



## Main **Science & Technology** Indicators of Korea



Ministry of Science and ICT



Korea Institute of S&T  
Evaluation and Planning



# Notes

- This booklet is published biannually. Please note that figures may vary according to the exact time of the survey.
- The figures included in this booklet are based on survey and analysis of statistics as of September 2022.
  - OECD regularly publishes R&D statistics comparing various countries, and international comparisons in this booklet are mostly based on the latest version of their biannual publication, Main Science & Technology Indicators 2022–September.
- The source of each indicator is stated in detail (in some cases with URL). The sum of individual figures and the total may not be identical due to issues such as significant figures.
  - For example, figures were rounded to the nearest integer when recomputing statistics or adjusting units (ten thousand KRW → 100 million KRW). Differences between the sum of individual figures and the total may arise from these processes.
- Some figures were recalculated from original data by the publishers to suit the purpose of the indicator. Thus some figures of the final year may not have been calculated.
  - For example, if the available data for labor force is from 2019 and researchers is from 2018, total researchers per 1,000 labor force (FTE) was calculated only up to 2018.
- Rankings were based on data of the most recent year obtained (or recomputed).





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# I Main Science and Technology Indicators

## 1. R&D Expenditure and Personnel

		Korea	USA	Japan	Germany	France	UK	China
R&D Expenditure	Gross Domestic Expenditure on R&D(100 million USD)	78,857 (5th)	720,880 (1st)	165,043 (3rd)	121,739 (4th)	61,942 (6th)	49,168 (7th)	353,484 (2nd)
	Ratio	1.00	9.14	2.09	1.54	0.79	0.62	4.48
	As a percentage of GDP(%)	4.81	3.45	3.27	3.14	2.35	1.76	2.40
	Government·Public·Private·Foreign Ratio(%)	23:77	27:73	21:79	30:70	35:65 ( <sup>1</sup> 19)	32:68	20:78
	Government Expenditure on R&D(100 million USD)	24,046	165,560	74,529	46,314	20,887	16,084 ( <sup>1</sup> 20)	–
	As a percentage of GDP(%)	1.34	0.72	1.51	1.09	0.71	0.58 ( <sup>1</sup> 20)	–
R&D Personnel	Total Researchers (1,000 FTE)	447	1,586 ( <sup>1</sup> 19)	690	452	322	316	2,281
	Total Researchers per 1,000 labor force(FTE)	16.0	9.6 ( <sup>1</sup> 19)	10.0	10.4	10.9	9.3	2.9

▶ Rankings were based on the data of the most recent year(<sup>1</sup>20) obtained from OECD Main Science & Technology Indicators 2022–9, and the year given in parentheses means the base year of data shown

▶ The sum of Government·Public·Private·Foreign Ratio in China is less than 100.0%

▶ Total R&D expenditure in Korea: 93,717 trillion KRW(<sup>1</sup>20), Government Budget on R&D: 27,5072 trillion KRW(<sup>1</sup>21)

## 2. R&D Performance

		Korea	USA	Japan	Germany	France	UK	China
Publications ( <sup>1</sup> 20)	SCI Papers	76,408 (12th)	512,341 (2nd)	97,724 (7th)	139,798 (4th)	91,229 (9th)	167,140 (3rd)	553,233 (1st)
	Number of triadic patent families( <sup>1</sup> 20)	3,244 (5th)	13,040 (2nd)	17,469 (1st)	4,381 (4th)	1,880 (6th)	1,708 (7th)	5,897 (3rd)
Patents	Number of patent applications to the PCT ( <sup>1</sup> 20)	20,053 (4th)	58,616 (2nd)	50,562 (3rd)	18,532 (5th)	7,769 (6th)	5,897 (7th)	68,770 (1st)
	Receipts (A, 100 million USD)	1,717	3,867	1,209	2,971	1,186	960	9,943
R&D-intensive industries( <sup>1</sup> 21) *Korea( <sup>1</sup> 20)	Payments (B, 100 million USD)	1,118	6,771	1,687	2,631	1,189	1,124	8,040
	Balance of payments ratio(A/B)	1.54	0.57	0.72	1.13	1.00	0.85	1.24
	Balance of payments (100 million USD)	599	–2,905	–479	340	–3	–165	1,903
IMD evaluation ( <sup>1</sup> 21)	Competitiveness ranking	27	10	34	15	28	23	17
	Science	3	1	8	2	15	14	9
	Technology	19	11	42	33	15	18	12

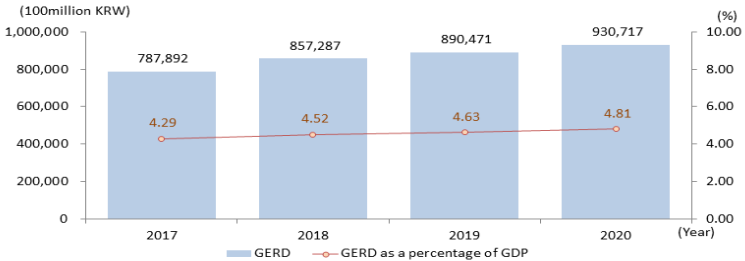


## II

## R&amp;D Expenditure

## 1. Gross Domestic Expenditure on R&amp;D (GERD)

## ① GERD in Korea



- ▶ Since the GDP for year Y is finalized on March of Y+2yrs, there is a possibility of change in GERD as a percentage of GDP that was initially extracted from November of Y+1yr
- ▶ Source: MSIT·KISTEP, Survey of Research and Development in Korea

## ② GERD in major countries

		2017	2018	2019	2020
Korea	GERD(million USD)	69,663	77,924	76,412	78,857
	As a percentage of GDP(%)	4.29	4.52	4.64	4.81
USA	GERD(million USD)	556,343	607,474	678,603	720,880
	As a percentage of GDP(%)	2.85	2.95	3.18	3.45
Japan	GERD(million USD)	156,128	162,276	164,709	165,043
	As a percentage of GDP(%)	3.17	3.22	3.20	3.27
Germany	GERD(million USD)	112,464	123,609	123,171	121,739
	As a percentage of GDP(%)	3.05	3.12	3.19	3.13
France	GERD(million USD)	57,184	61,218	59,811	61,942
	As a percentage of GDP(%)	2.20	2.19	2.19	2.35
UK	GERD(million USD)	44,800	49,460	49,168	-
	As a percentage of GDP(%)	1.68	1.73	1.71	-
China	GERD(million USD)	260,494	297,431	320,532	353,484
	As a percentage of GDP(%)	2.12	2.14	2.23	2.40

- ▶ GERD is calculated by applying GERD in MSTI 2022–September and KRW/USD currency exchange rate
- ▶ Source: OECD, MSTI 2022–September ([stats.oecd.org](https://stats.oecd.org)), MSIT·KISTEP, Survey of Research and Development in Korea

## ③ GERD per capita and per researcher in Korea

	2017	2018	2019	2020
GERD per capita (1,000 KRW)	1,534	1,661	1,772	1,797
GERD per researcher (million KRW)	163.2	166.7	165.5	166.8

► GERD is calculated by applying the R&D expenditure and exchange rate to USD listed in MSTI 2022–September

► Source: MSIT·KISTEP, Survey of Research and Development in Korea

## ④ GERD per capita and per researcher (FTE) in major countries

		2017	2018	2019	2020
GERD per capita population (USD)	Korea	1,356	1,510	1,478	1,523
	USA	1,740	1,892	2,066	2,183
	Japan	1,232	1,283	1,305	1,313
	Germany	1,361	1,491	1,482	1,464
	France	850	910	883	911
	UK	678	744	736	–
	China	187	213	227	250
GERD per researcher (FTE) (USD)	Korea	181,841	190,816	177,417	176,516
	USA	394,589	398,193	427,737	–
	Japan	230,859	239,298	241,572	239,232
	Germany	268,015	285,021	273,289	270,053
	France	192,574	200,721	190,862	192,636
	UK	151,385	161,743	155,448	–
	China	149,671	159,386	151,950	154,960

► FTE (Full-time equivalent) takes into account the amount of researchers' actual participation in labor

► Each country's GERD is calculated by applying the R&D expenditure and exchange rate to USD listed in MSTI 2022–September

► Source: OECD, MSTI 2022–September ([stats.oecd.org](https://stats.oecd.org))  
MSIT·KISTEP, Survey of Research and Development in Korea

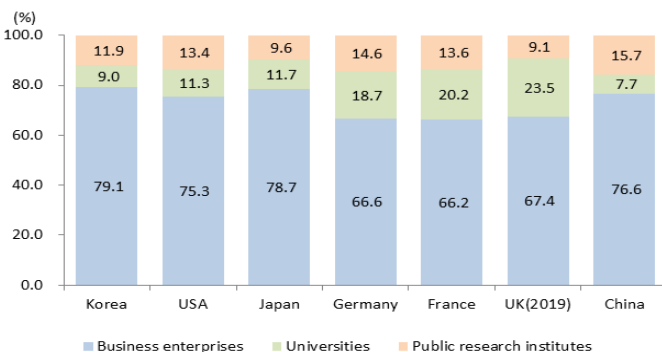
## ⑤ GERD by performance sector in Korea

	2017		2018		2019		2020	
	GERD (100 million KRW)	Percentage (%)	GERD (100 million KRW)	Percentage (%)	GERD (100 million KRW)	Percentage (%)	GERD (100 million KRW)	Percentage (%)
Business enterprise	625,634	79.4	688,344	80.3	715,067	80.3	735,998	79.1
University	66,825	8.5	70,504	8.2	73,716	8.3	83,534	9.0
Public research institute	95,432	12.1	98,439	11.5	101,688	11.4	111,186	11.9
Total	787,892	100.0	857,287	100.0	890,471	100.0	930,717	100.0

► Non-profit organizations are included in public research institutes

► Source: MSIT·KISTEP, Survey of Research and Development in Korea

## ⑥ Percentage of GERD by performance sector in major countries (2020)



► Non-profit organizations are included in public research institutes

► Source: OECD, MSTI Indicators 2022–September ([stats.oecd.org](https://stats.oecd.org))

MSIT·KISTEP, Survey of Research and Development in Korea, 2020

## ⑦ GERD by source of funds in Korea

	2017		2018		2019		2020	
	GERD (100 million KRW)	Percentage (%)	GERD (100 million KRW)	Percentage (%)	GERD (100 million KRW)	Percentage (%)	GERD (100 million KRW)	Percentage (%)
Government	177,371	22.5	183,630	21.4	190,955	21.4	215,812	23.2
Private	600,643	76.2	657,028	76.6	685,216	76.9	712,693	76.6
Abroad	9,878	1.3	16,629	1.9	14,300	1.6	2,212	0.2
Total	787,892	100.0	857,287	100.0	890,471	100.0	930,717	100.0

► Source: MSIT·KISTEP, Survey of Research and Development in Korea

## ⑧ Percentage of GERD by source of funds in major countries (%) (2020)

	Korea	USA	Japan	Germany	France ('19)	UK ('19)	China
Government	23.2	26.6	21.2	30.1	35.2	31.9	19.8
Private	76.6	66.3	78.3	62.6	56.7	53.6	77.5
Abroad	0.2	7.2	0.5	7.3	8.1	14.5	0.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	97.6

► The sum of Government, Private and Abroad of China is less than 100.0%

► Source: OECD, MSTI 2022–September ([stats.oecd.org](https://stats.oecd.org))

MSIT·KISTEP, Survey of Research and Development in Korea, 2020

## ⑨ GERD by type of R&amp;D in Korea

	2017		2018		2019		2020	
	GERD (100 million KRW)	Percentage (%)	GERD (100 million KRW)	Percentage (%)	GERD (100 million KRW)	Percentage (%)	GERD (100 million KRW)	Percentage (%)
Basic research	113,911	14.5	121,805	14.2	130,623	14.7	134,481	14.4
Applied research	173,159	22.0	188,247	22.0	200,401	22.5	200,786	21.6
Development research	500,822	63.6	547,235	63.8	559,446	62.8	595,450	64.0
Total	787,892	100.0	857,287	100.0	890,471	100.0	930,717	100.0

▶ Source: MSIT·KISTEP, Survey of Research and Development in Korea

## ⑩ GERD by type of R&amp;D in major countries (%) (2020)

	Korea ('20)	USA	Japan	France ( '19)	UK ( '19)	China
Basic research	14.4	15.0	12.3	22.7	18.3	6.0
Applied research	21.6	19.4	18.6	41.3	43.2	11.3
Development research	64.0	63.9	64.9	36.0	38.5	82.7

▶ For USA and Japan, other sources are excluded such that the total does not add up to 100.0%

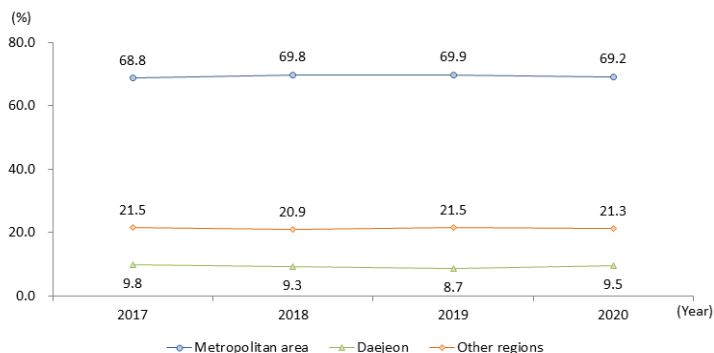
▶ Source: OECD, Research and Development Statistics 2021 ([stats.oecd.org](https://stats.oecd.org))

## ⑪ GERD on future and emerging technologies (6T) in Korea

	2017		2018		2019		2020	
	GERD (100 million KRW)	Percentage (%)	GERD (100 million KRW)	Percentage (%)	GERD (100 million KRW)	Percentage (%)	GERD (100 million KRW)	Percentage (%)
Information Technology (IT)	287,317	36.5	307,329	35.8	330,158	37.1	348,158	37.4
Biotechnology (BT)	62,111	7.9	66,401	7.7	76,262	8.6	89,162	9.6
Nanotechnology (NT)	76,201	9.7	87,377	10.2	88,185	9.9	94,129	10.1
Space Technology (ST)	11,603	1.5	14,789	1.7	15,436	1.7	16,671	1.8
Environment Technology (ET)	70,009	8.9	79,636	9.3	77,641	8.7	88,952	9.6
Culture Technology (CT)	7,841	1.0	8,075	0.9	8,098	0.9	8,277	0.9
Others	272,810	34.6	293,680	34.3	294,691	33.1	285,368	30.7
Total	787,892	100.0	857,287	100.0	890,471	100.0	930,717	100.0

▶ Source: MSIT·KISTEP, Survey of Research and Development in Korea

## 12 GERD by region in Korea



	2017		2018		2019		2020	
	GERD (100 million KRW)	Percentage (%)	GERD (100 million KRW)	Percentage (%)	GERD (100 million KRW)	Percentage (%)	GERD (100 million KRW)	Percentage (%)
Seoul	131,697	16.7	134,754	15.7	134,449	15.1	144,320	15.5
Busan	14,033	1.8	15,449	1.8	15,817	1.8	16,968	1.8
Daegu	12,380	1.6	13,258	1.5	13,360	1.5	13,641	1.5
Incheon	25,482	3.2	27,613	3.2	28,459	3.2	29,366	3.2
Gwangju	7,933	1.0	9,010	1.1	8,269	0.9	9,539	1.0
Daejeon	76,985	9.8	79,922	9.3	77,059	8.7	88,737	9.5
Ulsan	7,299	0.9	11,103	1.3	11,100	1.2	10,672	1.1
Sejong	4,837	0.6	5,171	0.6	5,941	0.7	6,115	0.7
Gyeonggi	384,625	48.8	436,153	50.9	459,348	51.6	470,451	50.5
Gangwon	4,503	0.6	4,818	0.6	5,172	0.6	5,551	0.6
Chungbuk	22,129	2.8	16,287	1.9	16,595	1.9	19,217	2.1
Chungnam	25,614	3.3	25,878	3.0	34,752	3.9	36,651	3.9
Jeonbuk	10,322	1.3	10,846	1.3	11,217	1.3	12,361	1.3
Jeonnam	5,491	0.7	6,608	0.8	7,238	0.8	7,041	0.8
Gyeongbuk	28,468	3.6	30,204	3.5	28,054	3.2	26,871	2.9
Gyeongnam	24,537	3.1	28,625	3.3	31,895	3.6	30,898	3.3
Jeju	1,560	0.2	1,590	0.2	1,744	0.2	2,316	0.2
Total	787,892	100.0	857,287	100.0	890,471	100.0	930,717	100.0

▶ Source: MSIT·KISTEP, Survey of Research and Development in Korea

## 2. Business Enterprise Expenditure on R&D(BERD)

### 13 Percentage of BERD financed by government in Korea (%)

	2017	2018	2019	2020
All business enterprise	4.7	4.4	4.5	5.3
SMEs and start-ups	13.6	13.9	13.4	14.9

▶ SME(Small-medium-sized business) here does not include start-ups (SMEs are broadly accepted as the combination of SMEs and start-ups)

▶ Source: MSIT·KISTEP, Survey of Research and Development in Korea

### 14 Percentage of BERD financed by government in major countries (%)

	2017	2018	2019	2020
Korea	4.7	4.4	4.4	5.3
USA	6.2	5.7	5.8	3.9
Japan	0.9	0.8	0.8	0.9
Germany	3.2	3.1	3.2	–
France	8.0	7.5	7.4	–
UK	7.6	6.9	7.1	–
China	3.4	3.2	3.8	2.8

▶ Source: OECD, MSTI 2022–September ([stats.oecd.org](https://stats.oecd.org))  
MSIT·KISTEP, Survey of Research and Development in Korea

### 15 BERD by business type in Korea

	2017		2018		2019		2019	
	BERD (100 million KRW)	Percentage (%)	BERD (100 million KRW)	Percentage (%)	BERD (100 million KRW)	Percentage (%)	BERD (100 million KRW)	Percentage (%)
Large Corp.	398,038	63.6	438,236	63.7	446,658	62.5	451,694	61.4
Medium	90,687	14.5	95,954	13.9	101,864	14.2	103,691	14.1
Small	70,069	11.2	74,883	10.9	80,048	11.2	79,341	10.8
Start-up	66,840	10.7	79,272	11.5	86,497	12.1	101,272	13.8
Total	625,634	100.0	688,344	100.0	715,067	100.0	735,998	100.0

▶ SME(Small-medium-sized business) here does not include start-ups (SMEs are broadly accepted as the combination of SMEs and start-ups)

▶ Note that medium-sized enterprises are included in the survey since 2017

▶ Source: MSIT·KISTEP, Survey of Research and Development in Korea

### 16 BERD by industry in Korea

		2017	2018	2019	2020
BERD (100 million KRW)	Manufacturing	559,867	611,572	625,550	638,163
	Compounds and chemicals (excluding pharmaceuticals)	35,517	35,574	37,800	36,924
	Electrical machinery and apparatus, radio, TV and communications equipment	310,776	345,206	351,654	351,135
	Motor vehicles and trailers	78,434	84,389	84,084	85,170
	Services	52,207	62,349	75,823	84,130
Percentage (%)	Manufacturing	89.5	88.8	87.5	86.7
	Compounds and chemicals (excluding pharmaceuticals)	5.7	5.2	5.3	5.0
	Electrical machinery and apparatus, radio, TV and communications equipment	49.7	50.2	49.2	47.7
	Motor vehicles and trailers	12.5	12.3	11.8	11.6
	Services	8.3	9.1	10.6	11.4

► Source: MSIT·KISTEP, Survey of Research and Development in Korea

### 17 BERD by industry in major countries (%)

	Korea (‘20)	USA (‘18)	Japan (‘19)	Germany (‘18)	France (‘17)	UK (‘18)
Manufacturing	86.7	61.5	87.0	85.4	48.7	39.0
Services	11.4	36.2	11.4	14.0	48.5	57.1

► Source: OECD, Research and Development Statistics, 2022–September ([stats.oecd.org](https://stats.oecd.org))  
MSIT·KISTEP, Survey of Research and Development in Korea, 2019

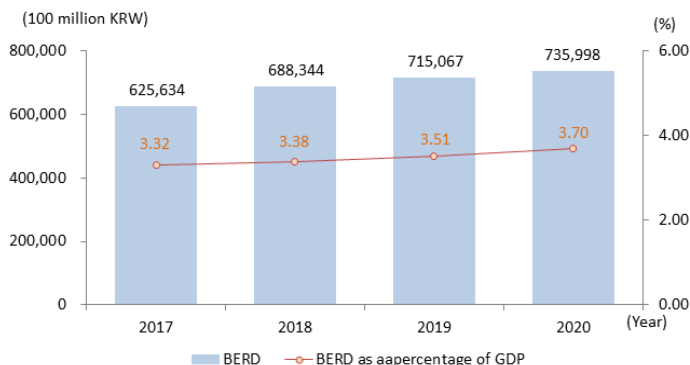
### 18 BERD performed in R&D-intensive industries of major countries

	Korea (‘20)	USA (‘19)	Japan (‘20)	Germany (‘19)	France (‘17)	UK (‘19)
BERD (million USD)	33,071	196,497	40,423	17,520	8,154	4,676
Percentage (%)	53.0	38.6	31.1	20.6	21.9	14.1

► R&D-intensive industries are defined as pharmaceutical, computer, electronic and optical, and aerospace industry (OECD)

► Source: OECD, MSTI 2022–September ([stats.oecd.org](https://stats.oecd.org))

## 19 BERD as a percentage of revenue in Korea



▶ Source: MSIT·KISTEP, Survey of Research and Development in Korea

## 20 BERD as a percentage of industry value added in major countries (2020)

	Korea	USA	Japan	Germany	France	UK	China
BERD as a percentage of value added in industry (%)	5.58	4.00	3.61	3.39	2.73	2.07	2.26

▶ Source: OECD, Main Science & Technology Indicators 2022–September ([stats.oecd.org](https://stats.oecd.org))

## 21 BERD intensity in Korea (%)

	2017	2018	2019	2020
Top 5 companies	47.1	47.6	46.9	45.2
Top 10 companies	53.8	53.9	52.9	51.6
Top 20 companies	58.5	58.3	57.1	55.8

▶ BERD intensity is the sum of BERD of top firms (in terms of BERD size) as a percentage of the total BERD

▶ Source: MSIT·KISTEP, Survey of Research and Development in Korea



## 22 World's top 50 companies by BERD (2020)

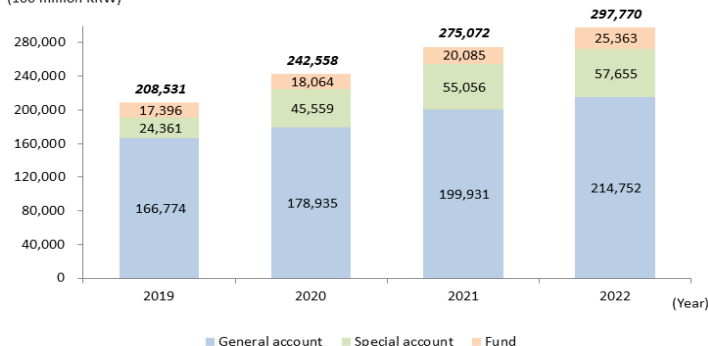
Rank	Name	Country	Rank	Name	Country
1	ALPHABET	USA	26	CISCO SYSTEMS	USA
2	HUAWEI INVESTMENT & HOLDING	China	27	GENERAL MOTORS	USA
3	MICROSOFT	USA	28	ABBVIE	USA
4	SAMSUNG ELECTRONICS	Korea	29	GLAXOSMITHKLINE	UK
5	APPLE	USA	30	SIEMENS	Germany
6	FACEBOOK	USA	31	ASTRAZENECA	UK
7	VOLKSWAGEN	Germany	32	QUALCOMM	USA
8	ROCHE	Switzerland	33	TENCENT	China
9	INTEL	USA	34	IBM	USA
10	JOHNSON & JOHNSON	USA	35	SAP	Germany
11	TOYOTA MOTOR	Japan	36	DELL TECHNOLOGIES	USA
12	DAIMLER	Germany	37	SONY	Japan
13	BRISTOL-MYERS SQUIBB	USA	38	GILEAD SCIENCES	USA
14	MERCK US	USA	39	BROADCOM	USA
15	PFIZER	USA	40	NISSAN MOTORS	Japan
16	BAYER	Germany	41	ERICSSON	Sweden
17	ALIBABA GROUP HOLDING	China	42	DENSO	Japan
18	NOVARTIS	Switzerland	43	STELLANTIS	Netherland
19	BMW	Germany	44	NOKIA	Finland
20	HONDA MOTOR	Japan	45	BOEHRINGER SOHN	Germany
21	ROBERT BOSCH	Germany	46	CHINA STATE CONSTRUCTION ENGINEERING	China
22	FORD MOTOR	USA	47	PANASONIC	Japan
23	NTT	Japan	48	PEUGEOT	France
24	SANOFI	France	49	TAKEDA PHARMACEUTICAL	Japan
25	ORACLE	USA	50	CONTINENTAL	Germany

► Source: EC, The 2021 EU Industrial R&D Investment Scoreboard ([iri.jrc.ec.europa.eu/scoreboard.html](https://iri.jrc.ec.europa.eu/scoreboard.html))

### 3. Government Intramural Expenditure on R&D (GOVERD)

#### 23 Total Government Budget Appropriations or Outlays for R&D (GBAORD) in Korea

(100 million KRW)



	2019	2020	2021	2022
General account (100 million KRW)	166,774	178,935	199,931	214,752
Special account (100 million KRW)	24,361	45,559	55,056	57,655
Funds (100 million KRW)	17,396	18,064	20,085	25,363
Total GBAORD (100 million KRW)	208,532	242,558	275,072	297,770

► Based on the supplementary budget and revised fund management plan and 2022 budget is the standard of National Assembly finalized budget before the supplementary budget

► Source: MSIT·KISTEP, Governmental R&D Survey and Analysis

#### 24 Total GBAORD in major countries (2021)

	Korea	USA	Japan	Germany	France	UK ( <sup>20</sup> )
Total GBAORD (million USD)	24,046	165,560	74,529	46,314	20,887	16,084
As a percentage of GDP (%)	1.34	0.72	1.51	1.09	0.71	0.58

► Source: OECD, MSTI 2022–September ([stats.oecd.org](https://stats.oecd.org))

## 25 GOVERD in Korea

	2018	2019	2020	2021
GOVERD (100 million KRW)	197,759	206,254	238,803	265,791
Number of projects	63,697	70,327	73,501	74,745

► Source: MSIT·KISTEP, Governmental R&D Survey and Analysis

## 26 GOVERD by performance sectors in Korea

	2018		2019		2020		2021	
	GOVERD (100 million KRW)	Percentage (%)	GOVERD (100 million KRW)	Percentage (%)	GOVERD (100 million KRW)	Percentage (%)	GOVERD (100 million KRW)	Percentage (%)
Research institutes	90,747	45.9	93,124	45.2	101,611	42.6	108,371	40.7
Universities	45,365	22.9	50,278	24.4	57,508	24.1	63,317	23.8
Business enterprises	46,694	23.6	48,811	23.7	61,784	25.9	70,214	26.4
Ministries	2,993	1.5	1,829	0.9	1,914	0.8	2,634	1.0
Others	11,960	6.0	12,212	5.9	15,986	6.7	21,254	8.0
Total	197,759	100.0	206,254	100.0	238,803	100.0	265,791	100.0

► Source: MSIT·KISTEP, Governmental R&D Survey and Analysis

## 27 GOVERD by type of R&amp;D in Korea

	2018		2019		2020		2021	
	GOVERD (100 million KRW)	Percentage (%)	GOVERD (100 million KRW)	Percentage (%)	GOVERD (100 million KRW)	Percentage (%)	GOVERD (100 million KRW)	Percentage (%)
Basic research	44,651	32.7	46,415	32.7	50,714	30.1	53,068	27.5
Applied research	27,665	20.2	30,458	21.5	38,907	23.1	46,619	23.6
Development research	64,387	47.1	64,883	45.8	78,754	46.8	94,565	48.9
Total	136,703	100.0	141,757	100.0	168,375	100.0	193,252	100.0

► Percentage is calculated excluding 'Others.'

► Source: MSIT·KISTEP, Governmental R&D Survey and Analysis

## 28 GOVERD by ministry in Korea

	2020		2021	
	GOVERD (100 million KRW)	Percentage (%)	GOVERD (100 million KRW)	Percentage (%)
Ministry of Science and ICT	77,137	32.3	83,472	31.4
Ministry of Trade, Industry and Energy	40,113	16.8	46,451	17.5
Defense Acquisition Program Administration	37,715	15.8	38,497	14.5
Ministry of Education	21,646	9.1	23,058	8.7
Ministry of SMEs and Startups	14,046	5.9	16,650	6.3
Multi-ministerial	4,493	1.9	8,645	3.3
Rural Development Administration	6,869	2.9	7,705	2.9
Ministry of Oceans and Fisheries	6,803	2.8	7,524	2.8
Ministry of Land, Infrastructure and Transport	5,030	2.1	5,979	2.2
Ministry of Health and Welfare	6,433	2.7	5,768	2.2
Office for Government Policy Coordination	5,165	2.2	5,424	2.0
Ministry of Environment	3,670	1.5	4,011	1.5
Ministry of Agriculture, Food and Rural Affairs	2,076	0.9	2,281	0.9
Korea Forest Service	1,147	0.5	1,348	0.5
Korea Disease Control and Prevention Agency	—	—	1,167	0.4
Korea Meteorological Administration	990	0.4	1,161	0.4
Nuclear Safety and Security Commission	729	0.3	1,143	0.4
Ministry of Culture, Sports and Tourism	937	0.4	1,102	0.4
Ministry of Food and Drug Safety	921	0.4	1,056	0.4
Ministry of the Interior and Safety	728	0.3	967	0.4
Others	2,155	0.9	2,379	0.9
Total	238,803	100.0	265,791	100.0

▶ Source: MSIT·KISTEP, Governmental R&D Survey and Analysis

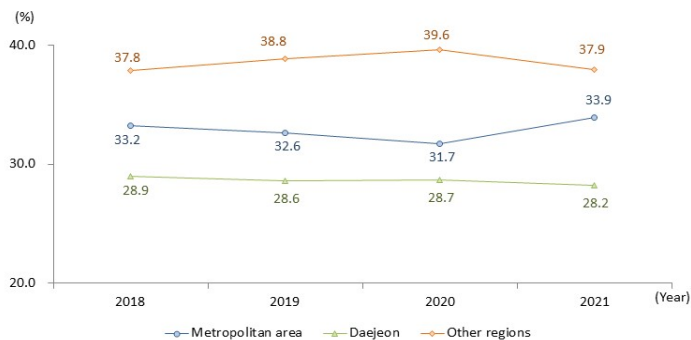
## 29 GOVERD on future and emerging technologies (6T) in Korea

	2018		2019		2020		2021	
	GOVERD (100 million KRW)	Percentage (%)	GOVERD (100 million KRW)	Percentage (%)	GOVERD (100 million KRW)	Percentage (%)	GOVERD (100 million KRW)	Percentage (%)
Information Technology (IT)	33,451	18.1	34,633	18.0	43,168	19.2	49,004	19.5
Biotechnology (BT)	35,494	19.2	36,717	19.1	41,253	18.4	47,766	19.0
Nanotechnology (NT)	8,133	4.4	8,364	4.3	10,884	4.8	12,498	5.0
Space Technology (ST)	14,875	8.1	17,622	9.1	21,461	9.6	20,498	8.2
Environment Technology (ET)	22,294	12.1	22,747	11.8	27,738	12.3	33,993	13.5
Culture Technology (CT)	2,423	1.3	2,195	1.1	2,485	1.1	3,260	1.3
Others	67,919	36.8	70,320	36.5	77,694	34.6	84,255	33.5
Total	184,589	100.0	192,597	100.0	224,682	100.0	251,274	100.0

▶ Analyzed on science and national defense R&D programs

▶ Source: MSIT·KISTEP, Governmental R&D Survey and Analysis

### 30 GOVERNMENT R&D by region in Korea



	2018		2019		2020		2021	
	GOVERNMENT R&D (100 million KRW)	Percentage (%)	GOVERNMENT R&D (100 million KRW)	Percentage (%)	GOVERNMENT R&D (100 million KRW)	Percentage (%)	GOVERNMENT R&D (100 million KRW)	Percentage (%)
Seoul	36,175	18.5	38,571	18.9	41,715	18.4	48,767	20.1
Busan	8,765	4.5	9,120	4.5	9,626	4.2	10,002	4.1
Daegu	6,233	3.2	6,301	3.1	6,842	3.0	7,168	3.0
Incheon	4,087	2.1	4,016	2.0	4,787	2.1	5,243	2.2
Gwangju	4,474	2.3	4,827	2.4	5,607	2.5	5,708	2.4
Daejeon	56,655	28.9	58,439	28.6	65,132	28.7	68,208	28.2
Ulsan	3,031	1.5	3,112	1.5	3,234	1.4	3,651	1.5
Sejong	4,696	2.4	4,837	2.4	5,159	2.3	5,877	2.4
Gyeonggi	24,763	12.7	24,139	11.8	25,611	11.3	28,082	11.6
Gangwon	2,804	1.4	2,996	1.5	3,156	1.4	3,601	1.5
Chungbuk	5,863	3.0	6,101	3.0	7,239	3.2	7,656	3.2
Chungnam	5,301	2.7	5,289	2.6	5,903	2.6	6,455	2.7
Jeonbuk	7,238	3.7	7,526	3.7	8,808	3.9	9,296	3.8
Jeonnam	2,724	1.4	3,199	1.6	3,671	1.6	3,654	1.5
Gyeongbuk	6,299	3.2	6,272	3.1	6,882	3.0	7,271	3.0
Gyeongnam	15,351	7.8	18,365	9.0	22,156	9.7	19,628	8.1
Jeju	1,286	0.7	1,487	0.7	1,714	0.8	1,858	0.8
Total	195,744	100.0	204,597	100.0	227,242	100.0	242,125	100.0

► Analyzed on government R&D programs classified by region (excluding overseas and others)

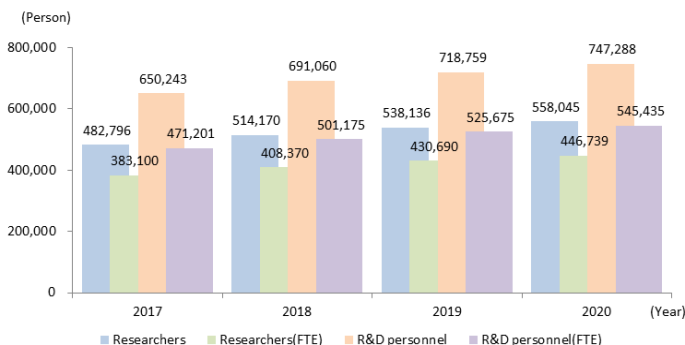
► Source: MSIT·KISTEP, Governmental R&D Survey and Analysis

## III

## R&amp;D Personnel

## 4. R&amp;D Personnel

## 31 Total researchers and total R&amp;D personnel in Korea



► Source: MSIT·KISTEP, Survey of Research and Development in Korea

## 32 Total researchers and total R&amp;D personnel in major countries (FTE)

		2017	2018	2019	2020
Total researchers (FTE)	Korea	383,100	408,370	430,690	446,739
	USA	1,434,176	1,553,328	1,586,497	–
	Japan	676,292	678,134	681,821	689,889
	Germany	419,617	433,685	450,697	451,859
	France	296,324	305,439	313,374	321,550
	UK	295,934	305,795	316,296	–
	China	1,740,442	1,866,109	2,109,460	2,281,134
Total R&D personnel (FTE)	Korea	471,201	501,175	525,675	545,435
	Japan	890,749	896,901	903,367	911,620
	Germany	686,349	707,704	735,584	733,831
	France	442,222	453,387	461,891	470,586
	UK	443,597	463,476	475,093	–
	China	4,033,597	4,381,444	4,800,768	5,234,508

► Source: OECD, MSTI 2022–September ([stats.oecd.org](https://stats.oecd.org))  
MSIT·KISTEP, Survey of Research and Development in Korea

- 33 Total researchers per 10,000 population, per 1,000 total employment, and per 1,000 labor force (FTE) in Korea

	2017	2018	2019	2020
Total researchers (FTE)	383,100	408,370	430,690	446,739
Total researchers per 10,000 population (FTE)	74.6	79.1	83.1	86.3
Total researchers per 1,000 total employee (FTE)	14.4	15.3	16.0	16.6
Total researchers per 1,000 labor force (FTE)	13.9	14.7	15.4	16.0

► Source: MSIT·KISTEP, Survey of Research and Development in Korea  
OECD, Research and Development Statistics, 2022–September ([stats.oecd.org](https://stats.oecd.org))

- 34 Total researchers per 10,000 population, per 1,000 total employment, and per 1,000 labor force (FTE) in major countries (2020)

	Korea	USA ('19)	Japan	Germany	France	UK ('19)	China
Researchers per 10,000 population (FTE)	86.3	48.3	54.9	54.2	47.3	47.4	16.2
Researchers per 1,000 total employment (FTE)	16.6	9.9	10.1	10.0	11.4	9.6	3.0
Researchers per 1,000 labor force (FTE)	16.0	9.6	10.0	10.4	10.9	9.3	2.9

► Source: MSIT·KISTEP, Survey of Research and Development in Korea  
OECD, MSTI 2022–September ([stats.oecd.org](https://stats.oecd.org))

- 35 Researchers by sector of employment in Korea

	2017		2018		2019		2020	
	Researchers	Percentage (%)	Researchers	Percentage (%)	Researchers	Percentage (%)	Researchers	Percentage (%)
Business enterprises	343,367	71.1	368,237	71.6	387,448	72.0	401,116	72
Universities	102,877	21.3	108,529	21.1	110,619	20.6	115,924	21
Public research institutes	36,552	7.6	37,404	7.3	40,069	7.4	41,005	7.3
Total	482,796	100.0	514,170	100.0	538,136	100.0	558,045	100.0

► Source: MSIT·KISTEP, Survey of Research and Development in Korea

- 36 Percentage of researchers (FTE) by sector of employment in major countries (%) (2020)

	Korea	Japan	Germany	France	UK ('19)	China
Business enterprises	81.8	74.7	60.4	62.9	41.8	58.5
Universities	10.0	19.7	26.1	26.4	54.5	24.0
Public research institutes	8.1	5.5	13.5	10.7	3.7	17.5

► Source: OECD, Research and Development Statistics, 2022–September ([stats.oecd.org](https://stats.oecd.org))  
MSIT·KISTEP, Survey of Research and Development in Korea

## 37 Women researchers in Korea

	2017	2018	2019	2020
Total researchers	482,796	514,170	538,136	558,045
Women researchers	97,042	104,728	113,187	119,551
Women researchers as a percentage of total researchers (%)	20.1	20.4	21.0	21.4

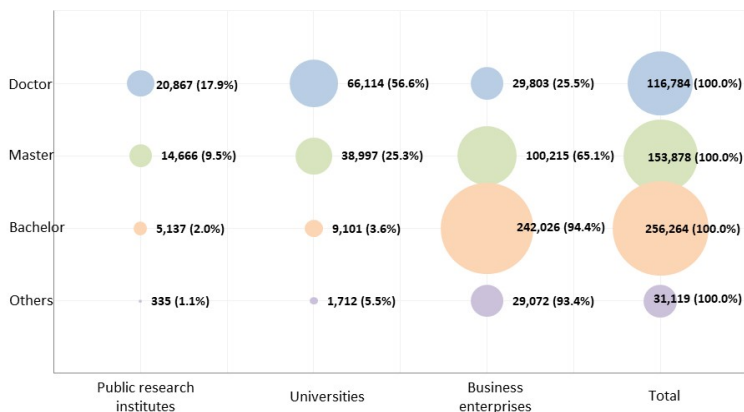
► Source: MSIT·KISTEP, Survey of Research and Development in Korea

## 38 Women researchers in major countries

	Korea ('20)	Japan ('20)	Germany ('19)	France ('17)	UK ('19)
Women researchers	119,551	166,304	187,231	117,754	213,856
As a percentage of total researchers (%)	21.4	17.5	27.9	28.3	39.0

► Source: OECD, MSTI 2022–September ([stats.oecd.org](https://stats.oecd.org))  
MSIT·KISTEP, Survey of Research and Development in Korea

## 39 Distribution of researchers by sector of employment and qualification in Korea (2020)



► Source: MSIT·KISTEP, Survey of Research and Development in Korea



## 40 Researchers by degree in Korea

	2017		2018		2019		2020	
	Researchers	Percentage (%)	Researchers	Percentage (%)	Researchers	Percentage (%)	Researchers	Percentage (%)
Doctor	103,582	21.5	105,930	20.6	111,955	20.8	116,784	20.9
Master	137,996	28.6	144,399	28.1	149,529	27.8	153,878	27.6
Bachelor	214,752	44.5	233,922	45.5	247,267	45.9	256,264	45.9
Others	26,466	5.5	29,919	5.8	29,385	5.5	31,119	5.6
Total	482,796	100.0	514,170	100.0	538,136	100.0	558,045	100.0

► Source: MSIT·KISTEP, Survey of Research and Development in Korea

## 41 Researchers by field of study in Korea

	2017		2018		2019		2020	
	Researchers	Percentage (%)	Researchers	Percentage (%)	Researchers	Percentage (%)	Researchers	Percentage (%)
Natural science	67,736	14.0	72,884	14.2	86,248	16.0	81,152	14.5
Engineering	322,952	66.9	344,916	67.1	350,000	65.0	371,068	66.5
Medicine & health	27,911	5.8	29,774	5.8	31,848	5.9	33,262	6.0
Agricultural science	10,423	2.2	10,991	2.1	11,051	2.1	10,853	1.9
Humanities	26,576	5.5	27,931	5.4	28,854	5.4	30,213	5.4
Social science	27,198	5.6	27,674	5.4	30,135	5.6	31,497	5.6
Total	482,796	100.0	514,170	100.0	538,136	100.0	558,045	100.0

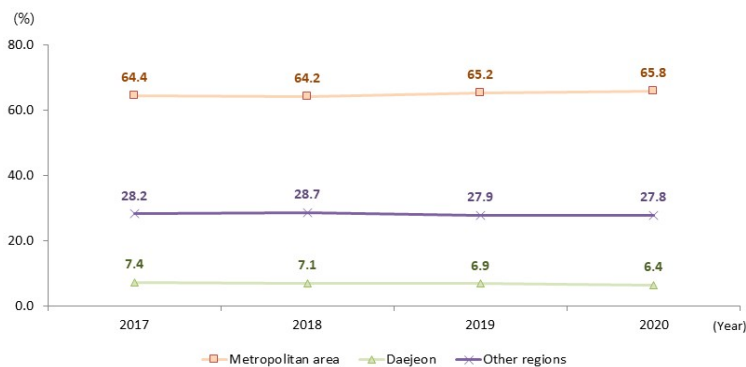
► Source: MSIT·KISTEP, Survey of Research and Development in Korea

## 42 Researchers by age in Korea

	2017		2018		2019		2020	
	Researchers	Percentage (%)	Researchers	Percentage (%)	Researchers	Percentage (%)	Researchers	Percentage (%)
Under 29	73,767	15.3	76,906	15.0	78,788	14.6	81,386	14.6
30~39	201,623	41.8	208,607	40.6	214,521	39.9	214,991	38.5
40~49	139,118	28.8	151,436	29.5	160,550	29.8	168,434	30.2
50~59	54,136	11.2	61,146	11.9	65,984	12.3	72,534	13.0
Over 60	14,152	2.9	16,075	3.1	18,293	3.4	20,700	3.7
Total	482,796	100.0	514,170	100.0	538,136	100.0	558,045	100.0

► Source: MSIT·KISTEP, Survey of Research and Development in Korea

### 43 Researchers by region in Korea



	2017		2018		2019		2020	
	Researchers	Percentage (%)	Researchers	Percentage (%)	Researchers	Percentage (%)	Researchers	Percentage (%)
Seoul	118,541	24.6	127,350	24.8	132,997	24.7	139,511	25.0
Busan	14,371	3.0	16,356	3.2	16,507	3.1	17,305	3.1
Daegu	11,781	2.4	13,429	2.6	14,047	2.6	14,498	2.6
Incheon	19,635	4.1	20,197	3.9	21,685	4.0	21,917	3.9
Gwangju	7,722	1.6	9,472	1.8	9,471	1.8	9,967	1.8
Daejeon	35,745	7.4	36,361	7.1	37,357	6.9	35,691	6.4
Ulsan	7,807	1.6	8,422	1.6	8,025	1.5	7,900	1.4
Sejong	4,109	0.9	4,064	0.8	4,199	0.8	4,741	0.8
Gyeonggi	172,583	35.7	182,654	35.5	195,972	36.4	205,899	36.9
Gangwon	6,668	1.4	6,730	1.3	7,084	1.3	7,268	1.3
Chungbuk	12,324	2.6	13,405	2.6	13,318	2.5	14,137	2.5
Chungnam	17,139	3.5	17,823	3.5	18,384	3.4	18,584	3.3
Jeonbuk	9,126	1.9	9,653	1.9	9,207	1.7	10,032	1.8
Jeonnam	4,493	0.9	5,106	1.0	5,532	1.0	5,769	1.0
Gyeongbuk	19,335	4.0	19,412	3.8	19,535	3.6	19,189	3.4
Gyeongnam	19,584	4.1	21,908	4.3	22,807	4.2	23,396	4.2
Jeju	1,833	0.4	1,828	0.4	2,009	0.4	2,241	0.4
Total	482,796	100.0	514,170	100.0	538,136	100.0	558,045	100.0

▶ Source: MSIT·KISTEP, Survey of Research and Development in Korea

#### 44 Researchers by business size in Korea

	2017		2018		2019		2020	
	Researchers	Percentage (%)	Researchers	Percentage (%)	Researchers	Percentage (%)	Researchers	Percentage (%)
Large corp.	115,791	33.7	118,022	32.1	123,528	31.9	123,787	30.9
Medium	54,408	15.8	55,683	15.1	58,867	15.2	60,459	15.1
Small	92,427	26.9	99,748	27.1	104,879	27.1	104,141	26.0
Start-up	80,741	23.5	94,784	25.7	100,174	25.9	112,729	28.1
Total	343,367	100.0	368,237	100.0	387,448	100.0	401,116	100.0

► Small-medium sized business (SME) here does not include start-ups (SMEs are broadly accepted as the combination of SMEs and start-ups)

► Notice that medium enterprises are included in the survey since 2017

► Source: MSIT-KISTEP, Survey of Research and Development in Korea

#### 45 Researchers by industry in Korea

		2017	2018	2019	2020
Number of researchers	Manufacturing	263,045	277,250	287,648	293,784
	Compounds and chemicals (excluding pharmaceuticals)*	21,295	22,952	23,697	21,835
	Electrical machinery and apparatus, radio, TV and communications equipment*	95,736	97,686	103,149	106,749
	Motor vehicles and trailers*	36,387	38,061	36,827	37,132
	Services	69,703	79,777	88,443	96,329
Percentage (%)	Manufacturing	76.6	75.3	74.2	73.2
	Compounds and chemicals (excluding pharmaceuticals)	10.6	10.8	10.7	5.4
	Electrical machinery and apparatus, radio, TV and communications equipment	27.9	26.5	26.6	26.6
	Motor vehicles and trailers	10.6	10.3	9.5	9.3
	Services	20.3	21.7	22.8	24.0

► \* indicates top 3 industries with R&D expenditure among manufacturing fields (medium category)

► Source: MSIT-KISTEP, Survey of Research and Development in Korea

#### 46 Researcher and doctoral researcher intensity of the top companies in Korea (%)

		2017	2018	2019	2020
Researcher	Top 5 companies	21.9	20.3	20.4	20.0
	Top 10 companies	26.1	24.2	24.3	23.4
	Top 20 companies	29.3	27.3	27.2	26.4
Doctoral researcher	Top 5 companies	33.1	33.8	33.3	32.2
	Top 10 companies	39.7	40.2	39.4	39.1
	Top 20 companies	45.5	45.6	44.7	43.9

► Researcher and doctoral researcher intensities were calculated by the order of the highest from each category

► Source: MSIT-KISTEP, Survey of Research and Development in Korea

**47** Principal investigators of government R&D programs by sector, gender, and degree in Korea

		2018		2019		2020		2021	
		Researchers	Percentage (%)	Researchers	Percentage (%)	Researchers	Percentage (%)	Researchers	Percentage (%)
Sector	Research institutes	5,970	13.7	6,307	14.0	6,551	13.8	6,606	13.3
	Universities	21,639	49.5	24,067	53.4	24,659	51.9	25,588	51.4
	Business enterprises	14,512	33.2	13,007	28.9	14,371	30.3	15,247	30.6
	Others	1,519	3.5	1,638	3.6	1,870	3.9	2,297	4.6
	Ministries	60	0.1	56	0.1	56	0.1	59	0.1
	Total	43,700	100.0	45,075	100.0	47,507	100.0	49,797	100.0
Gender	Male	36,002	83.2	36,777	82.5	38,783	82.6	40,337	82.3
	Female	7,252	16.8	7,801	17.5	8,154	17.4	8,688	17.7
	Total	43,254	100.0	44,578	100.0	46,937	100.0	49,025	100.0
Degree	Doctor	30,122	69.6	32,879	73.8	34,030	72.5	35,828	73.1
	Master	5,122	11.8	4,933	11.1	5,463	11.6	5,708	11.6
	Bachelor and under	8,010	18.5	6,766	15.2	7,444	15.9	7,489	15.3
	Total	43,254	100.0	44,578	100.0	46,937	100.0	49,025	100.0

► Analysis includes principal investigators in science and technology R&D programs (excludes R&D programs for humanities and social sciences; classified national security R&D programs)

► For programs by sector, individuals with multiple affiliations were counted multiple times

► Source: MSIT·KISTEP, Governmental R&D Survey and Analysis

**48** Current and shortfall of S&T industry personnel in Korea

	2017	2018	2019	2020
Current personnel	1,634,346	1,661,446	1,672,937	1,657,673
Shortfall of personnel	36,908	37,484	37,924	36,450
Percentage of shortfall (%)	2.2	2.2	2.2	2.2

► Source: MOTIE, Survey Reports on S&T Industry Personnel

## 5. Nurturing Human Capital

### 49 Number of students enrolled in bachelor's, master's and doctoral programs in Korea

		2018	2019	2020	2021
Bachelor's program	Total	1,904,364	1,893,882	1,875,553	1,815,238
	Science & engineering	691,435	694,897	691,173	667,710
	Percentage of science & engineering (%)	36.3	36.7	36.9	36.8
Master's program	Total	214,413	211,544	208,409	215,574
	Science & engineering	45,099	44,749	45,101	48,588
	Percentage of science & engineering (%)	21.0	21.2	21.6	22.5
Doctoral program	Total	64,479	65,828	68,089	72,036
	Science & engineering	29,052	28,851	29,647	31,527
	Percentage of science & engineering (%)	45.1	43.8	43.5	43.8

► Science & engineering is the sum of students in natural sciences and engineering majors. Bachelor's program is the sum of 2/3-year curricula and 4-year curricula. Number of enrolled students excludes students on leave

► Source: MOE, Statistical Yearbook of Education ([kess.kedi.re.kr](http://kess.kedi.re.kr))

### 50 Number of science and engineering graduates with master's and doctoral degrees in Korea

		2018	2019	2020	2021
Master's degree	Total	82,837	82,137	83,046	80,030
	Science & engineering	20,267	20,076	19,949	19,494
	Percentage of science & engineering (%)	24.5	24.4	24.0	24.4
Doctoral degree	Total	14,674	15,308	16,139	16,420
	Science & engineering	6,351	6,713	7,263	7,314
	Percentage of science & engineering (%)	43.3	43.9	45.0	44.5

► Science & engineering is the sum of students in natural sciences and engineering majors

► Source: MOE, Statistical Yearbook of Education ([kess.kedi.re.kr](http://kess.kedi.re.kr))

### 51 New doctorates in natural sciences and engineering as a percentage of all graduates in major countries (%) (2019)

	Korea	USA	Japan	Germany	France	UK
New doctorates in natural sciences and engineering as a percentage of all doctorate graduates	37.8	38.6	35.8	41.4	48.5	45.8

► Science & engineering is the sum of students in natural sciences and engineering majors, and natural sciences here means field 4 (science, comprising the life sciences, physical sciences, mathematics and statistics and computing) in ISCED 2011

► Source: OECD, Education at a Glance 2021 ([www.oecd-ilibrary.org](http://www.oecd-ilibrary.org))

### 52 Tertiary education graduates in natural sciences and engineering as a percentage of all graduates in major countries (%)

	Korea	USA	Japan	Germany	France	UK
2018	24.7	14.8	21.7	30.5	21.9	22.9
2019	25.0	14.8	21.8	32.3	22.2	22.3

► Science & engineering is the sum of students in natural sciences and engineering majors. Tertiary education graduate school indicates all forms of institutes with the purpose of official tertiary education, regardless of legal status

► Source: OECD, Education at a Glance 2021 ([www.oecd-ilibrary.org](http://www.oecd-ilibrary.org))

## IV

## R&amp;D Performance

## 6. Publications

## 53 Number of papers published in SCI journals in Korea

	2017	2018	2019	2020
Number of papers published	61,693	64,472	70,430	76,408
World share (%)	3.38	3.42	3.38	3.45
World ranking	12	12	12	12

▶ World share(%) is the relative share to the total number of papers published worldwide. It is different from the relative share to the sum of the number of papers published yearly by each nation, which is greater than the total number of papers published worldwide due to papers co-authored by multiple countries

▶ Source: KISTEP·KAIST, SCI Analysis Research (2011–2020)

## 54 Number of papers published in SCI journals in major countries

		2017	2018	2019	2020
Korea	Number of papers	61,693	64,472	70,430	76,408
	World share (%)	3.38	3.42	3.38	3.45
	World ranking	12	12	12	12
USA	Number of papers	471,103	474,722	503,704	512,341
	World share (%)	25.79	25.18	24.17	23.13
	World ranking	1	1	1	2
Japan	Number of papers	86,000	87,398	91,839	97,724
	World share (%)	4.71	4.64	4.41	4.41
	World ranking	5	5	5	7
Germany	Number of papers	124,133	126,029	134,393	139,798
	World share (%)	6.80	6.69	6.45	6.31
	World ranking	4	4	4	4
France	Number of papers	83,879	83,722	87,169	91,229
	World share (%)	4.59	4.44	4.18	4.12
	World ranking	6	6	10	9
UK	Number of papers	149,087	150,676	162,270	167,140
	World share (%)	8.16	7.99	7.79	7.55
	World ranking	3	3	3	3
China	Number of papers	350,148	402,665	494,121	553,233
	World share (%)	19.17	21.36	23.71	24.98
	World ranking	2	2	2	1

▶ World share(%) is the relative share to the total number of papers published worldwide. It is different from the relative share to the sum of the number of papers published yearly by each nation, which is greater than the total number of papers published worldwide due to papers co-authored by multiple countries

▶ Source: KISTEP·KAIST, SCI Analysis Research (2011–2020)

**55** Number of papers published in SCI journals per 10,000 population or per 100 researchers (FTE) in Korea

	2017	2018	2019	2020
Number of papers (SCI) per 10,000 population	12.01	12.49	13.62	14.76
Number of papers (SCI) per 100 researchers (FTE)	16.10	15.79	16.35	17.10

► Source: OECD, Main Science & Technology Indicators 2022–September ([stats.oecd.org](https://stats.oecd.org))  
KISTEP·KAIST, SCI Analysis Research (2011–2020)

**56** Number of papers published in SCI journals per 10,000 population or per 100 researchers (FTE) in major countries (2020)

	Korea	USA	Japan	Germany	France	UK	China
Number of papers (SCI) per 10,000 population	14.76	15.52	7.77	16.81	13.42	24.92	3.92
Number of papers (SCI) per 100 researchers (FTE)	17.10	31.75 ('19)	14.17	31.01	28.37	51.30 ('19)	24.25

► Source: OECD, Main Science & Technology Indicators 2022–September ([stats.oecd.org](https://stats.oecd.org))  
KISTEP·KAIST, SCI Analysis Research (2011–2020)

**57** Average citations per paper over five-year periods in Korea

	2013–2017	2014–2018	2015–2019	2016–2020
Average citations per paper over five-year periods	6.12	6.50	7.01	7.57
World average of citations	5.91	6.11	6.44	6.92

► Average citations per paper over five-year periods are the average number of cumulative citations over the five-year periods from the year of publication

► Source: KISTEP·KAIST, SCI Analysis Research (2011–2020)

**58** Average citations per paper over five-year periods in major countries (2016–2020)

Korea	USA	Japan	Germany	France	UK	China
7.57	9.20	7.24	9.57	9.55	9.70	8.08

► Average citations per paper over five-year period are the average number of cumulative citations over the five-year period from the year of publication

► Source: KISTEP·KAIST, SCI Analysis Research (2011–2020)

## 59 Number of papers published in top 3 journals in Korea

	2017	2018	2019	2020
NATURE	27	28	32	46
SCIENCE	23	35	22	31
CELL	2	12	10	13
Total	52	75	64	90

▶ Only full-length papers (Articles and Reviews) were counted

▶ Source: KISTEP·KAIST, SCI Analysis Research (2011–2020)

## 60 Number of papers published by region in Korea (2020)

	Co-authorship		First authorship	
	Number of papers	Percentage (%)	Number of Papers	Percentage (%)
Seoul	37,175	33.3	23,302	39.3
Gyeonggi	15,903	14.2	7,686	13.0
Daejeon	10,864	9.7	5,635	9.5
Busan	5,544	5.0	2,868	4.8
Gyeongbuk	5,085	4.6	2,435	4.1
Daegu	4,843	4.3	2,503	4.2
Incheon	4,611	4.1	2,106	3.6
Gangwon	4,144	3.7	1,772	3.0
Gwangju	3,952	3.5	1,810	3.1
Gyeongnam	3,907	3.5	2,054	3.5
Jeonbuk	3,730	3.3	1,843	3.1
Chungnam	3,180	2.8	1,344	2.3
Chungbuk	2,966	2.7	1,269	2.1
Ulsan	2,567	2.3	1,309	2.2
Jeonnam	1,347	1.2	560	0.9
Jeju	1,038	0.9	500	0.8
Sejong	743	0.7	314	0.5
Others	65	0.1	12	0.0
Total	111,664	100.0	59,322	100.0

▶ Source: KISTEP·KAIST, SCI Analysis Research (2011–2020)



## 7. Patents

### 61 Domestic patent applications and patent grants in Korea

	2018	2019	2020	2021
Patent applications	209,992	218,975	226,759	237,998
Patent grants	119,012	125,661	134,766	145,882

► Source: KIPO, Intellectual Property Statistics ([kipo.go.kr](http://kipo.go.kr))

### 62 Domestic patent applications and patent grants by region in Korea

	Patent applications				Patent grants			
	2018	2019	2020	2021	2018	2019	2020	2021
Seoul	47,123	52,270	53,124	54,042	25,224	26,483	29,293	31,576
Busan	6,172	6,058	6,676	6,504	3,412	3,300	3,410	3,570
Daegu	4,619	4,801	4,782	5,037	2,519	2,781	2,881	2,837
Incheon	6,236	6,439	6,728	7,095	3,499	3,585	3,916	3,921
Gwangju	3,431	3,458	3,522	3,549	1,765	1,806	1,846	1,817
Daejeon	10,767	10,632	10,867	11,374	5,877	6,504	6,712	6,688
Ulsan	2,347	2,277	2,499	2,209	1,308	1,268	1,560	1,557
Sejong	811	813	874	57,830	394	405	482	34,663
Gyeonggi	47,175	49,685	54,696	2,898	25,440	27,708	31,565	1,706
Gangwon	2,666	2,604	2,800	4,353	1,479	1,462	1,572	2,413
Chungbuk	3,509	3,700	4,053	7,274	1,921	2,167	2,359	4,987
Chungnam	6,482	6,917	7,217	4,354	3,808	3,966	4,396	2,357
Jeonbuk	3,995	4,343	4,529	4,050	1,995	2,137	2,277	2,101
Jeonnam	3,223	3,424	3,592	6,733	1,605	1,836	1,906	4,390
Gyeongbuk	6,634	6,615	6,698	6,964	4,176	4,477	4,557	4,099
Gyeongnam	6,521	6,657	6,810	1,046	3,751	3,956	4,059	470
Jeju	837	891	1,003	922	412	430	485	564
Others	13	19	7	11	642	581	605	635
Total	162,561	171,603	180,477	186,245	89,227	94,852	103,881	110,351

► The table above refers to the first applicant's/patent holder's address

► "Others" include those who are Korean citizens but do not have an address in Korea (overseas residents, soldiers, etc.)

► Based on the address of the first right holder among domestic rights holders

► Source: KIPO, Intellectual Property Statistics ([kipo.go.kr](http://kipo.go.kr))

**63** Number of triadic patent families in Korea

	2017	2018	2019	2020
Triadic patent families	2,776	3,160	3,362	3,244
Triadic patent families per million population	54.0	61.2	65.0	62.7
Triadic patent families per 10,000 researchers (FTE)	72.4	77.4	78.1	72.6

► Triadic patent families: Patents applied to EPO(European Patent Office) and JPO(Japan Patent Office), and granted by USPTO(United States Patent and Trademark Office)

► Source: OECD, MSTI 2022–September ([stats.oecd.org](https://stats.oecd.org))

**64** Number of triadic patent families in major countries (2020)

	Korea	USA	Japan	Germany	France	UK	China
Triadic patent families	3,244	13,040	17,469	4,381	1,880	1,708	5,897
Triadic patent families per million population	62.7	39.5	139.0	52.7	27.6	25.5	4.2
Triadic patent families per 10,000 researchers (FTE)	72.6	82.2	253.2	97.2	58.5	54.0	25.9

► Source: OECD, MSTI 2022–September ([stats.oecd.org](https://stats.oecd.org))

**65** Number of patent applications to and grants from the USPTO in Korea

	2017	2018	2019	2020
Patent applications	35,565	33,961	36,424	37,490
Patent grants	20,717	19,780	21,684	21,974

► Patent applications here is number of Utility Patents by their filing year

► Source: WIPO, WIPO Statistics Database, 2021.12 ([ipstats.wipo.int](https://ipstats.wipo.int))

**66** Number of patent applications to and grants from the USPTO in major countries (2020)

	Korea	USA	Japan	Germany	France	UK	China
Patent applications	37,490	269,586	78,308	28,747	11,309	13,229	41,210
Patent grants	21,974	164,562	51,618	17,788	7,090	7,419	21,476

► Patent applications here is number of Utility Patents by their filing year

► Country is based upon nationality of the first patentee, Hong Kong and Macao are not included in China.

► Source: WIPO, WIPO Statistics Database, 2021.12 ([ipstats.wipo.int](https://ipstats.wipo.int))

### 67 Top 10 companies granted U.S. Patents

Rank	2019		2020	
	Number of patents	Company	Number of patents	Company
1	9,253	INTERNATIONAL BUSINESS MACHINES CORPORATION	9,118	INTERNATIONAL BUSINESS MACHINES CORPORATION
2	6,440	SAMSUNG ELECTRONICS CO., LTD.	6,396	SAMSUNG ELECTRONICS CO., LTD.
3	3,548	CANON KABUSHIKI KAISHA	3,225	CANON KABUSHIKI KAISHA
4	3,083	MICROSOFT TECHNOLOGY LICENSING, LLC.	2,909	MICROSOFT TECHNOLOGY LICENSING, LLC.
5	3,020	INTEL CORPORATION	2,865	INTEL CORPORATION
6	2,801	LG ELECTRONICS INC.	2,830	LG ELECTRONICS INC.
7	2,483	APPLE, INC.	2,817	TAIWAN SEMICONDUCTOR MANUFACTURING CO., LTD.
8	2,464	FORD GLOBAL TECHNOLOGIES, L.L.C.	2,788	APPLE, INC.
9	2,427	AMAZON TECHNOLOGIES, INC.	2,760	HUAWEI TECHNOLOGIES CO., LTD.
10	2,417	HUAWEI TECHNOLOGIES CO., LTD.	2,276	QUALCOMM, INC.

► Source : USPTO ([uspto.gov](https://uspto.gov))

### 68 Number of patent applications to and grants from the EPO in Korea

	2017	2018	2019	2020
Patent applications	6,455	7,280	8,332	9,085
Patent grants	4,443	6,258	7,251	7,050

► Source: WIPO, WIPO Statistics Database, 2021. 12 ([epo.org](https://epo.org))

## 69 Number of patent applications to and grants from the EPO in major countries (2020)

	Korea	USA	Japan	Germany	France	UK	China
Patent applications	9,085	44,275	21,906	25,954	10,606	5,719	13,374
Patent grants	7,050	34,148	20,235	20,055	8,397	4,006	6,862

► Source : WIPO, WIPO Statistics Database, 2021, 12 ([epo.org](http://epo.org))

## 70 Number of patent applications filed under the PCT in Korea

	2017	2018	2019	2020
PCT applications	15,751	16,920	19,074	20,053

► PCT (Patent Cooperation Treaty): International patent law treaty that provides a unified procedure for filing patent applications to protect inventions in each of its contracting states

► Source : WIPO, WIPO Statistics Database, 2021, 12 ([ipstats.wipo.int](http://ipstats.wipo.int))

## 71 Number of patent applications filed under the PCT in major countries (2020)

	Korea	USA	Japan	Germany	France	UK	China
PCT applications	20,053	58,616	50,562	18,532	7,769	5,897	68,770
Rank	4	2	3	5	6	7	1

► Source : WIPO, WIPO Statistics Database, 2021, 12 ([ipstats.wipo.int](http://ipstats.wipo.int))

## 72 Number of patent applications filed under the PCT in the ICT and biotechnology sector in major countries (2019)

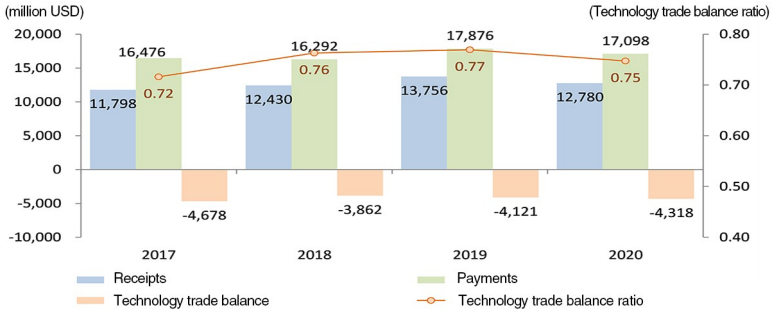
	Korea	USA	Japan	Germany	France	UK	China
ICT	7,082	17,712	11,919	3,074	1,144	1,308	29,032
Biotechnology	1,066	6,559	1,635	663	425	594	2,080

► The number of patent applications is based on priority year, extracted from OECD data for the comparison of the same standards

► Source : OECD, MSTI 2022–September ([stats.oecd.org](http://stats.oecd.org))

## 8. Technology Trade

### 73 Technology balance of payments in Korea



	2017	2018	2019	2020
Receipts (million USD)	11,798	12,430	13,756	12,780
Payments (million USD)	16,476	16,292	17,876	17,098
Technology trade balance (million USD)	-4,678	-3,862	-4,121	-4,318
Technology trade balance ratio (Receipts/Payments)	0.72	0.76	0.77	0.75

► Source: Statistics Report on the Technology Trade of Korea, published by MSIT-Korea Industrial Technology Association ([www.koita.or.kr](http://www.koita.or.kr))

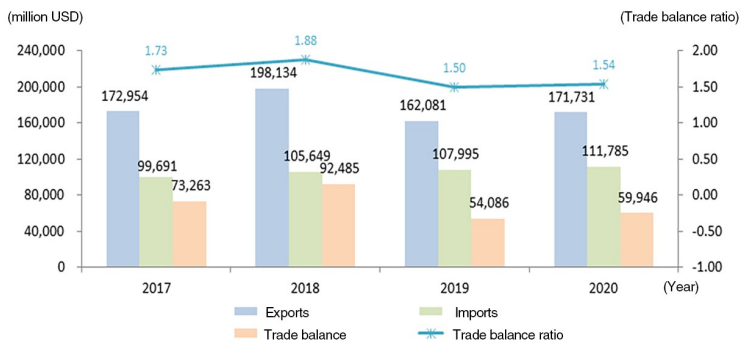
### 74 Technology balance of payments by industry in Korea

	Receipts (million USD)		Payments (million USD)		Balance of payments (million USD)		Balance of payments ratio (Receipts/Payments)	
	2019	2020	2019	2020	2019	2020	2019	2020
ICT	5,957	6,064	5,100	6,606	857	-542	1.17	0.92
Electrical/electronics	4,071	3,345	8,167	5,798	-4,096	-2,453	0.50	0.58
Machine	1,626	1,490	1,670	1,618	-44	-129	0.97	0.92
Chemistry	506	440	898	1,116	-392	-676	0.56	0.39
Construction	162	145	68	64	94	80	2.38	2.25
Agriculture, forestry and fisheries	76	68	301	255	-225	-188	0.25	0.27
Textiles	34	16	170	179	-136	-163	0.20	0.09
Materials	13	27	284	109	-271	-82	0.05	0.25
Others	1,311	1,186	1,218	1,353	93	-167	1.08	0.88
Total Amount	13,756	12,780	17,876	17,098	-4,120	-4,318	0.77	0.75

► Source: Statistics Report on the Technology Trade of Korea, published by MSIT-Korea Industrial Technology Association ([www.koita.or.kr](http://www.koita.or.kr))

## 9. International Trade in High-Tech Industries

### 75 International trade in R&D-intensive industries of Korea



	2017	2018	2019	2020
Exports (million USD)	172,954	198,134	162,081	171,731
Imports (million USD)	99,691	105,649	107,995	111,785
Trade balance (million USD)	73,263	92,485	54,086	59,946
Trade balance ratio (Exports/Imports)	1.73	1.88	1.50	1.54

▶ R&D-intensive industries include pharmaceutical, computer, electronic and optical, and aerospace industries, as defined by OECD

▶ Source : OECD, Main Science & Technology Indicators 2022–September([stats.oecd.org](https://stats.oecd.org))

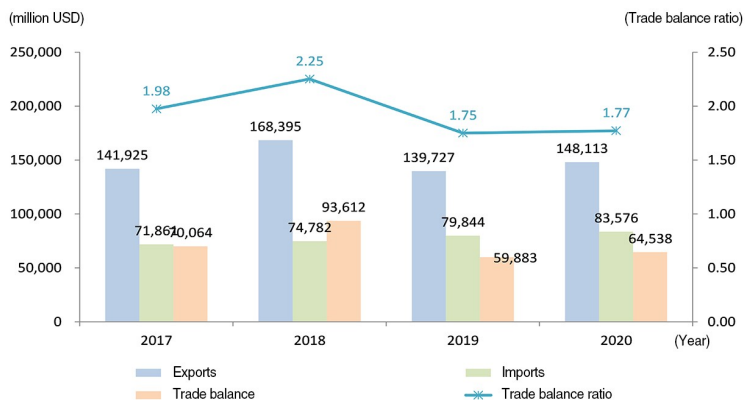
### 76 International trade in R&D-intensive industries of major countries (2021)

	Korea ('20)	USA	Japan	Germany	France	UK	China
Exports (million USD)	171,731	386,658	120,865	297,107	118,589	95,961	994,290
Imports (million USD)	111,785	677,146	168,715	263,098	118,927	112,419	804,014
Trade balance (million USD)	59,946	-290,488	-47,850	34,009	-338	-16,457	190,277
Trade balance ratio (Exports/Imports)	1.54	0.57	0.72	1.13	1.00	0.85	1.24

▶ R&D-intensive industries include pharmaceutical, computer, electronic and optical, and aerospace industries, as defined by OECD

▶ Source : OECD, Main Science & Technology Indicators 2022–September([stats.oecd.org](https://stats.oecd.org))

## 77 ICT industry trade in Korea



	2017	2018	2019	2020
Exports (million USD)	141,925	168,395	139,727	148,113
Imports (million USD)	71,861	74,782	79,844	83,576
Trade balance (million USD)	70,064	93,612	59,883	64,538
Trade balance ratio (Exports/Imports)	1.98	2.25	1.75	1.77

► Source : OECD, STAN Bilateral Trade Database ISIC4 ed, 2021 ([stats.oecd.org](https://stats.oecd.org))

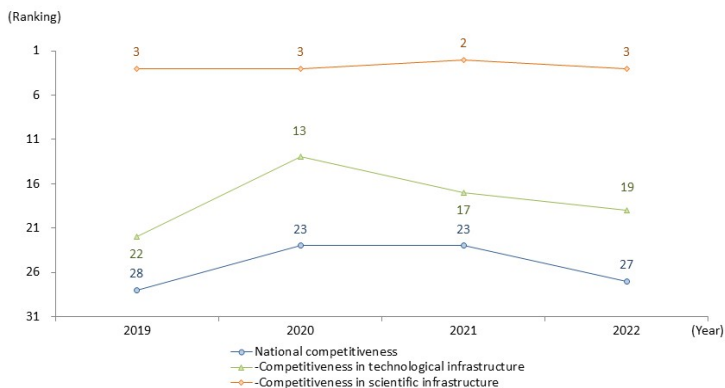
## 78 ICT industry trade in major countries (2020)

	Korea	USA	Japan	Germany	France	UK	China
Exports (million USD)	148,113	138,375	57,009	71,606	18,429	16,580	701,868
Imports (million USD)	83,576	347,415	89,726	105,323	38,924	52,169	516,389
Trade balance (million USD)	64,538	-209,040	-32,716	-33,717	-20,495	-35,589	185,479
Trade balance ratio (Exports/Imports)	1.77	0.40	0.64	0.68	0.47	0.32	1.36

► Source : OECD, STAN Bilateral Trade Database ISIC4 ed, 2021 ([stats.oecd.org](https://stats.oecd.org))

## 10. National Competitiveness

### 79 Competitiveness ranking of Korea (IMD)



	2019	2020	2021	2022
Overall competitiveness	28	23	23	27
Economic performance	27	27	18	22
Government efficiency	31	28	34	36
Business efficiency	34	28	27	33
Infrastructure	20	16	17	16
– Scientific infrastructure	3	3	2	3
– Technological infrastructure	22	13	17	19

▶ Source : IMD, The World Competitiveness Yearbook ([www.imd.org](http://www.imd.org))

### 80 Competitiveness ranking of major countries (2022, IMD)

	Korea	USA	Japan	Germany	France	UK	China
Competitiveness	27	10	34	15	28	23	17
– Science infrastructure	3	1	8	2	15	14	9
– Technology infrastructure	19	11	42	33	15	18	12

▶ Source : IMD, The World Competitiveness Yearbook 2022 ([www.imd.org](http://www.imd.org))



### 81 Competitiveness ranking of Korea in scientific infrastructure (IMD)

	2019	2020	2021	2022
Total expenditure on R&D	5	5	5	5
Total expenditure on R&D as a percentage of GDP	1	2	2	2
Total expenditure on R&D per capita	9	8	9	9
Business expenditure on R&D	5	5	5	5
Business expenditure on R&D as a percentage of GDP	2	2	2	2
Total R&D personnel nationwide	6	6	6	5
Total R&D personnel nationwide per 1,000 people	5	3	3	3
Total R&D personnel in business enterprise	6	5	5	5
Total R&D personnel in business per 1,000 people	3	3	3	3
Researcher in R&D per 1,000 people	2	2	1	1
Percentage of total first university degrees in science and engineering**	11	16	10	11
Scientific articles	9	10	9	8
Nobel prizes	29	29	29	28
Nobel prizes per 1,000,000 people	29	29	29	28
Number of patent applications	4	4	4	4
Number of patent applications filed per 100,000 inhabitants	3	3	2	2
Number of patents granted	4	4	4	4
Number of patents in force per 100,000 inhabitants	4	4	4	4
Medium- and high-tech value added	4	4	4	5
Laws relating to scientific research do encourage innovation*	34	31	30	31
Intellectual property rights are adequately enforced*	37	38	36	37
Knowledge transfer is highly developed between companies and universities*	35	30	25	30
Overall Ranking	3	3	2	3

► \* represents indicators in the survey

► \*\* represented percentage of university degree in science and technology before 2021

► Source: IMD, The World Competitiveness Yearbook ([www.imd.org](http://www.imd.org))

## 82 Competitiveness ranking of Korea in technological infrastructure (IMD)

	2019	2020	2021	2022
Investment in telecommunications as a percentage of GDP	46	42	44	15
Mobile broadband subscribers**	10	10	9	11
Monthly telephone costs per capita	57	55	57	54
Communications technology*	12	10	12	12
Number of secure internet servers				43
Number of internet users per 1,000 people	16	16	7	8
Number of broadband subscribers per 1,000 inhabitants	21	27	26	25
Internet bandwidth speed	27	2	12	12
Digital technology skills are readily available*	26	18	33	46
Qualified engineers are available in labor market*	31	25	37	42
Public and private sector ventures are supporting technological development*	41	29	38	46
Development and application of technology are supported by the legal environment*	50	44	45	48
Funding for technological development is readily available*	42	38	34	30
High-tech exports	8	4	6	5
High-tech exports as a percentage of manufactured exports	19	6	7	6
ICT as a percentage of total service exports	28	41	41	35
Cyber security is being adequately addressed by corporations*	23	21	23	28
Overall Ranking	22	13	17	19

▶ \* represents indicators in the survey

▶ \*\* represented based upon 3G and 4G services before 2021

▶ Source: IMD, The World Competitiveness Yearbook ([www.imd.org](http://www.imd.org))

## 83 Global competitiveness of Korea (WEF)

	2017	2018	2019
Global competitiveness	17	15	13
Institutions	28	27	26
Infrastructure	7	6	6
ICT adoption	1	1	1
Macroeconomic stability	1	1	1
Health	20	19	8
Skills	31	27	27
Product market	65	67	59
Labor market	47	48	51
Financial system	22	19	18
Market size	13	14	14
Business dynamism	22	22	25
Innovation capability	10	8	6

► Source: WEF, The Global Competitiveness Report ([www.weforum.org](http://www.weforum.org))

## 84 Global competitiveness ranking of major countries (2019, WEF)

Korea	USA	Japan	Germany	France	UK	China
13	2	6	7	15	9	28

► Source: WEF, The Global Competitiveness Report, 2019 ([www.weforum.org](http://www.weforum.org))

## 85 Composite Science and Technology Innovation Index (COSTII) of Korea

	2018		2019		2020		2021	
	Indicator (Score)	Ranking	Indicator (Score)	Ranking	Indicator (Score)	Ranking	Indicator (Score)	Ranking
COSTII	11,558	7	11,424	7	12,246	8	12,658	5
Resource	1,733	7	1,843	6	1,927	6	1,988	5
Activities	3,521	3	3,909	3	3,985	3	3,842	2
Network	1,605	9	1,743	8	1,926	7	2,521	6
Environment	2,276	25	2,459	23	2,669	23	2,817	22
Performance	1,744	14	1,770	14	1,740	14	1,490	13

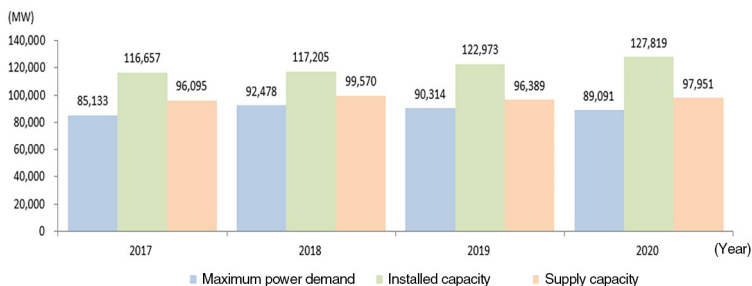
► Source: MSIT·KISTEP, COSTII

## V

## Other R&amp;D Statistics

## 11. Energy and Resources

## 86 Electricity supply and demand in Korea



- Installed capacity and supply capacity is based on each year's time of occurrence for maximum power demand  
 ► Source: KEPCO, Electric Power statistics ([home.kepcoco.kr](http://home.kepcoco.kr))

## 87 Petroleum and LNG supply in Korea

		2017	2018	2019	2020
Petroleum	Crude oil imports (million barrels)	1,118	1,116	1,072	980
	Amount of crude oil imports (million USD)	59,603	80,393	70,252	44,456
LNG	Imports (1,000 tons)	37,537	44,015	40,750	39,982

- Source: Statistics Korea (Korea National Oil Corporation, Korea Gas Corporation, and Korea Customs) ([www.index.go.kr](http://www.index.go.kr))

## 88 Total primary energy supply per 1,000 USD of GDP in major countries (2020)

	Korea	USA	Japan	Germany	France	UK	China ('19)
Energy supply (toe)/ 1,000 USD (PPP)	0.13	0.11	0.08	0.07	0.08	0.06	0.15

- Source: OECD, Primary energy supply (indicator)

## 89 Nuclear electricity as a percentage of total electricity generation in major countries (% , 2019)

Korea	USA	Japan	Germany	France	UK
24.8	19.3	5.9	12.3	69.4	16.4

- Source: OECD, Electricity generation (indicator)

## 90 Overseas natural resource development in Korea

		2017	2018	2019	2020
Number of overseas resource development programs (cumulative)	Petroleum/Gas	380	380	383	386
	In progress	131	122	119	118
	Production	79	73	70	69
	Development	12	11	11	10
	Exploration	40	38	38	39
	Completed programs	249	258	264	268
	General minerals	538	544	547	549
	In progress	322	316	308	301
Self-sufficient development ratio (%)	Completed programs	216	228	239	248
	Petroleum/Gas	13.0	13.0	13.0	12.0
	Bituminous coal	38.0	30.0	32.0	34.0
	Iron	26.0	32.0	32.0	34.0
	Bronze	8.0	8.0	10.0	12.0
	Zinc	20.6	19.9	20.7	21.5
	Nickel	61.8	55.2	55.0	47.2

► Self-sufficient development ratio indicates the percentage of resource developed and produced by domestic companies compared to total imports

► Source: Statistics Korea (Ministry of Trade, Industry & Energy) ([www.index.go.kr](http://www.index.go.kr))

## 12. Green Growth and Technology

## 91 Renewable energy supply in Korea (1,000 toe, %)

	2017	2018	2019	2020
Renewable energy supply	8,481	10,097	10,584	12,362
Supply percentage (%)	2.8	3.3	3.5	4.2
Solar heat	28.1	27.4	26.9	26.4
Sunlight	1,672.4	2,194.0	3,055.2	4,156.0
Bio	3,598.8	4,442.4	4,162.4	3,899.2
Waste	1,235.4	1,126.9	1,119.8	1,166.0
Water power	600.7	718.8	594.5	826.3
Wind power	462.2	525.2	570.8	671.1
Geothermal heat	183.9	205.5	224.7	241.0
Hydrogen/Fuel cell	313.3	376.3	487.2	750.8
Marine	104.3	103.4	101.0	97.4
hydrothermal	7.9	14.7	21.2	21.3
IGCC	273.9	362.5	219.7	506.4

► Source: Statistics Korea (New Renewable Energy Center) ([www.index.go.kr](http://www.index.go.kr))

## 92 Contribution of renewable energy to energy supply in major countries (% , 2020)

Korea	USA	Japan	Germany	France	UK	China (*19)
2.25	8.50	6.77	16.38	11.81	13.91	9.67

► Source: OECD, Renewable energy (indicator)

**93** CO<sub>2</sub> emissions in major countries (kg/PPP \$, 2020)

Korea	USA	Japan	Germany	France	UK	China('19)
0.27	0.22	0.20	0.15	0.10	0.12	0.43

► Source: IEA, Data Services, 2021

**94** GBAORD performed in health and environment sector in major countries (% , 2021)

Korea ('20)	USA	Japan	Germany	France	UK ('20)
14.9	56.4	9.6	12.2	12.2	29.3

► Source: OECD, Main Science & Technology Indicators 2022–September

## 13. Space

**95** Space programs as a percentage of GBARD in major countries (2021)

	Korea ('20)	USA	Japan	Germany	France	UK ('20)
GBARD for space programs (million USD)	339	12,594	2,987	2,050	2,319	218
Space programs as a percentage of GBARD (%)	1.98	14.38	4.06	4.63	12.43	1.48

► Government R&D budget does not include national defense budget

► Source: OECD, MSTI 2022–September ([stats.oecd.org](https://stats.oecd.org))

**96** BERD performed in aerospace industry in major countries (2020)

	Korea	USA ('19)	Japan	Germany ('19)	France ('17)	UK ('19)
Aerospace industry R&D expenditure (million USD)	336	18,708	1,033	1,673	2,969	2,298
Percentage of aerospace industry R&D expenditure in BERD (%)	0.54	3.72	0.80	1.97	7.95	6.94

► Source: OECD, MSTI 2022–September ([stats.oecd.org](https://stats.oecd.org))

## 14. Biotechnology

**97** BERD performed in biotechnology industry in major countries (2019)

	Korea	USA	Germany ('20)	France
Biotechnology industry R&D expenditures(million ppp \$)	2,118	77,792	2,871	3,978
Companies in biotechnology industry	966	2,470	877	2,265

► OECD, Key Biotechnology Indicators (<http://oecd.org/kbi>)

### 98 Trends and personnel in biotechnology industry in Korea

		2017	2018	2019	2020
Industry trends (trillion KRW)	Production	10,15	10,61	12,66	17,49
	Domestic demand	6,55	7,10	8,18	9,82
	Exports	5,17	5,24	6,54	10,02
	Imports	1,70	1,73	2,07	2,34
Personnel	R&D personnel	14,143	14,532	15,333	16,873
	Production personnel	15,874	16,169	16,802	18,492
	Total	27,756	30,017	30,701	32,434

► R&D personnel indicates personnel for R&D in biotechnology

► Production personnel indicates personnel for production, including facility management and quality assurance in biotechnology

► Source: MOTIE, Korea Biotechnology Industry Organization, Report on Survey of Domestic Bio-industry

## 15. Economic and Social Indicators

### 99 Population and GDP per capita in major countries (2021)

	Korea	USA	Japan	Germany	France	UK	China
Population (thousands)	51,952	330,601	125,502	83,196	68,217	67,531	1,412,600
GDP per capita (USD)	34,619	69,558	39,341	51,204	43,360	47,191	12,584

► Source: OECD, MSTI 2022–September ([stats.oecd.org](https://stats.oecd.org))

### 100 Labor force, total employment, and industry value added in major countries (2021)

	Korea	USA	Japan	Germany	France	UK	China
Labor force (thousands)	28,117	162,630	68,755	43,063	30,123	33,740	783,920 ('20)
Total employment (thousands)	27,266	154,827	68,286	44,603	29,007	32,361	750,640 ('20)
Value added of industry (100 million USD)	12,273	149,861	35,080	26,192	17,177	19,502	144,595

► Source: OECD, MSTI 2022–September ([stats.oecd.org](https://stats.oecd.org))







# Glossary

Abbreviation	Full name
EPO	European Patent Organization
IMD	International Institute for Management Development
ISIC	International Standard Industrial Classification
JPO	Japan Patent Office
KAIST	Korea Advanced Institute of Science and Technology
KEPCO	Korea Electric Power Corporation
KIPO	Korea Intellectual Property Office
KSIC	Korean Standard Industrial Classification
MOE	Ministry of Education
MOTIE	Ministry of Trade, Industry & Energy
MSIT	Ministry of Science and ICT
MSTI	Main Science and Technology Indicators
OECD	Organization for Economic Cooperation and Development
PCT	Patent Cooperation Treaty
PPP	Purchasing Power Parity
SCI	Science Citation Index
USPTO	United States Patent and Trademark Office
WEF	World Economic Forum
WIPO	World Intellectual Property Organization

2022–September

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