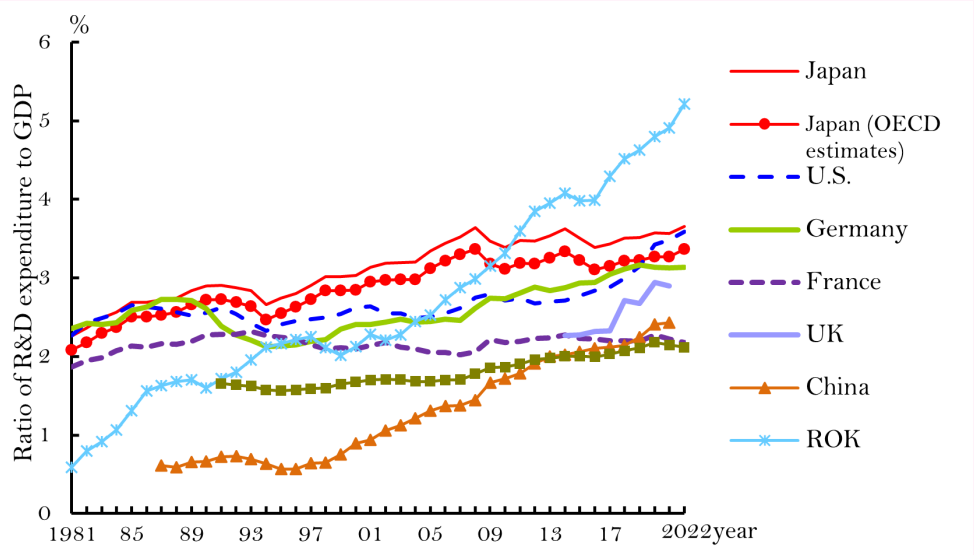
Indicators Related to Japanese Science, Technology and Innovation

This document provides an overview of indicators related to science, technology, and innovation in Japan as a whole, and makes comparison with other major countries.

Item 1: R & D Expenditure

1. Changes in the Ratio of Total R&D Expenditure to GDP

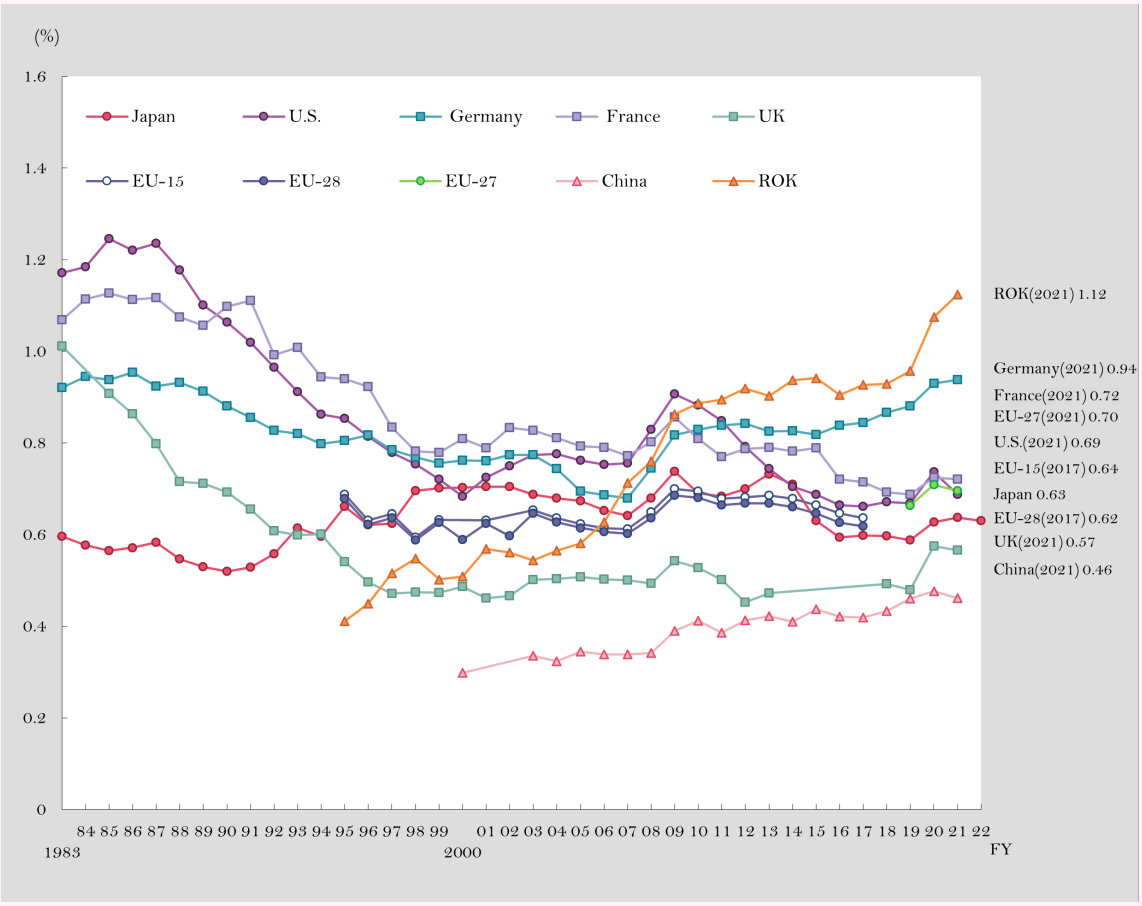
■Figure D1-1/Changes in the ratio of total R&D expenditure to GDP in Major Countries, etc.



Source: NISTEP, MEXT, "Japanese Science and Technology Indicators 2024."
See the source for notes.

2. Changes in the Ration of Government-Funded Research Expenditure to GDP in Major Countries, etc.

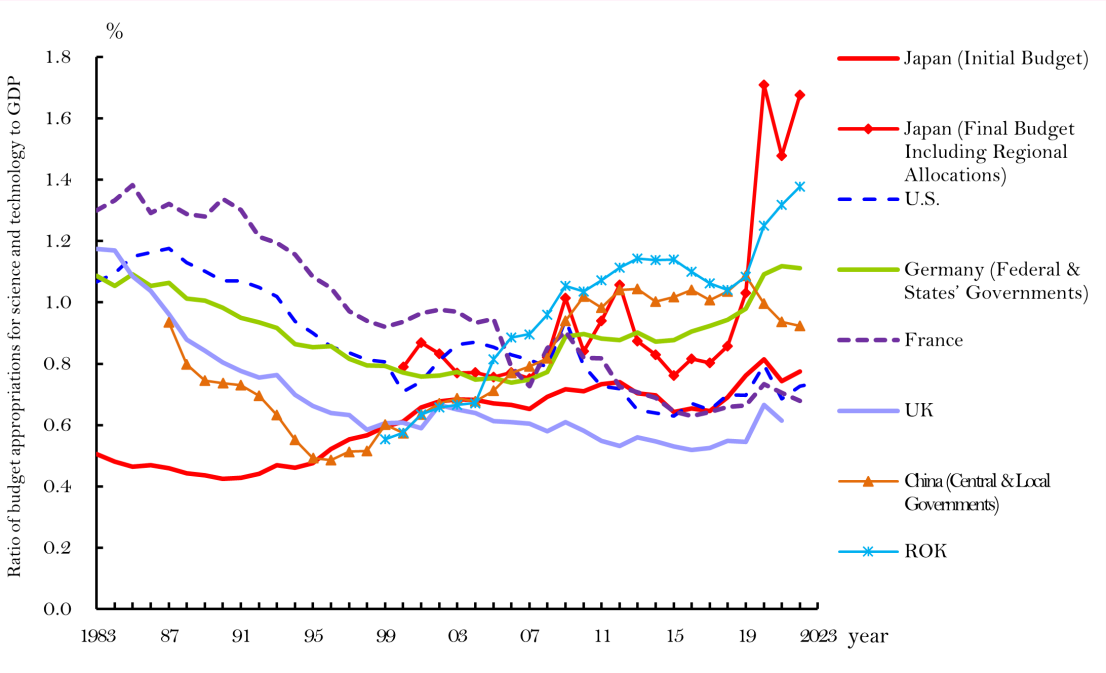
■Figure D1-2/Changes in the ratio of government-funded research expenditure to GDP in Major Countries, etc.



Source: Created by MEXT based on MEXT, " Indicators of Science and Technology 2023."

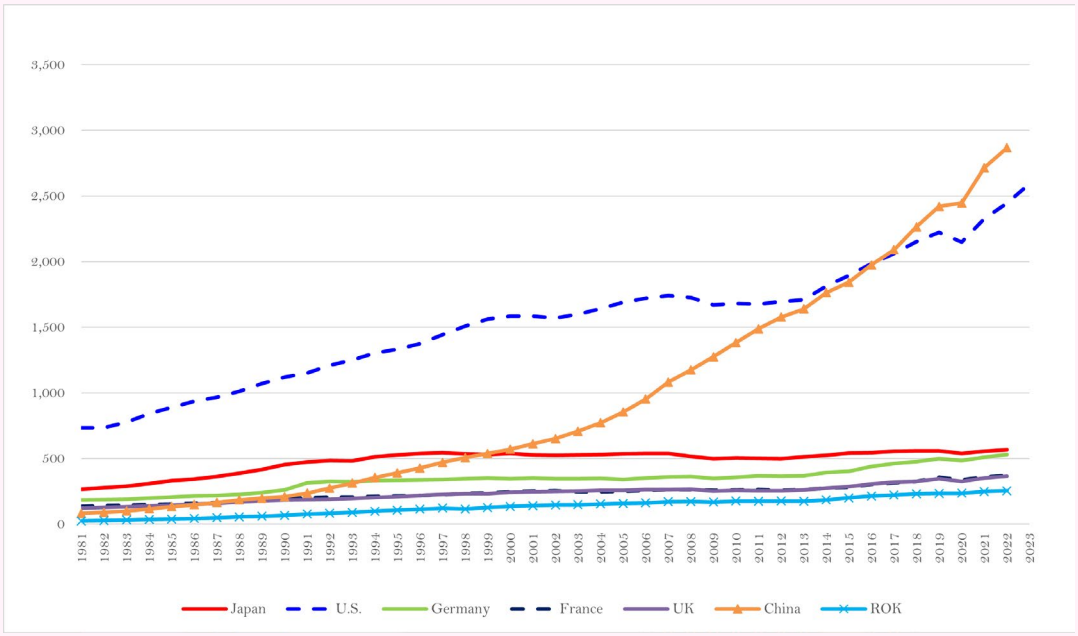
3. Changes in the Ration of Government Budget Appropriations for Science and Technology to GDP in Major Countries

■Figure D1-3/Changes in the ratio of government budget appropriations for science and technology to GDP in major Countries



Source: NISTEP, MEXT, "Japanese Science and Technology Indicators 2024."
See the source for notes.

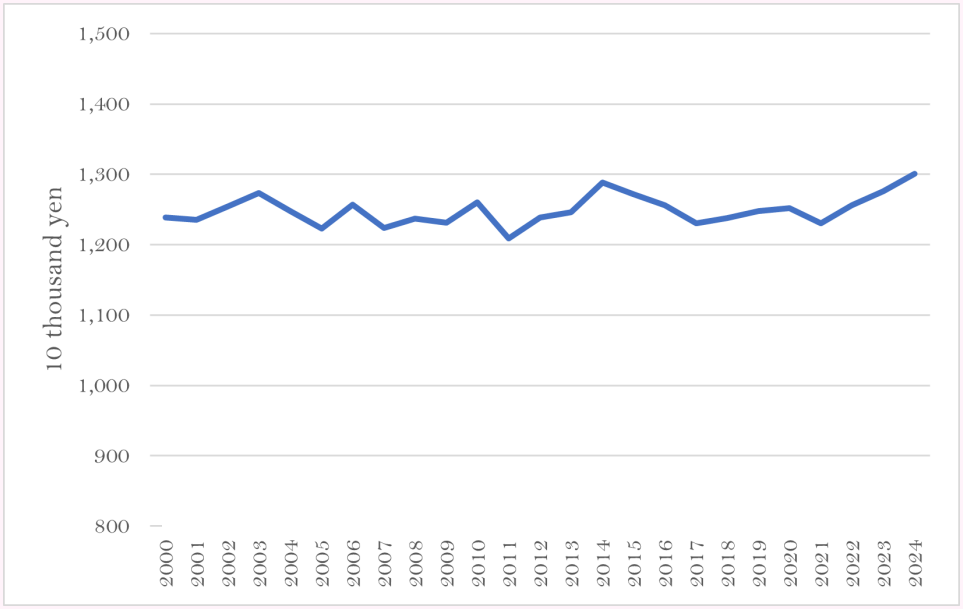
■Figure D1-4/Changes in the gross domestic product (GDP) of major countries (OECD purchasing power parity equivalent)



Source: Created by MEXT based on NISTEP, MEXT, "Japanese Science and Technology Indicators 2024. "

4. Research Expenditure per Full-time Researcher in the University Sector

■Figure D1-5/Changes in research expenditure per full-time researcher



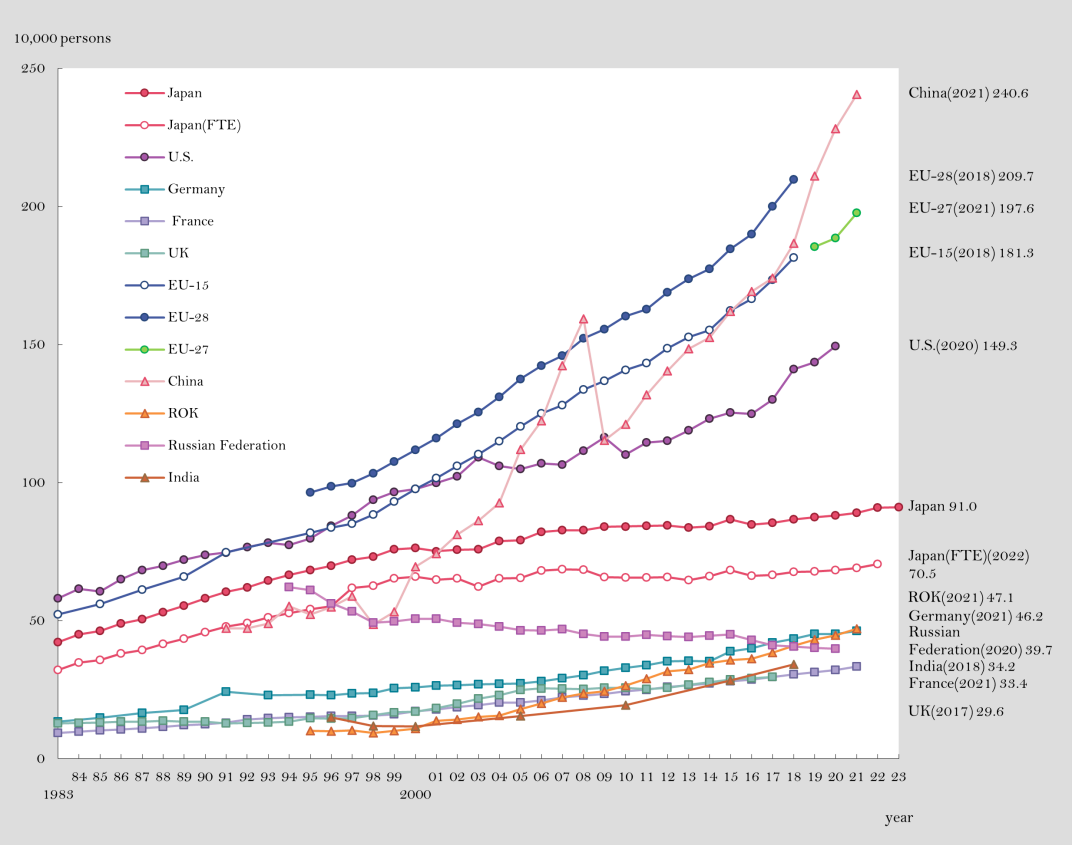
Note: As of March 31 of each year
Source: Created by MEXT based on Statistics Bureau, MIC, "Reports of Survey of Research and Development."[1]

[1] Statistics Bureau, MIC, "Results of the Survey of Research and Development."
https://www.stat.go.jp/data/kagaku/kekka/index.html

Item 2. Research Personnel

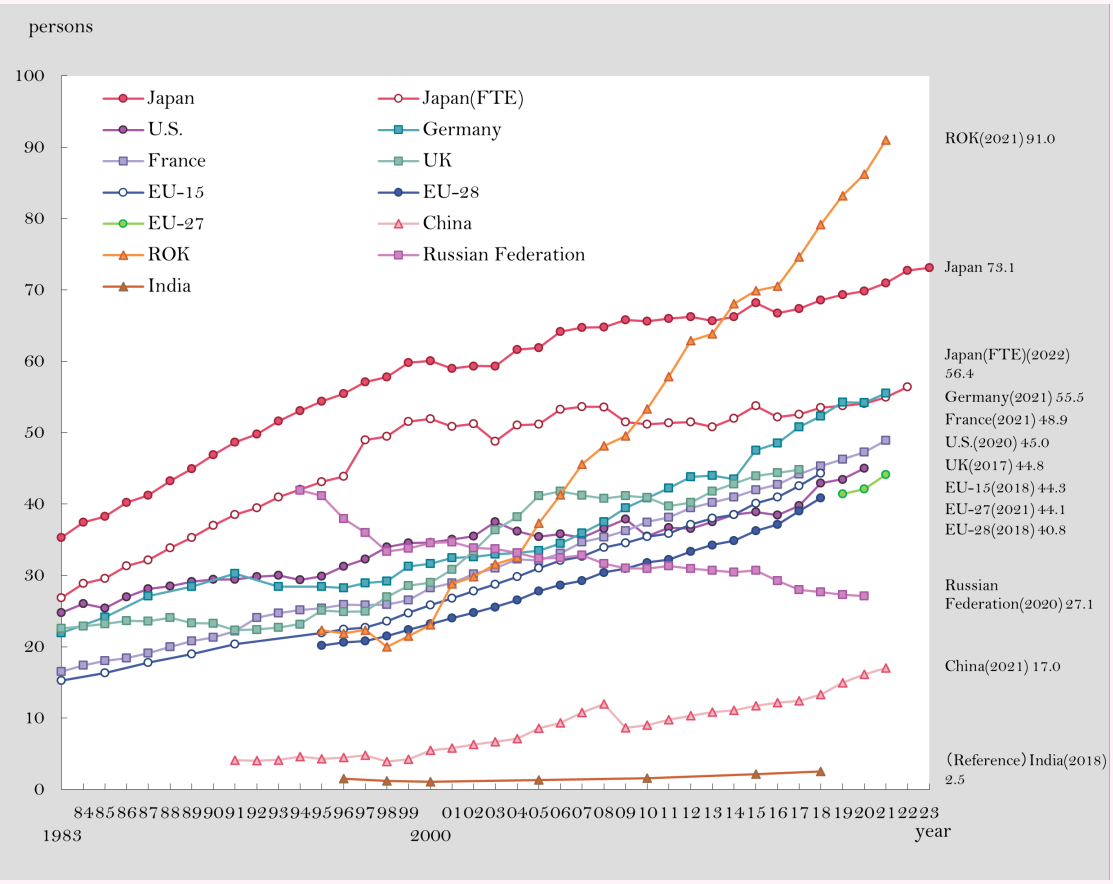
1. Number of Researchers Taking into Account the Ratio of Time Spent on Research

■Figure D1-6/Changes in the number of researchers in major countries, etc.



Source: " MEXT, "Indicators of Science and Technology 2023."
See the source for notes.

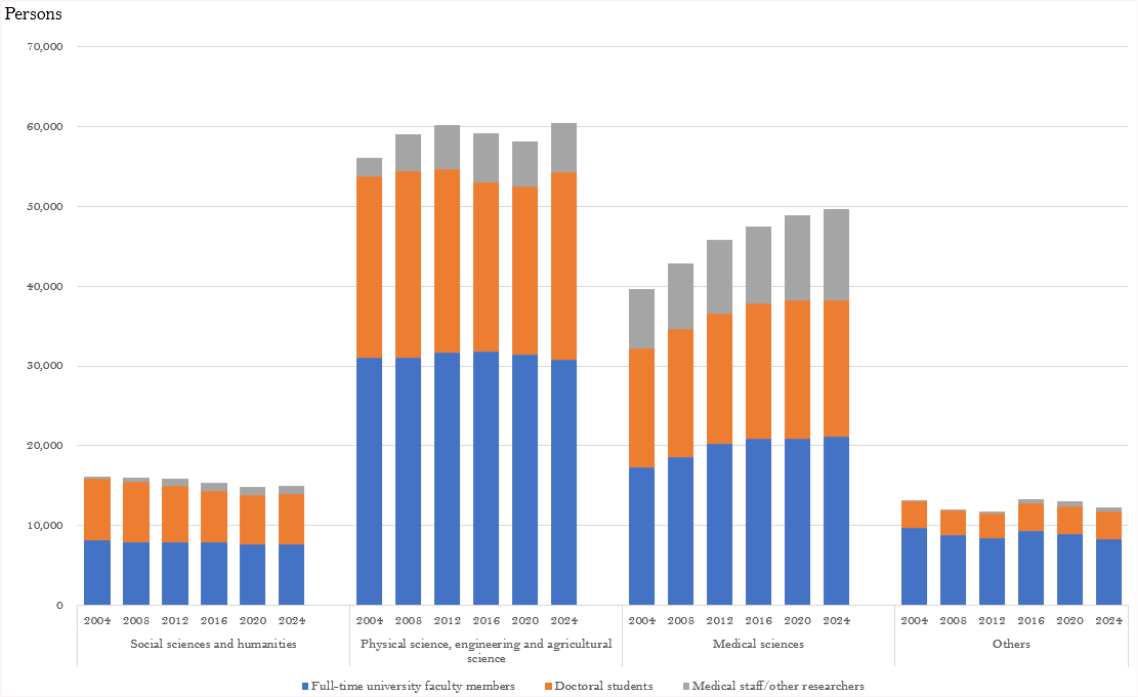
■Figure D1-7/Changes in Number of Researchers per 10,000 Population in Major Countries, etc.



Source: MEXT, "Indicators of Science and Technology 2023."
See the source for notes.

2. Number of Researchers by Field at National Universities, etc.

■Figure D1-8/Changes in the number of researchers by field at national universities, etc.

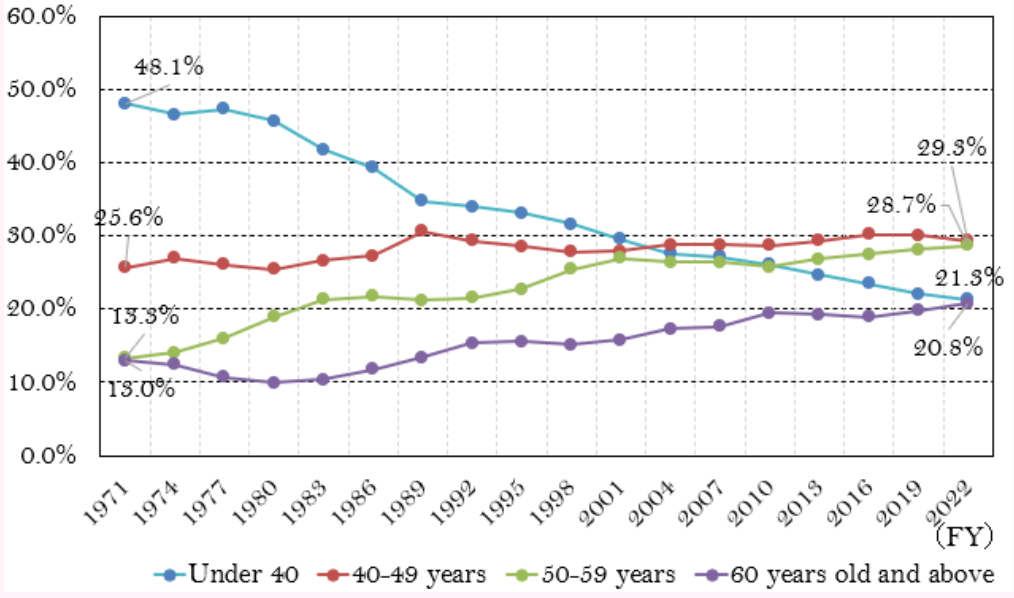


Note: As of March 31 of each year

Source: Created by MEXT based on Statistics Bureau, MIC, "Results of the Survey of Research and Development."[1]

3. Percentage of Full-time University Faculty Members by Age Group

■Figure D1-9/Changes in the percentage of full-time university faculty members by age group

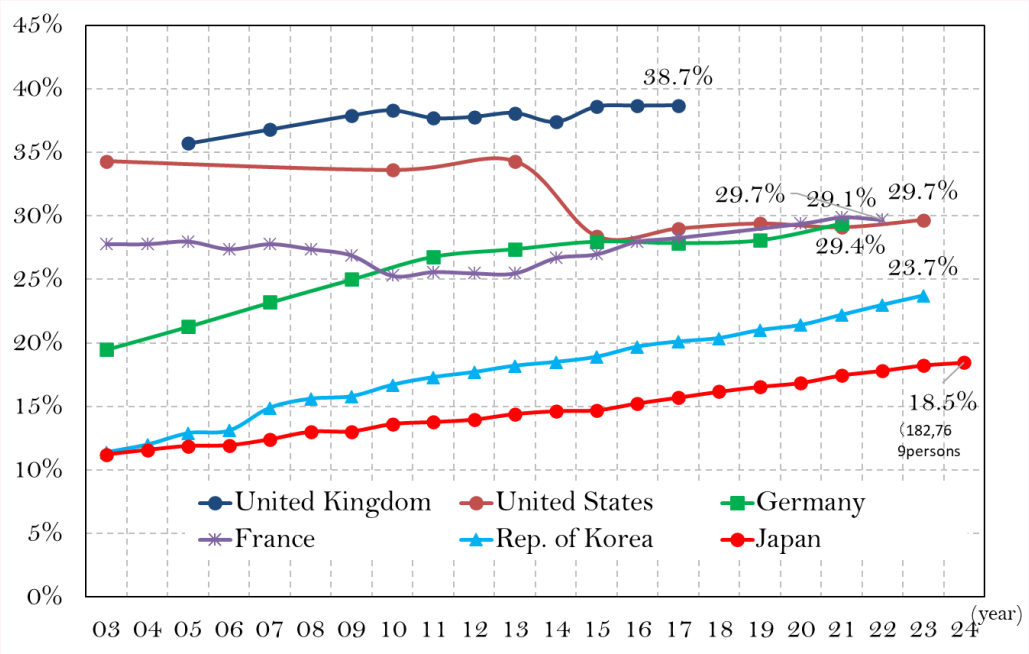


Source: Created by MEXT based on MEXT, "School Teachers Survey."

[1] Statistics Bureau, MIC, "Report of the Survey of Research and Development."
https://www.stat.go.jp/data/kagaku/kekka/index.html

4. Percentage of Female Researchers

■Figure D1-10/Percentage of female researchers in various foreign countries



(Note 1) Data for the U.S. are the percentages of women who, of scientific and engineering occupations (S&E occupations), are scientists and who are employed with a bachelor's degree or higher (Scientific occupations include biologists and life scientists, computer and information scientists, mathematical scientists, physical chemists, psychologists, and social scientists. Engineering occupations include aerospace engineers, chemical engineers, civil engineers, electrical engineers, industrial engineers, mechanical engineers, other engineers, and educators in higher education.)

(Note 2) A "researcher" in Japan refers to persons who have completed a course in a university (excluding junior college) or who have specialized knowledge equivalent to or superior to such courses and are conducting research on a specific theme. In addition to universities, researchers from public institutions and business enterprises, etc., have also been included in the survey.

(Note 3) When surveying and counting researchers in Japanese universities, in addition to university faculty members (professors, associate professors, lecturers, and assistant professors), medical staff, those enrolled in graduate school doctoral programs, etc., have been included.

Sources:

Japan: "Report on the Survey of Research and Development" [1], Statistics Bureau, Ministry of Internal Affairs and Communications (as of March 31 of each year)

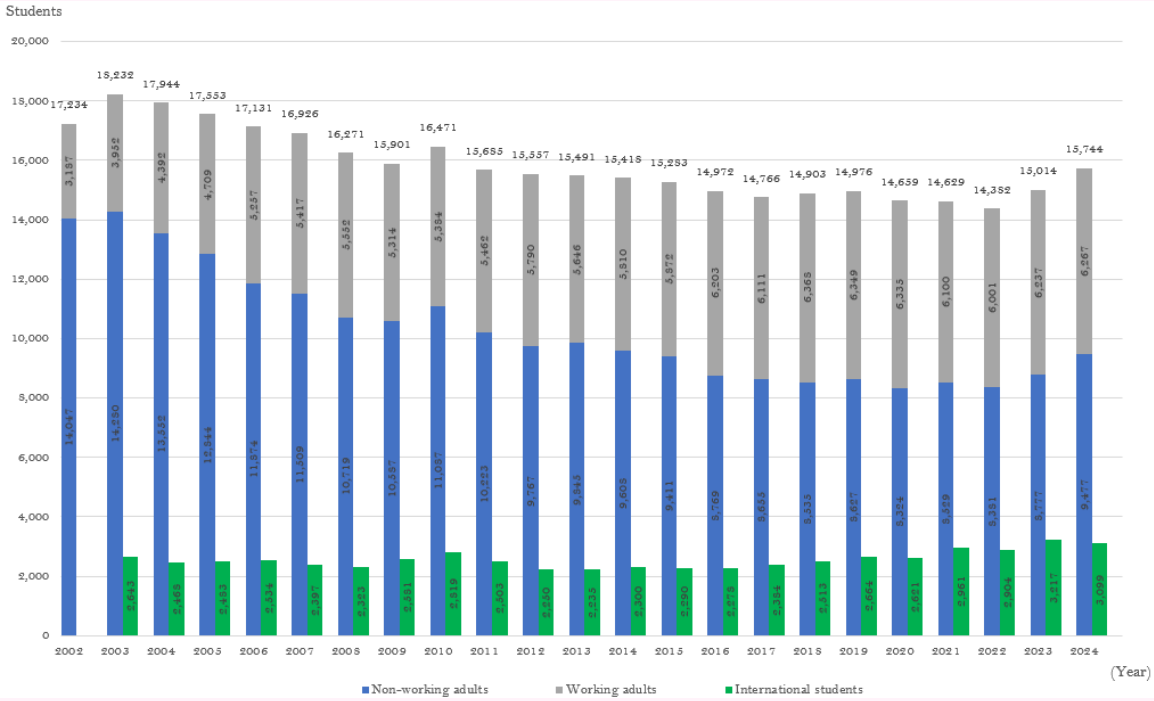
U.S/NSF "Science and Engineering Indicator"

Other countries/Created by MEXT based on OECD "Main Science and Technology Indicators" (as of June 6, 2025)

1 Statistics Bureau, MIC, "Report of the Survey of Research and Development." https://www.stat.go.jp/data/kagaku/kekka/index.html

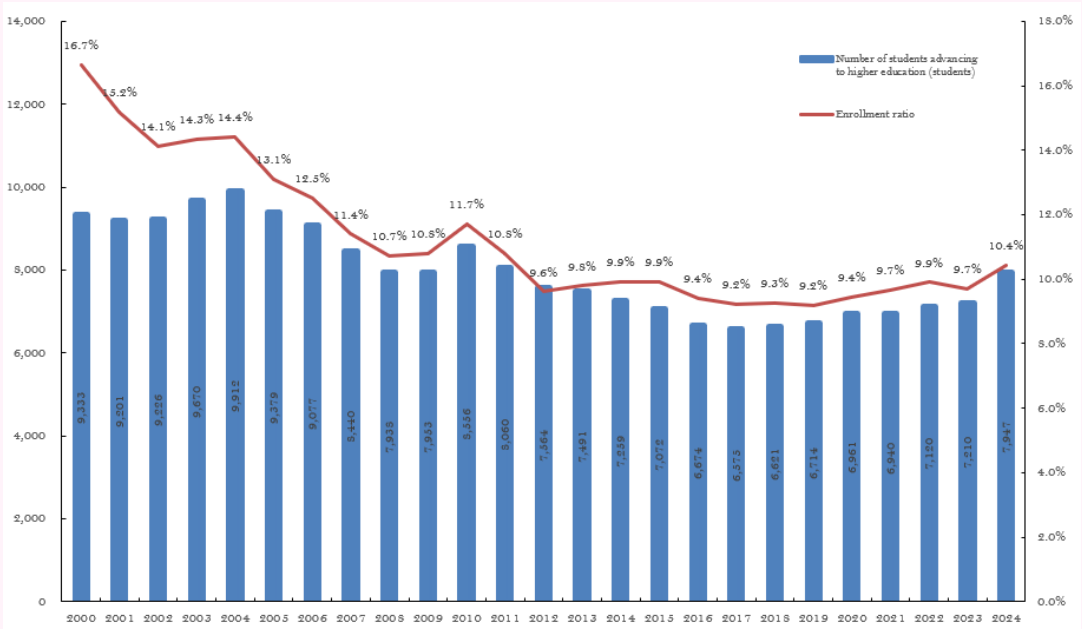
5. Number of Students Enrolled in Doctoral Courses

■Figure D1-11/Changes in the number of students enrolled in doctoral courses



Source: Created by MEXT based on MEXT, "School Basic Statistics."

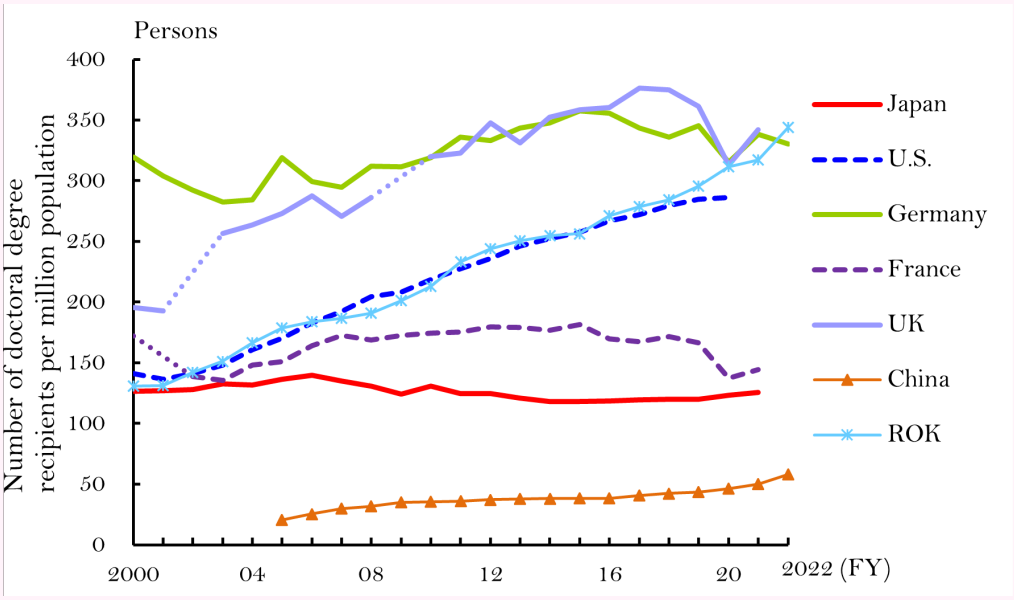
■Figure D1-12/Changes in the number and percentage of students advancing from master's courses to doctoral courses, etc.



Source: Created by MEXT based on MEXT, "School Basic Statistics."

6. Number of Doctoral Degree Recipients per Population

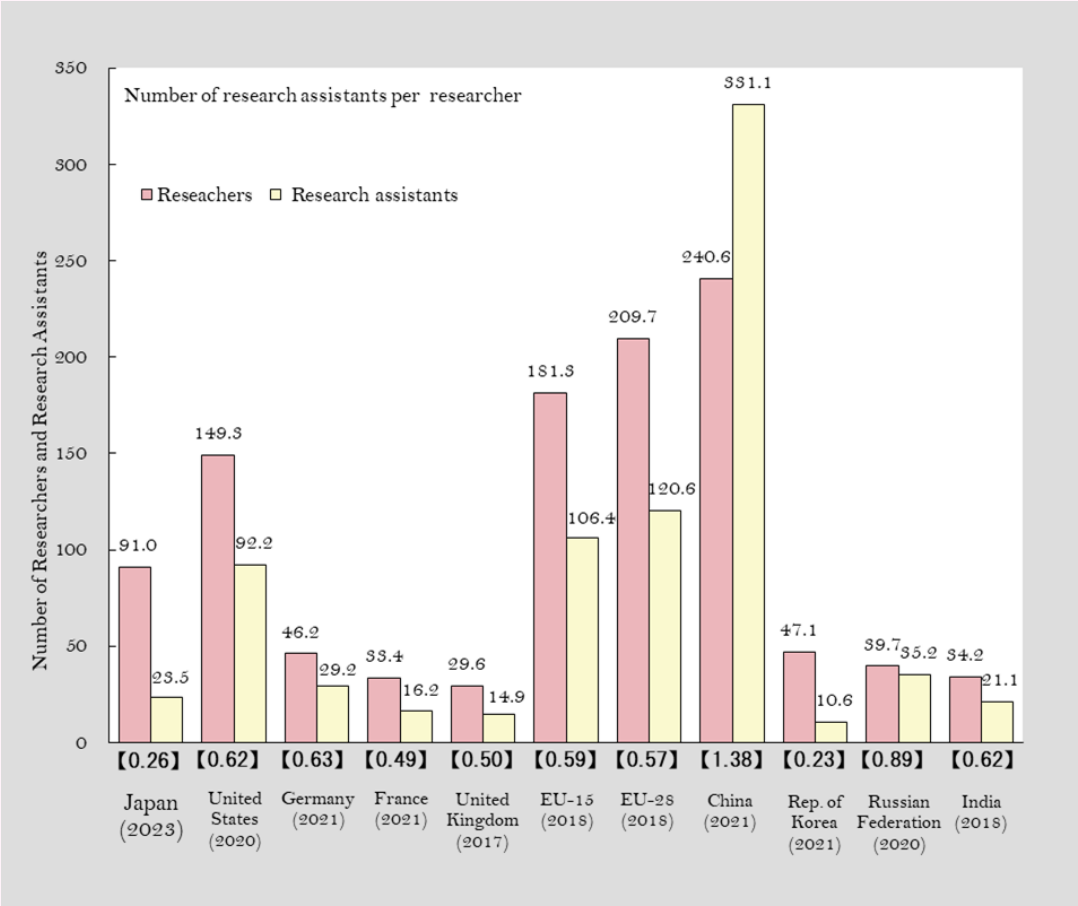
■Figure D1-13/International comparison of doctoral degree recipients per million population



Source: NISTEP, MEXT, "Japanese Science and Technology Indicators 2024."
See the source for notes.

7. Number of Research Assistants

■Figure D1-14/Number of research assistants per researcher in major countries, etc.

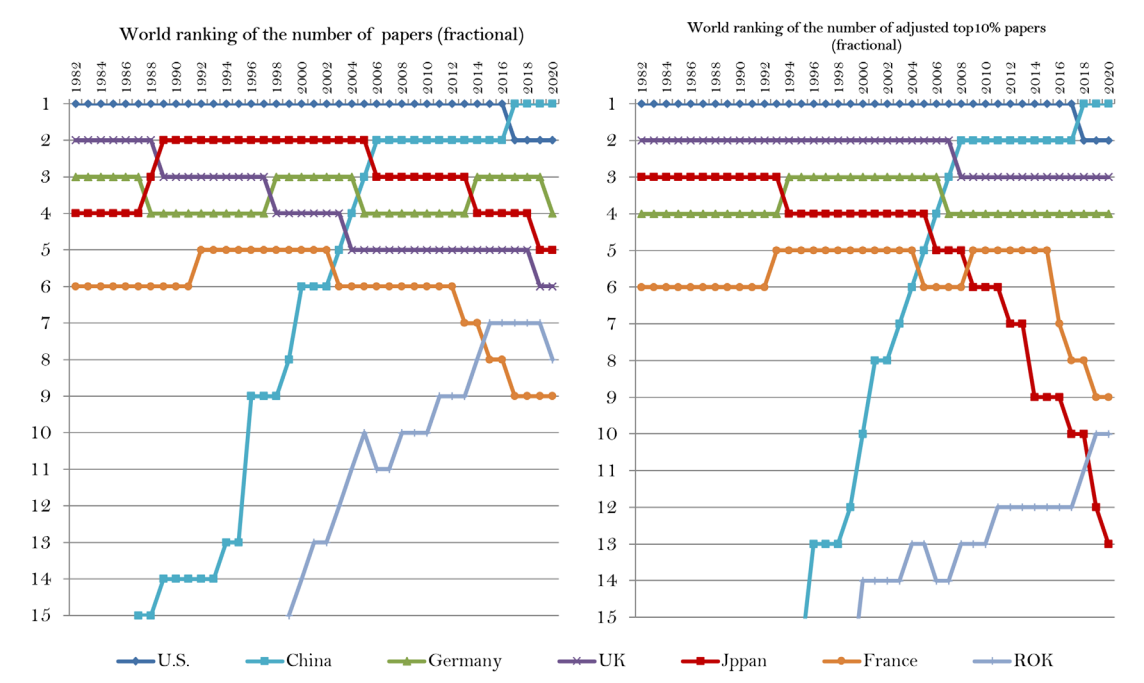


Source: MEXT, " Indicators of Science and Technology 2023."
See the source for notes.

Item 3. Paper Index[1]

1. World Ranking in Number of Papers

■Figure D1-15/Changes in the world ranking of major countries for the number of papers and number of adjusted top 10% papers



Source: NISTEP, MEXT, "Benchmarking Scientific Research 2023."
See the source for notes.

■Figure D1-16/ Number of papers and number of adjusted top 10% papers by country: top countries (natural sciences, fractional counting)

All fields	2020- 2022 (PY) (average)		
	Number of papers		
Contry/region name	Fractional Counting		
	Papers	Share	Ranking
China	541,425	26.9	1
U.S.	301,822	15.0	2
India	85,061	4.2	3
Germany	74,456	3.7	4
Japan	72,241	3.6	5
UK	68,041	3.4	6
Italy	61,124	3.0	7
ROK	59,051	2.9	8
France	46,801	2.3	9
Spain	46,006	2.3	10

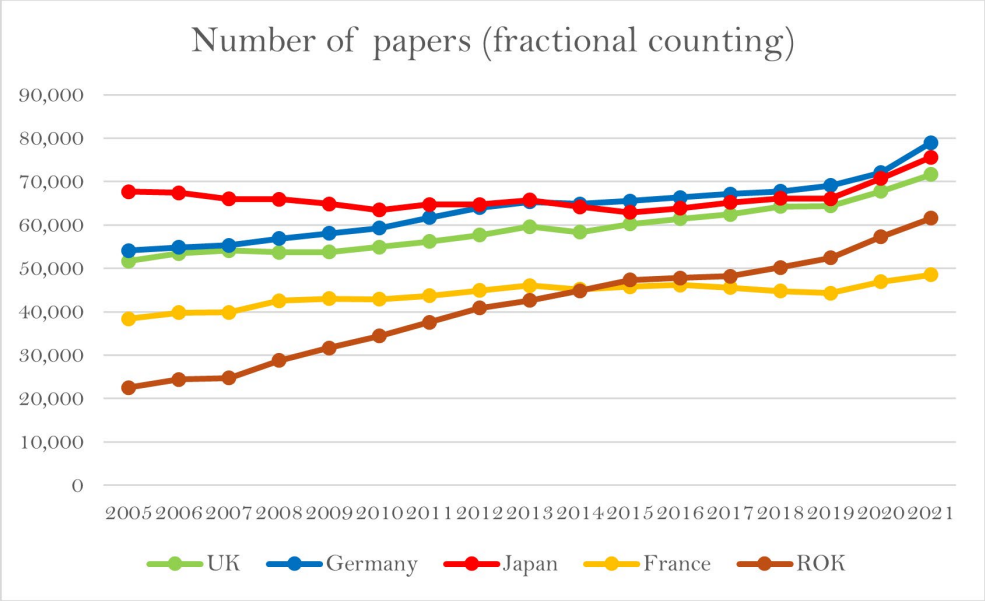
All fields	2020 to 2022 (PY) (Average)		
	Number of adjusted top 10% papers		
Contry/region name	Fractional Counting		
	Papers	Share	Ranking
China	64,138	31.8	1
U.S.	34,995	17.4	2
UK	8,850	4.4	3
India	7,192	3.6	4
Germany	7,137	3.5	5
Italy	6,943	3.4	6
Australia	5,151	2.6	7
Canada	4,654	2.3	8
⋮	⋮	⋮	⋮
Japan	3,719	1.8	13

Source:Created by MEXT based on NISTEP, MEXT, "Japanese Science and Technology Indicators 2024."
See the source for notes.

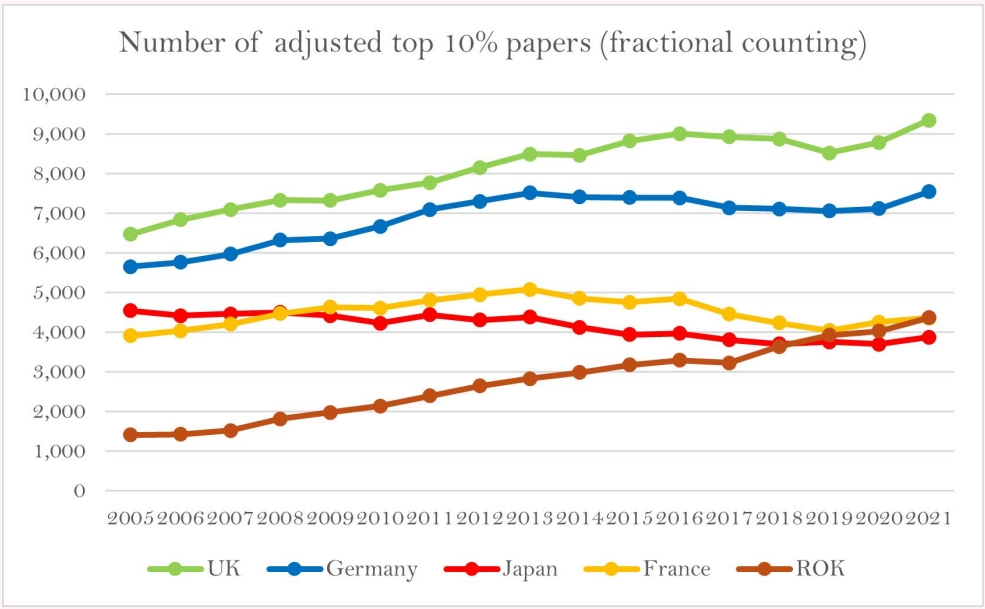
1 The number of papers referred to in this item includes only the papers classified as those in the field of natural sciences which are contained in Clarivate's Web of Science Core Collection.

2. Changes in the Number of Papers and Adjusted Top 10% Papers

■Figure D1-17/Changes in the number of papers and number of adjusted top 10% papers of major countries



* The number of papers in the U.S. (approx. 230,000 → approx. 310,000) and China (approx. 60,000 → approx. 520,000) are not included

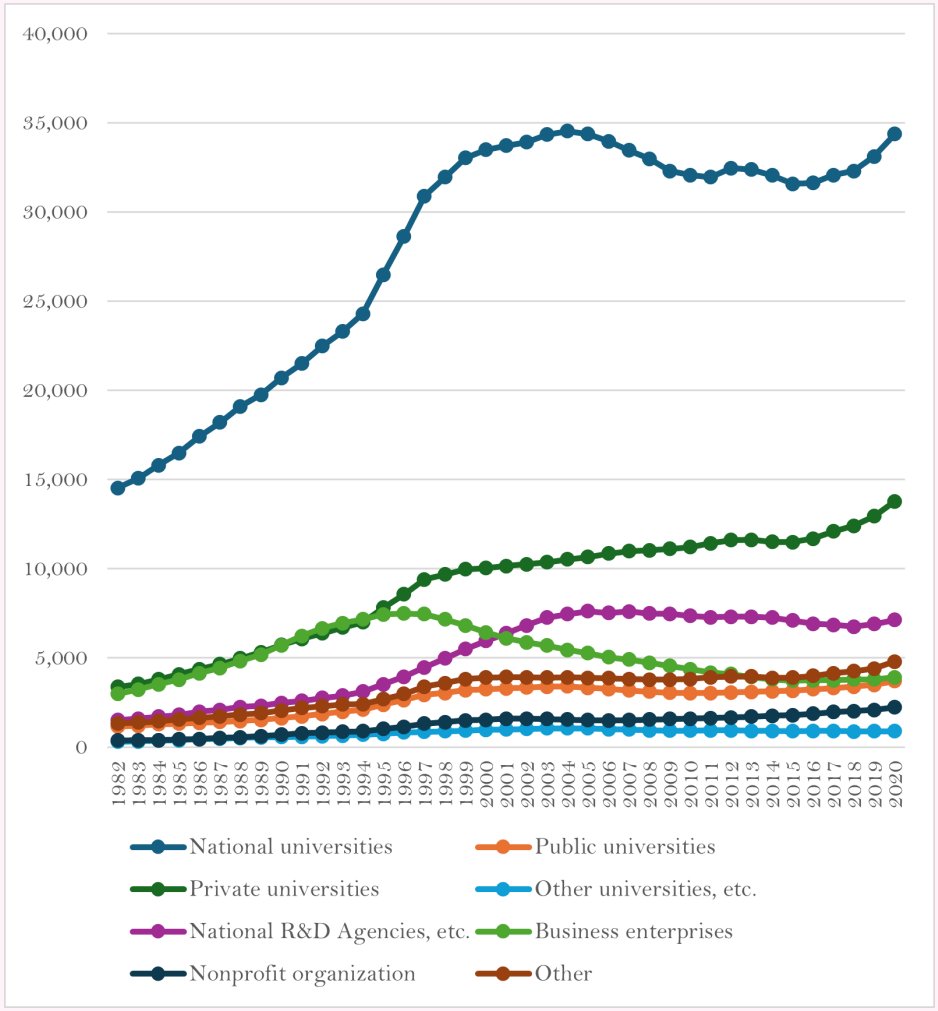


* The number of U.S. (approx. 30,000 → approx. 40,000) and China (approx. 4,000 → approx. 60,000) are not included.

Source: Created by MEXT based on NISTEP, MEXT, "Benchmarking Scientific Research 2023."

3. Changes in the Number of papers by Organization

■Figure: D1-18/Changes in Japan's number of papers by type of organization (moving average over 3 years, fractional counting)

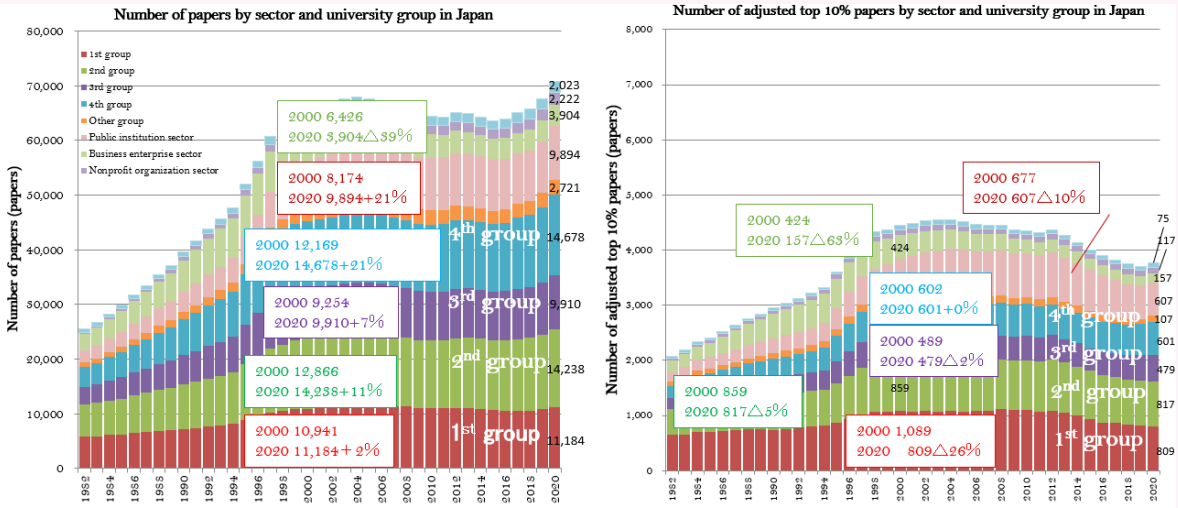


Source: Created by MEXT based on NISTEP, MEXT, "Benchmarking Scientific Research 2023"

4. Number of Papers and Number of Adjusted Top 10% Papers by Sector and University Group

■Figure D1-19/ Number of papers and adjusted top 10% papers by sector and university group in Japan

Share of the number of papers: Universities, etc. sector / 75%, Public institution sector / 14%, Business enterprise sector / 6%
Share of the number of adjusted top 10% papers: Universities, etc. sector / 75%, Public institution sector / 16%, Business enterprise sector / 4%



University Group	Share of papers (2017 to 21)	Number of universities (National. Public, Private)	Name of university
1st group	1% or more (top 4 universities)	4 (4, 0, 0)	Osaka Univ., Kyoto Univ., Tokyo Univ., Tohoku Univ.
2nd group	1% or more (excluding top 4 universities)	14 (11, 1, 2)	Okayama Univ., Kanazawa Univ., Kyushu Univ., Kobe Univ., Chiba Univ., Univ. of Tsukuba, Tokyo Medical & Dental Univ., Tokyo Institute of Technology, Nagoya Univ., Hiroshima Univ., Hokkaido Univ., Osaka Metropolitan Univ., Keio Univ., Waseda Univ.
3rd group	0.5% or more - less than 1%	28 (16, 3, 9)	Ehime Univ., Kagoshima Univ., Gifu Univ., Kumamoto Univ., Shizuoka Univ., Shinshu Univ., Tokyo Univ. of Agriculture & Technology, Tokushima Univ., Tottori Univ., Toyama Univ., Nagasaki Univ., Niigata Univ., Mie Univ., Yamagata Univ., Kyoto Prefectural Univ. of Medicine, Tokyo Metropolitan Univ., Yokohama City Univ., Kitasato Univ., Kinki Univ., Jichi Medical Univ., Juntendo Univ., Tokai Univ., Tokyo Women's Medical Univ., Tokyo Univ. of Science, Nihon Univ., Ritsumeikan Univ.
4th group	0.05% or more - less than 0.5%	133 (36, 17, 80)	National: Akita Univ., Asahikawa Medical Univ., Ibaraki Univ., Iwate Univ., Utsunomiya Univ., others Public: Aizu Univ., Akita Prefectural Univ., Kitakyushu City Univ., Gifu Pharmaceutical Univ., Kyushu Dental Univ., others Private: Aichi Medical Univ., Aichi Gakuin Univ., Aichi Institute of Technology, Aoyama Gakuin Univ., Azabu Univ., others
Other group	Less than 0.05%	—	Universities other than those above, inter-university research institute corporations, and technical colleges

(Note 1) Articles and Reviews are included in the analysis and analyzed using the fractional counting method. Shows the 3-year moving average.
(Note 2) The "public institution sector" includes national government agencies, national R&D agencies, and organizations of local governments.
Source:Created by MEXT based on NISTEP, MEXT, "Benchmarking Scientific Research 2023."

Item 4. Patents and Industry-University Collaboration [1]

1. Number of Patent Families

■Figure D1-20/Number of patent families in major countries/region (top 10 countries/regions)

1997 - 1999 (average)			
Country/region name	Number of patent families (whole counting)		
	Count	Share	Ranking
U.S.	35,042	27.6	1
Japan	34,410	27.1	2
Germany	22,419	17.6	3
France	8,014	6.3	4
UK	6,880	5.4	5
ROK	4,827	3.8	6
Italy	3,592	2.8	7
Netherlands	3,085	2.4	8
Switzerland	2,859	2.3	9
Canada	2,845	2.2	10

2007 - 2009 (average)			
Country/region name	Number of patent families (whole counting)		
	Count	Share	Ranking
Japan	58,426	29.2	1
U.S.	44,460	22.3	2
Germany	27,603	13.8	3
ROK	17,179	8.6	4
France	10,564	5.3	5
China	10,320	5.2	6
Taiwan	9,813	4.9	7
UK	8,140	4.1	8
Canada	5,219	2.6	9
Italy	5,122	2.6	10

2017 - 2019 (average)			
Country/region name	Number of patent family (whole counting)		
	Count	Share	Ranking
Japan	67,082	25.5	1
U.S.	56,987	21.7	2
China	36,363	13.8	3
Germany	28,199	10.7	4
ROK	23,071	8.8	5
Taiwan	11,346	4.3	6
France	11,184	4.3	7
UK	8,734	3.3	8
Italy	5,461	2.1	9
Canada	5,454	2.1	10

Source: NISTEP, MEXT, "Japanese Science and Technology Indicators 2024."
See the source for notes.

1 The number of papers referred to in this item includes only the papers classified as those in the field of natural sciences which are contained in Clarivate's Web of Science Core Collection.

2. Number of Papers Cited in Patent Families

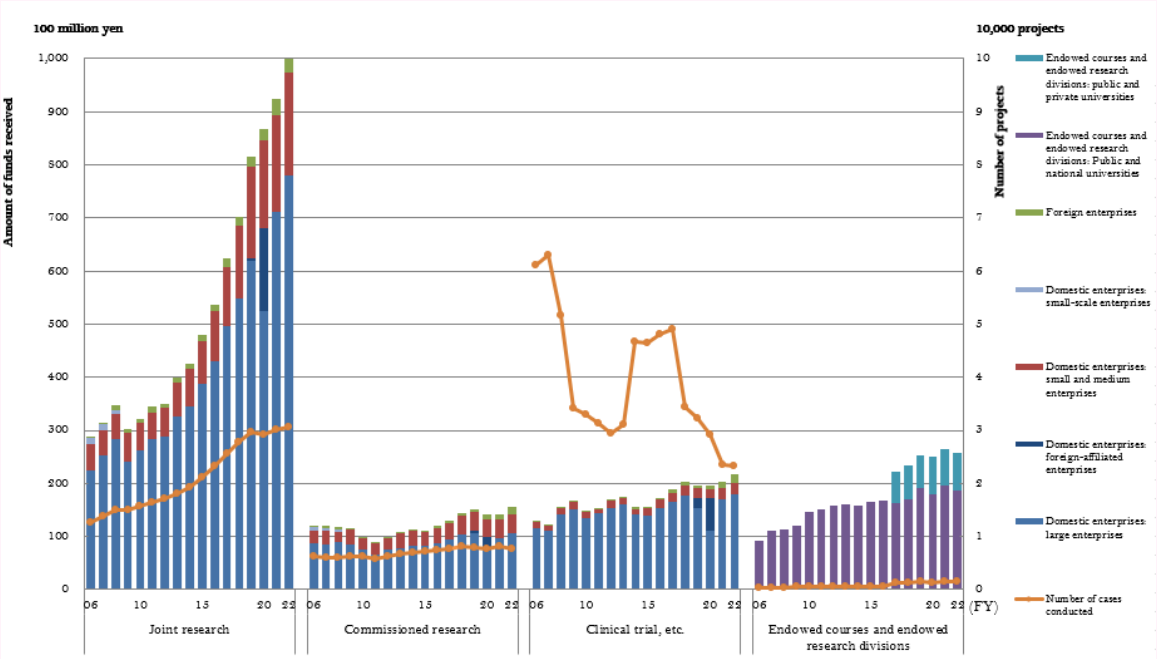
■Figure D1-21: Number of papers cited in patent families (top 25 countries/regions)

1981 - 2019 (total number)					
	(C) Number of papers cited by patent families			(D) Percentage of (C) in the number of papers	Ranking based on (D)
Country/region name	Whole counting				
	Count	Share	Ranking		
U.S.	440,247	33.7	1	4.6	3
UK	90,139	6.9	2	3.5	11
Germany	88,118	6.8	3	3.4	12
Japan	76,517	5.9	4	3.2	15
China	74,195	5.7	5	2.0	21
France	57,003	4.4	6	3.1	16
Canaka	48,660	3.7	7	3.4	13
Italy	40,991	3.1	8	3.0	17
Netherlands	34,210	2.6	9	4.3	4
ROK	29,564	2.3	10	3.5	10
Australia	29,249	2.2	11	2.9	18
Switzerland	27,976	2.1	12	4.6	2
Spain	27,257	2.1	13	2.7	20
Sweden	22,124	1.7	14	3.7	8
Belgium	17,941	1.4	15	4.1	5
India	16,162	1.2	16	1.5	23
Denmark	13,472	1.0	17	3.9	7
Taiwan	13,424	1.0	18	2.8	19
Israel	13,416	1.0	19	4.0	6
Austria	11,300	0.9	20	3.7	9
Brazil	9,458	0.7	21	1.4	24
Singapore	9,306	0.7	22	4.8	1
Finland	8,945	0.7	23	3.2	14
Poland	7,747	0.6	24	1.5	22
Russian Federation	7,213	0.6	25	0.6	25

Source: NISTEP, MEXT, "Japanese Science and Technology Indicators 2024."
See the source for notes.

3. Joint Research Projects between Universities, Private Enterprises, etc.

■Figure D1-22/Changes in the amount received (breakdown) and the number of joint research projects between universities and private enterprises



Source: NISTEP, MEXT, "Japanese Science and Technology Indicators 2024."
See the source for notes.