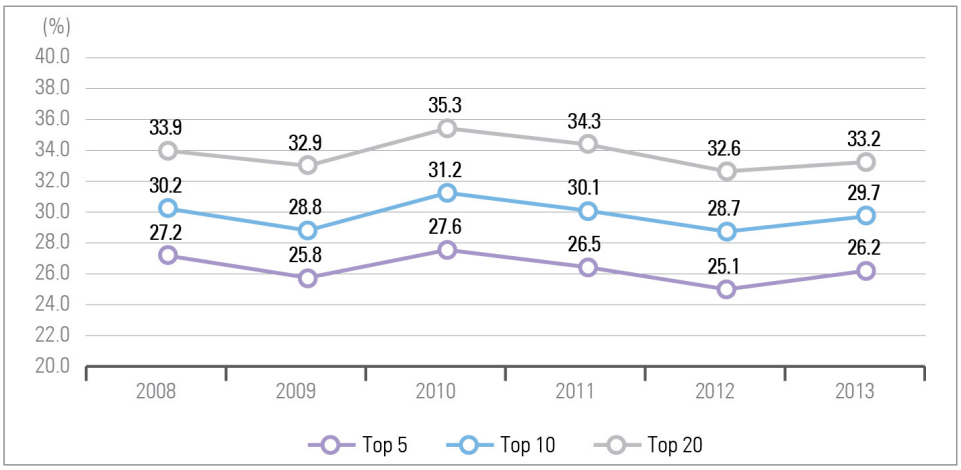
〈Figure 44〉
R&D expenditure intensity of the top companies



● Researcher intensity of the top companies has been indicating a downward trend over the last three years('10~'12), but have shown positive move on 2013.

- Among the increase, the top 5 companies researcher intensity have shown the biggest rise.

〈Figure 45〉
Researcher intensity of the top companies

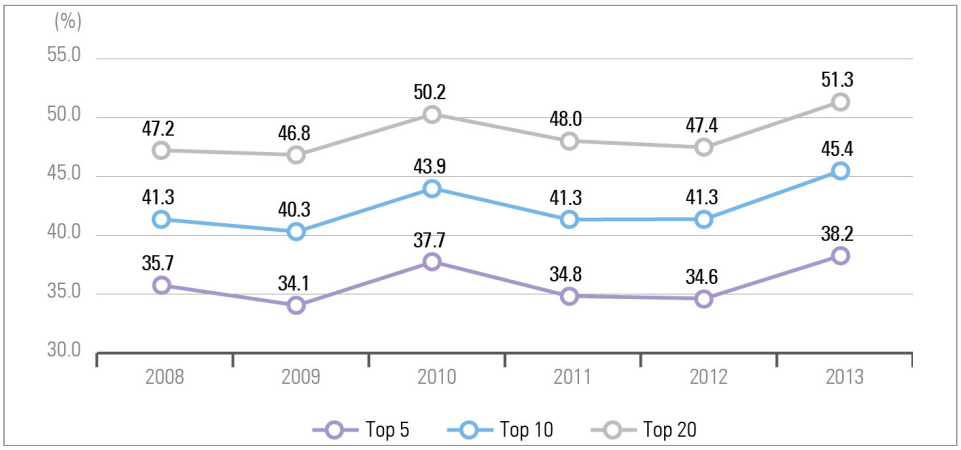


3) R&D intensity by item is the intensity of R&D institutions that is calculated by items such as R&D expenditure, researchers, and doctoral researchers. The statistic is different from the intensity of top sales companies.

● The share of doctoral researcher intensity of the top companies has been indicating downward trend over the last three years('10~'12), but have shown positive move on 2013.

- Among the increase, the top 5 companies doctoral researcher intensity have shown the biggest rise.
- Of the total doctoral researchers, the top 20 companies employed more than half of the total doctoral researchers.

〈Figure 46〉 Doctoral researcher intensity of the top companies



R&D Expenditure by Type of Usage

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

- In 2013, investments made in new product development are 20,409.5 billion won, which accounts for 43.8% of total R&D expenditure of the business enterprise sector.
- R&D investments for other uses are devoted to improving existing products (10,264.9 billion won, 22.0%), developing new manufacturing processes (9,333.3 billion won, 20.0%), and improving existing manufacturing processes (6,552.2 billion won, 14.1%).

〈Table 16〉 R&D expenditure by type of usage (Korea)

(Unit : 0.1 billion won, %)

	2008	2009	2010	2011	2012	2013
New product	128,349	134,184	153,847	172,998	191,811	204,095
	(49.4)	(47.6)	(46.9)	(45.3)	(44.4)	(43.8)
Existing product	56,412	60,048	70,473	89,630	100,479	102,649
	(21.7)	(21.3)	(21.5)	(23.5)	(23.2)	(22.0)
New process	41,843	51,393	60,292	69,891	80,530	93,333
	(16.1)	(18.2)	(18.4)	(18.3)	(18.6)	(20.0)
Existed process	33,396	36,033	43,421	49,313	59,409	65,522
	(12.8)	(12.8)	(13.2)	(12.9)	(13.7)	(14.1)

APPENDIX

Exchange rates by Country

(Unit : national currency per dollar)

	2008	2009	2010	2011	2012	2013
Australia	1.192	1.282	1.090	0.969	0.966	1.036
Austria	0.683	0.720	0.755	0.719	0.778	0.753
Belgium	0.683	0.720	0.755	0.719	0.778	0.753
Canada	1.067	1.143	1.030	0.990	0.999	1.030
Chile	522.461	560.860	510.249	483.668	486.471	495.273
Czech Republic	17.072	19.063	19.098	17.696	19.578	19.571
Denmark	5.098	5.361	5.624	5.369	5.792	5.616
Estonia	0.683	0.719	0.755	0.719	0.778	0.753
Finland	0.683	0.720	0.755	0.719	0.778	0.753
France	0.683	0.720	0.755	0.719	0.778	0.753
Germany	0.683	0.720	0.755	0.719	0.778	0.753
Greece	0.683	0.720	0.755	0.719	0.778	0.753
Hungary	172.113	202.342	207.944	201.055	225.104	223.695
Iceland	87.948	123.638	122.242	115.954	125.083	122.179
Ireland	0.683	0.720	0.755	0.719	0.778	0.753
Israel	3.588	3.932	3.739	3.578	3.856	3.611
Italy	0.683	0.720	0.755	0.719	0.778	0.753
Japan	103.359	93.570	87.780	79.807	79.791	97.596
Korea	1102.050	1276.930	1156.060	1108.290	1126.470	1094.850
Luxembourg	0.683	0.720	0.755	0.719	0.778	0.753
Mexico	11.130	13.514	12.636	12.423	13.170	12.772
Netherlands	0.683	0.720	0.755	0.719	0.778	0.753
New Zealand	1.423	1.600	1.387	1.266	1.234	1.219
Norway	5.640	6.288	6.044	5.605	5.818	5.875
Poland	2.409	3.120	3.015	2.963	3.257	3.161
Portugal	0.683	0.720	0.755	0.719	0.778	0.753
Slovak Republic	0.709	0.720	0.755	0.719	0.778	0.753
Slovenia	0.683	0.720	0.755	0.719	0.778	0.753
Spain	0.683	0.720	0.755	0.719	0.778	0.753
Sweden	6.591	7.654	7.208	6.494	6.775	6.514
Switzerland	1.083	1.088	1.043	0.888	0.938	0.927
Turkey	1.302	1.550	1.503	1.675	1.796	1.904
United Kingdom	0.544	0.642	0.647	0.624	0.633	0.640
United States	1.000	1.000	1.000	1.000	1.000	1.000
Argentina	3.144	3.710	3.896	4.110	4.537	5.459
China	6.949	6.831	6.770	6.461	6.312	6.196
Romania	2.519	3.049	3.178	3.049	3.468	3.328
Russian ederation	24.853	31.740	30.368	29.382	30.840	31.837
Singapore	1.415	1.455	1.364	1.258	1.250	1.251
South Africa	8.261	8.474	7.321	7.261	8.210	9.655
Chinese Taipei	31.517	33.049	31.642	29.464	29.614	29.770

* Source : OECD, Main Science and Technology Indicators 2014-1

Survey of Research and Development in Korea, 2013

Print & Edit December 2014

Contacts
Ministry of Science, ICT and Future Planning
47, Gwanmun-ro, Gwacheon-si, Gyeonggi-do, Korea, 427-700
Tel : +82-2-2110-2722
E-mail : cyhan@msip.go.kr
http://www.msip.go.kr

KISTEP
11th floor, Dongwon Industry Building,
68 Mabang-Ro, Seocho-Gu, Seoul, Korea, 137-717
Tel : +82-2-589-2885
E-mail : ohyj@kistep.re.kr, chung0506@kistep.re.kr
http://www.kistep.re.kr