Highlights of
Science and Technology Indicators 2015
and
Benchmarking Scientific Research 2015

Research Unit for Science and Technology Analysis and Indicators

National Institute of Science and Technology Policy (NISTEP)

This material indicates the main points of the following reports released on August 5, 2015.

1) Science and Technology Indicators 2015, NISTEP Research Material-238

2) Benchmarking Scientific Research 2015, NISTEP Research Material-239

Introduction

Science and Technology Indicators (from 1991, annually released since 2005)

- S&T activities are classified into five categories: "R&D expenditure," "R&D personnel," "higher education," "output of R&D," and "science, technology and innovation."
- Approximately 150 indicators are used to understand the situation of Japan and those of the selected countries.
- Long-term (since the 1980s) S&T activities of Japan and the selected countries are shown if time-series data are available.

Benchmarking Scientific Research (from 2008, generally released every two years)

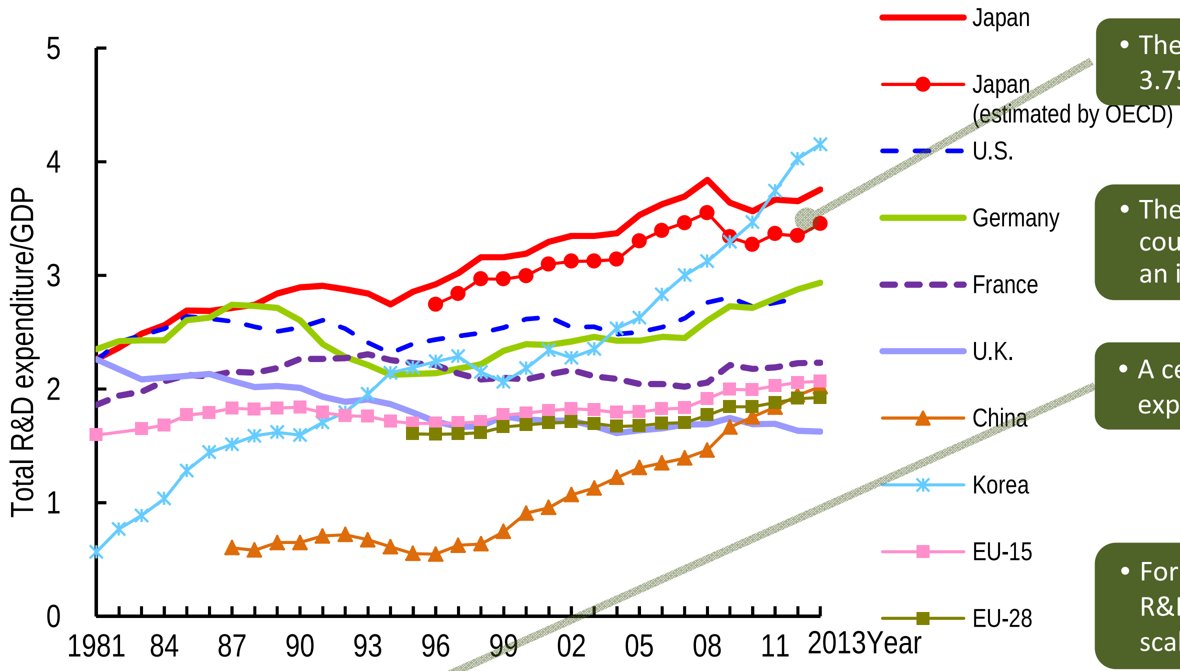
- Indicators of scientific publications are analyzed in detail.
- For each field of science, circumstances of Japan are analyzed on the basis of the number of papers; of hot papers*; and of citations.
- Comparison with benchmarking countries.

*: Papers that rank in the world top 10% (top 1%) in terms of the number of times they are cited.

⇨ The main circumstances of S&T activities in Japan and the selected countries derived from "Science and Technology Indicators 2015" and "Benchmarking Scientific Research 2015" are as shown on the following slides.

□ Japan's total R&D expenditure/GDP is at a relatively high level among the selected countries. However, the increase in the ratio compared with 10 years ago is partly attributable to the decline of GDP.

<Trend in the total R&D expenditure/GDP in selected countries>



- The ratio of Japan's total R&D expenditure/GDP was 3.75% in 2013 (OECD estimate: 3.45%)
- The ratios of total R&D expenditure/GDP in the selected countries' (except for the U.K. and France) have shown an increasing trend in the last 10 years.
- A certain part of Japan's increase in total R&D expenditure/GDP is attributable to the decline of its GDP.

⇕

- For the United States, Germany, China and Korea, total R&D expenditure/GDP have risen as their economic scales have expanded.

[Reference] Gross Domestic Products (GDPs) of the selected countries

Year	Japan (Billion yen)	U.S. (Billion dollar)	Germany (Billion euro)	France (Billion euro)	U.K. (Billion pound)	China (Billion yuan)	Korea (Billion won)	EU-15 (Billion dollar)	EU-28 (Billion dollar)
2004	502,760.8	12,274.9	2,267.6	1,710.8	1,255.2	16,095.7	876,033.1	11,638.6	13,089.8
2013	483,110.3	16,768.1	2,809.5	2,113.7	1,713.3	58,667.3	1,428,294.6	15,481.6	17,915.6
growth rate	-3.9%	36.6%	23.9%	23.6%	36.5%	264.5%	63.0%	33.0%	36.9%

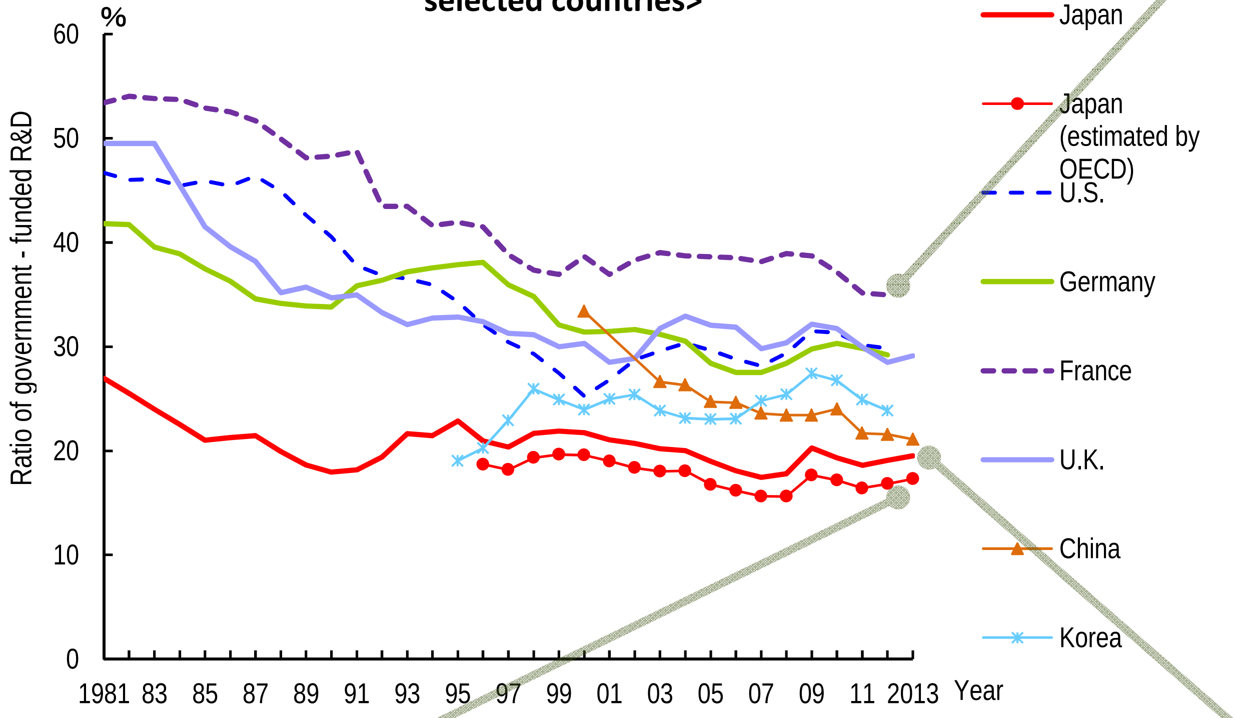
Note: the GDP of each country is based on 2008SNA (except for Japan and China).

(Source) Science and Technology Indicators 2015, NISTEP Research Material-238, released on August 5, 2015

◻ The percentage of government-funded R&D expenditure in Japan is low among the selected countries.

• The country with the largest percentage of government-funded R&D expenditure among the selected countries is France (35.0% in 2012).

<Trend in the ratios of government-funded R&D expenditure in the selected countries>



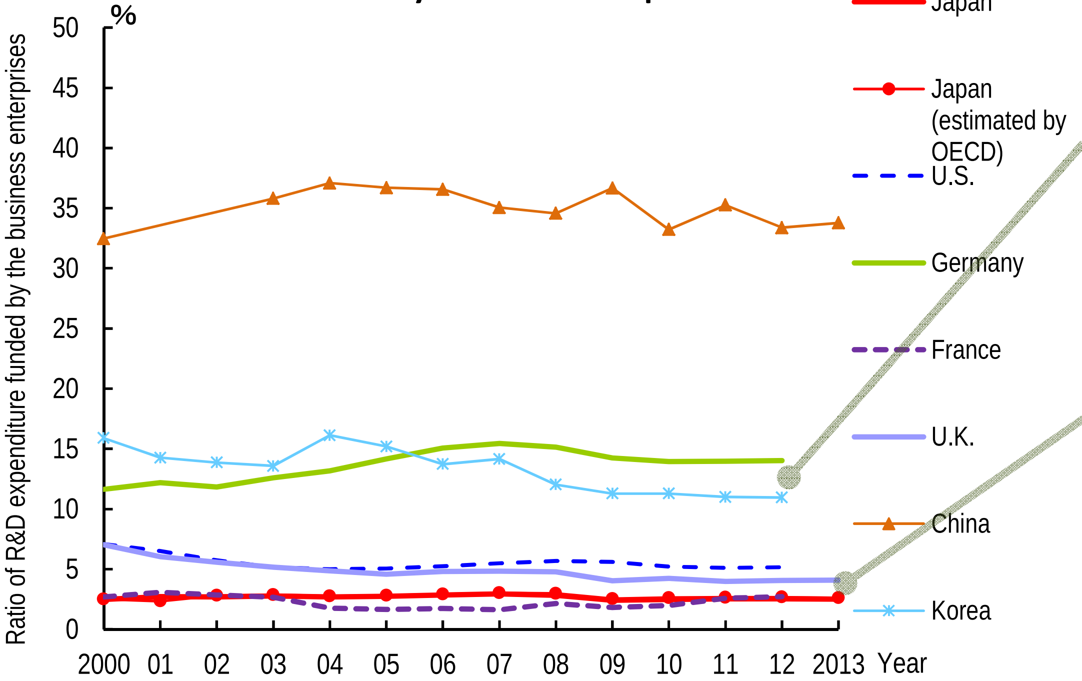
• Japan's percentage is the lowest among the seven countries shown here. The percentage of the government-funded expenditure in 2013 was 19.5% (OECD estimate: 17.3%).

• In Japan, the proportion of R&D expenditure funded by private universities (9.6%, considered to be sourced mainly from tuition fees) as well as the proportion funded by business enterprises (69.6%) are high, compared with the other countries.

(Source) Science and Technology Indicators 2015, NISTEP Research Material-238, released on August 5, 2015

□ Regarding the R&D expenditure of universities and colleges in Japan, there has not been a significant change in the proportion of the expenditure funded by business enterprises.

<Trend in the ratio of the R&D expenditure of universities and colleges funded by business enterprises>



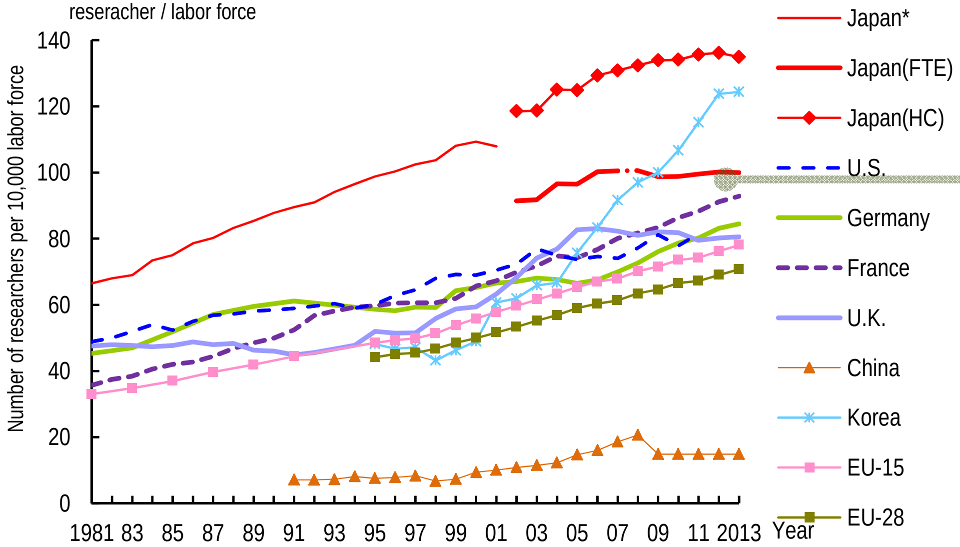
- Although there has not been a significant change in most of the countries in the last 10 years, Germany's percentage has increased and Korea's has declined.

- Regarding the percentages of the expenditure funded by business enterprises (all in the most recent year), China was the highest (33.8%), followed by Germany (14.0%), Korea (11.0%), the U.S. (5.2%), the U.K.(4.1%), and France (2.7%). Japan's percentage was 2.5% (OECD estimate: 2.6%), the lowest among the selected countries.

(Source) Science and Technology Indicators 2015, NISTEP Research Material-238, released on August 5, 2015

◻ The number of researchers per ten thousand labor force in Japan is relatively high among the selected countries. However, the growth of this number has been small in the last 10 years, in comparison with many of the selected countries.

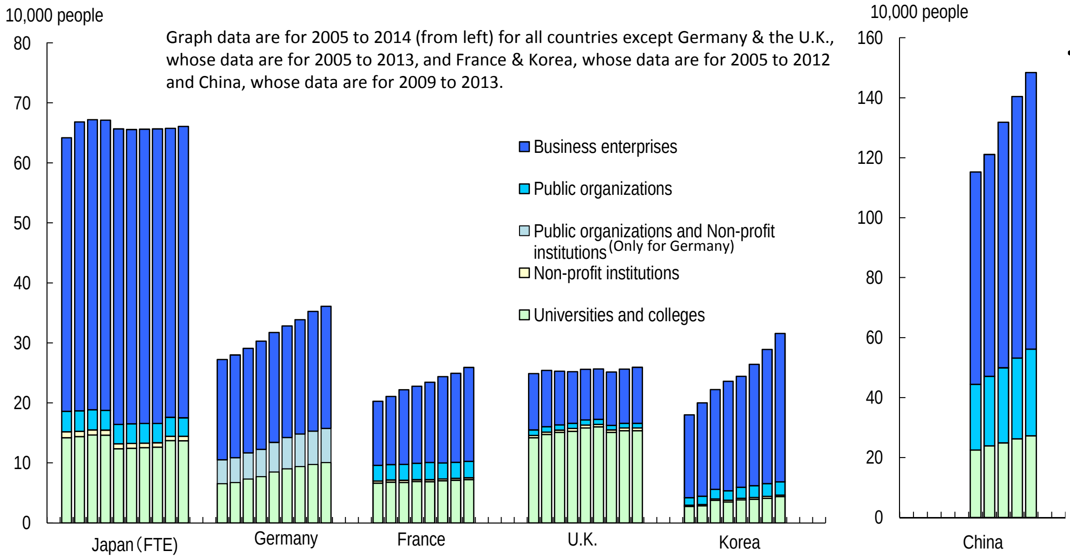
<Trend in the number of researchers per ten thousand labor force>



- The number of researchers (FTE) per ten thousand labor force in Japan is relatively high among the selected countries (the number in Korea exceeded that in Japan in 2009).
- Changes in the number of researchers during the past 10 years show that the number has risen in the selected countries except for the U.K. On the other hand, the number of researchers in Japan (FTE) has remained almost flat.

Note: HC means the head count of researchers.
FTE means the real number of researchers counted by taking account of the degree of their engagement in research.

<Trend in the number of researchers by sector>



- There has been a particularly significant increase in the number of university and college researchers in Germany, and in the number of corporate researchers in France and Korea.

Note 1: "Researchers" in business enterprises in Japan are those having completed a university or college course (excluding junior college courses) or possessing equivalent specialized knowledge, and additionally engaging in research based on a specific theme.

Note 2: Since the figures of business enterprise sector are only available for the U.S., the trend is not shown.

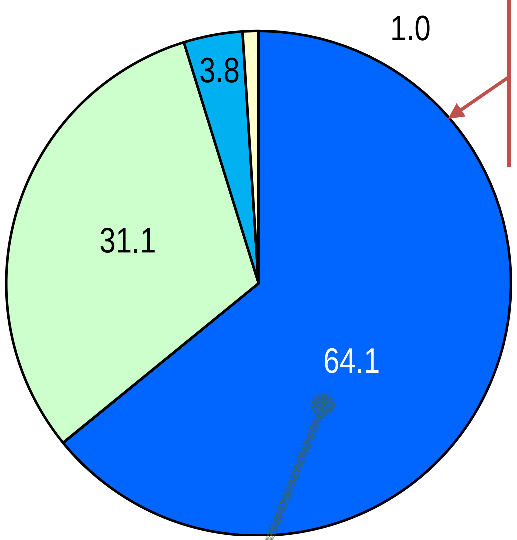
(Source) Science and Technology Indicators 2015, NISTEP Research Material-238, released on August 5, 2015

□ With regard to Japanese researchers, while many male researchers belong to "business enterprises," the percentage of female researchers belonging to business enterprises is small and many belong to "universities and colleges."

<Percentages of number of researchers by gender for each sector in Japan (2014)>

Male Researchers

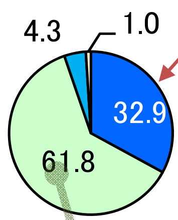
761,803 (85.4**%**)



Humanities and social sciences	1%
Natural sciences	22%
Engineering	**72%**
Agricultural sciences	2%
Medical sciences	2%

Female Researchers

130,603 (14.6**%**)



Humanities and social sciences	4%
Natural sciences	**35%**
Engineering	**41%**
Agricultural sciences	9%
Medical sciences	**12%**

* Percentages of the number of individual researchers by field of specialization

■ Business enterprises ■ Universities and colleges

■ Public organizations ■ Non-profit institutions

Note: The values are on a head count basis (actual number).

- The largest number of male researchers belong to "business enterprises" (64.1%), followed by "universities and colleges" (31.1%).

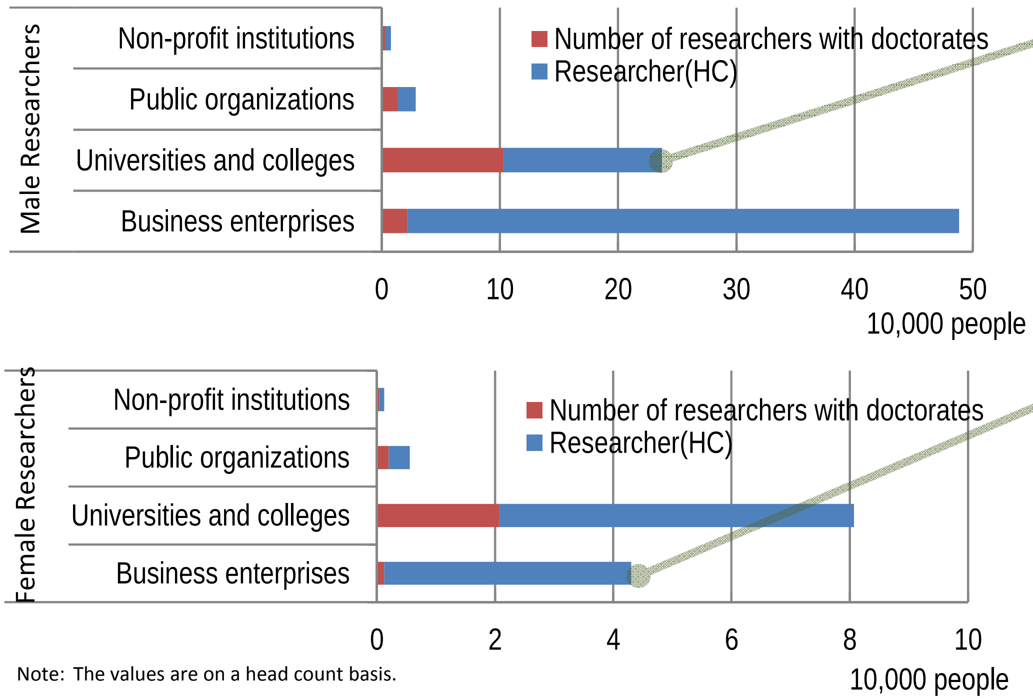
- The largest number of female researchers belong to "universities and colleges" (61.8%), followed by "business enterprises" (32.9%).

* Individuals' fields of specialization: these are the backgrounds of individual researchers, not necessarily relating to the sectors (industrial classification and academic fields) of the organizations they currently belong to.

(Source) Science and Technology Indicators 2015, NISTEP Research Material-238, released on August 5, 2015

☐ A large number of both male and female researchers with doctorates belong to "universities and colleges."

<The situation of doctorate holders in each sector by gender (2014)>



Note: The values are on a head count basis.

- Among both male and female researchers in "universities and colleges," the proportion of doctorate holders is high.

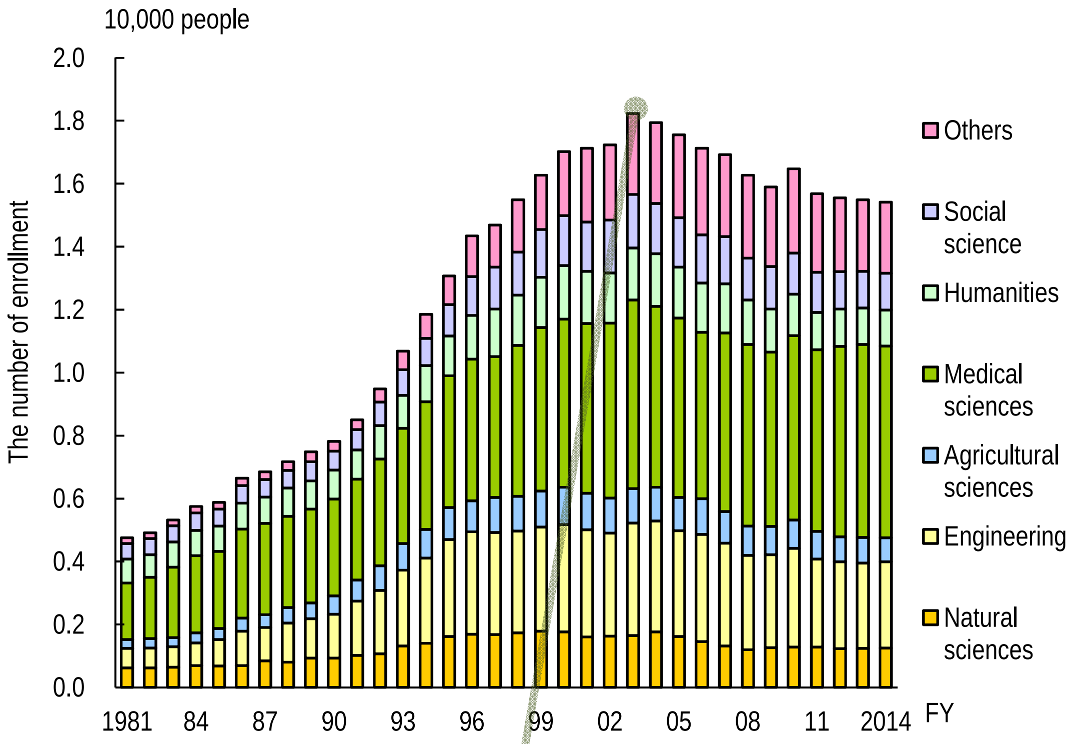
- The proportion of male and female doctorate holders among researchers in "business enterprises" is 4.4% and 3.0%, respectively.

(Source) Science and Technology Indicators 2015, NISTEP Research Material-238, released on August 5, 2015

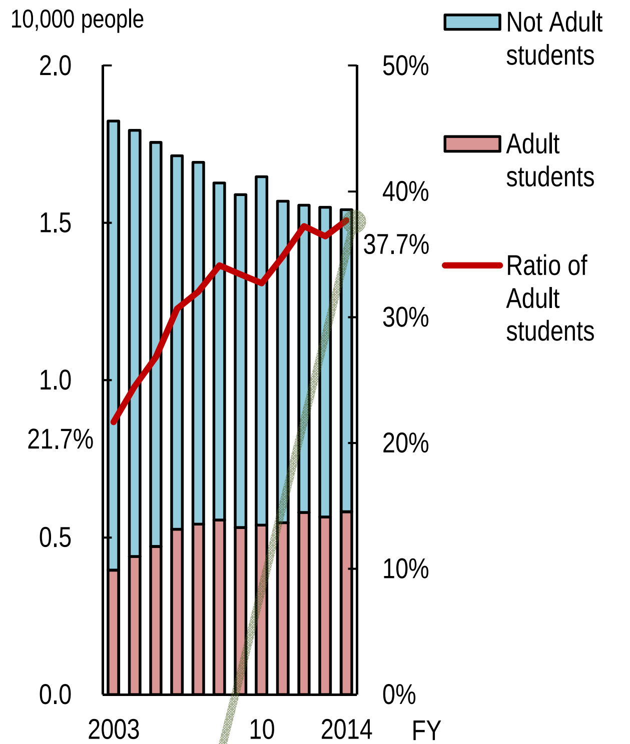
□ The numbers of students newly enrolled in graduate schools for doctoral programs began decreasing after reaching a peak in 2003. In particular, the number of enrolled students other than adult students has fallen.

<The numbers of new enrollments in graduate schools (doctoral programs)>

(A) Changes in number of new enrollments in graduate schools by major subject (Doctoral programs)



(B) Changes in number of adult students newly enrolled in graduate schools (Doctoral programs)



- The numbers of students newly enrolled in Japan's graduate schools for doctoral programs began decreasing after reaching a peak in 2003 (15 thousand enrollments in 2014).

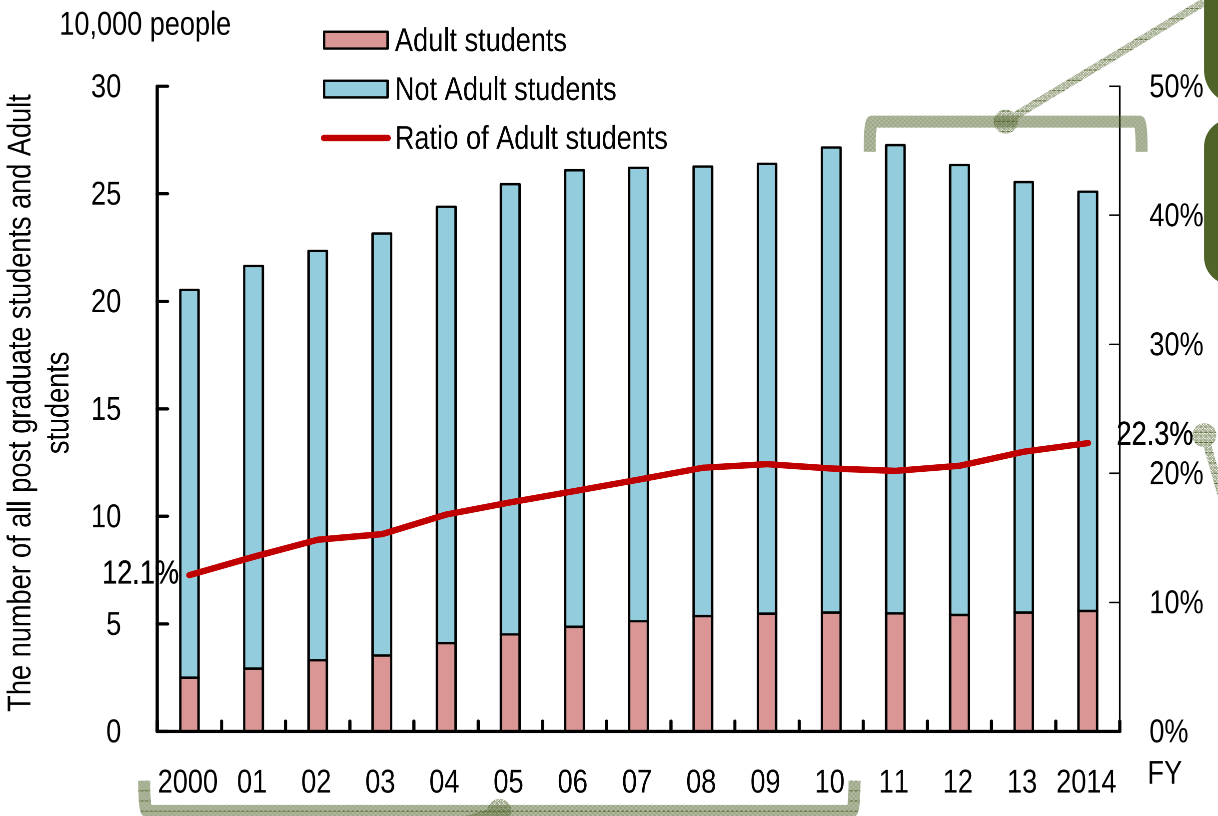
- The ratio of the number of adult students newly enrolled in doctoral programs against the total was 21.7% in 2003, but increased roughly twofold to 37.7% in 2014.

Note: "Adult" refers to persons who have entered into employment to receive regular income such as pay, wage or remuneration as of May 1 of each year; it includes retired employees and housewives.

(Source) Science and Technology Indicators 2015, NISTEP Research Material-238, released on August 5, 2015

◻ The composition of students enrolled in graduate schools (for master's or doctoral programs, etc.) has gone through changes.

<The situation of adult graduate students (enrolled in programs) in Japan>



- The total number of graduate students started declining after having reached a peak in 2011, and the degree of increase in the number of adult students started shrinking.
- By field, the number of adult graduate students in master's and doctoral programs in natural sciences has been on a downward trend since around 2005.
- Until 2010, both the total number of graduate students and that of adult graduate students had been rising.
- The ratio of adult graduate students against all graduate students (enrolled in programs) in Japan: 12.1% (in 2000) → 22.3% (in 2014)

Note: 1) Graduate students in this section mean those persons who are registered in a master's program or the preliminary term of a doctoral program, a doctoral program or the latter term of a doctoral program, or a professional graduate program.
2) For the definition of "adult," please see the note on the previous page.

(Source) Science and Technology Indicators 2015, NISTEP Research Material-238, released on August 5, 2015

Although the volume of scientific papers produced in Japan has remained at the same level in recent 10 years, Japan has dropped in rank due to increasing volume of papers produced by other countries.

<Top 10 countries/regions (fractional counting) in the number of papers and hot papers (top 10% and top 1%) >

PY (Publication Year) 2001–2003

All fields	2001 — 2003 (PY) (Average)		
	The number of papers		
	Fractional counting		
Country/Region	The number of papers	Share	World rank
U.S.	206,916	26.8	1
Japan	66,635	8.6	2
Germany	50,859	6.6	3
U.K.	49,560	6.4	4
France	36,604	4.7	5
China	35,147	4.5	6
Italy	27,530	3.6	7
Canada	24,763	3.2	8
Russia	20,253	2.6	9
Spain	19,341	2.5	10

All fields	2001 — 2003 (PY) (Average)		
	The number of adjusted top 10% papers		
	Fractional counting		
Country/Region	The number of papers	Share	World rank
U.S.	31,430	40.8	1
U.K.	6,042	7.8	2
Germany	5,196	6.7	3
Japan	4,561	5.9	4
France	3,549	4.6	5
Canada	2,816	3.7	6
Italy	2,337	3.0	7
China	2,313	3.0	8
Netherlands	1,858	2.4	9
Australia	1,722	2.2	10

All fields	2001 — 2003 (PY) (Average)		
	The number of adjusted top 1% papers		
	Fractional counting		
Country/Region	The number of papers	Share	World rank
U.S.	3,802	49.3	1
U.K.	633	8.2	2
Germany	485	6.3	3
Japan	363	4.7	4
France	296	3.8	5
Canada	254	3.3	6
China	190	2.5	7
Italy	179	2.3	8
Netherlands	176	2.3	9
Switzerland	150	1.9	10

PY (Publication Year) 2011–2013

All fields	2011 — 2013 (PY) (Average)		
	The number of papers		
	Fractional counting		
Country/Region	The number of papers	Share	World rank
U.S.	263,133	21.0	1
China	163,891	13.1	2
Japan	64,843	5.2	3
Germany	63,087	5.0	4
U.K.	57,433	4.6	5
France	44,455	3.5	6
India	43,034	3.4	7
Italy	40,763	3.3	8
Korea	40,323	3.2	9
Canada	37,809	3.0	10

All fields	2011 — 2013 (PY) (Average)		
	The number of adjusted top 10% papers		
	Fractional counting		
Country/Region	The number of papers	Share	World rank
U.S.	38,509	30.8	1
China	15,062	12.0	2
U.K.	7,983	6.4	3
Germany	7,711	6.2	4
France	4,932	3.9	5
Japan	4,471	3.6	6
Italy	4,270	3.4	7
Canada	4,230	3.4	8
Australia	3,612	2.9	9
Spain	3,518	2.8	10

All fields	2011 — 2013 (PY) (Average)		
	The number of adjusted top 1% papers		
	Fractional counting		
Country/Region	The number of papers	Share	World rank
U.S.	4,613	36.8	1
China	1,405	11.2	2
U.K.	880	7.0	3
Germany	749	6.0	4
France	459	3.7	5
Canada	419	3.3	6
Japan	367	2.9	7
Australia	365	2.9	8
Italy	311	2.5	9
Spain	310	2.5	10

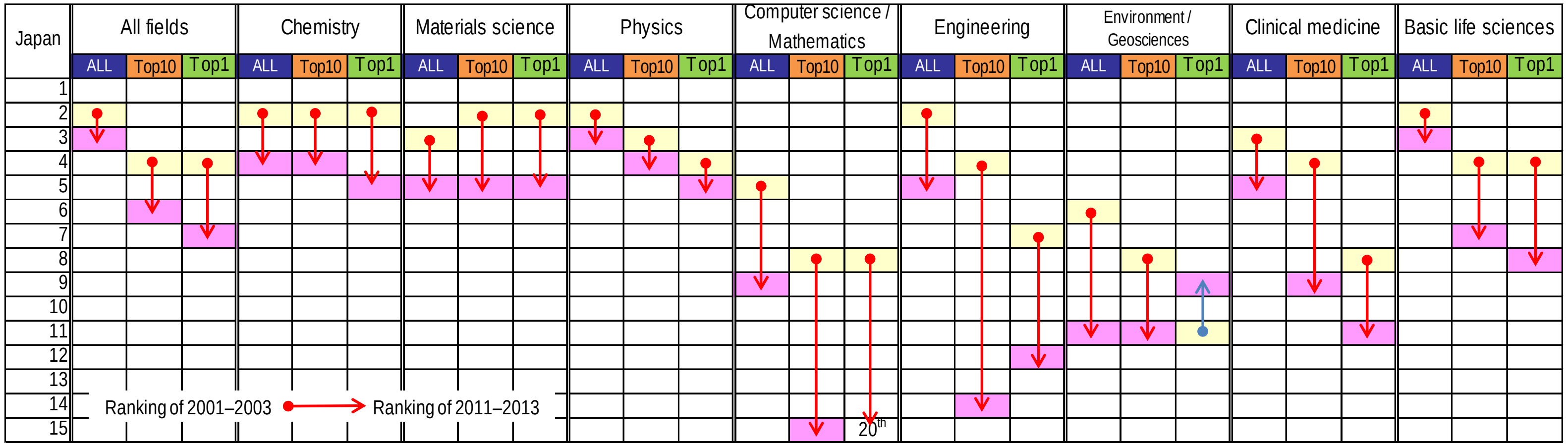
[Methods of counting papers]
(Fractional counting method) In the case where one paper is co-authored by Japanese Organization A and US Organization B, this method counts Japan as 1/2 and the U.S. as 1/2. This indicates the degree of contribution to the production of papers.
(Whole counting method) In the case where one paper is co-authored by Japanese Organization A and US Organization B, this method counts Japan as 1 and the U.S. as 1. This indicates the degree of participation in the production of papers.
For counting, both the methods are based on the countries of the organizations with which the authors are affiliated.

(Source) Science and Technology Indicators 2015, NISTEP Research Material-238, released on August 5, 2015

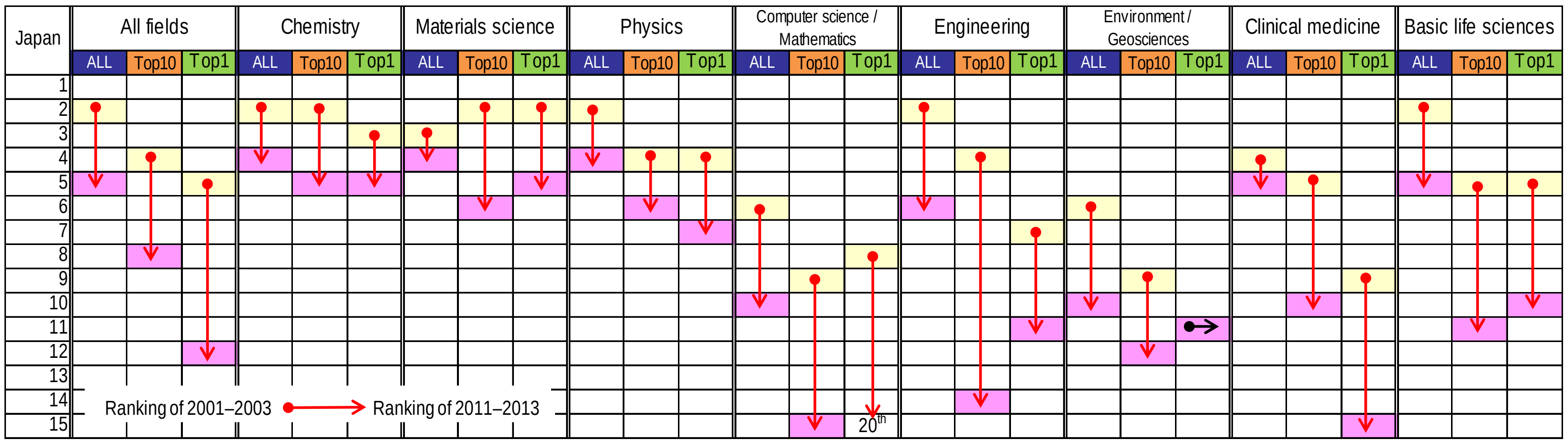
□ In many fields of science, Japan has dropped in rank in terms of the number of papers and the number of hot papers (top 10% and top 1%).

<Changes in Japan's position in world ranking of number of papers and number of hot papers (top 10% and top 1%)>

Fractional counting (degree of contribution to the production of papers)



Whole counting (degree of participation in the production of papers)



Note: ALL: the world ranking of the number of papers

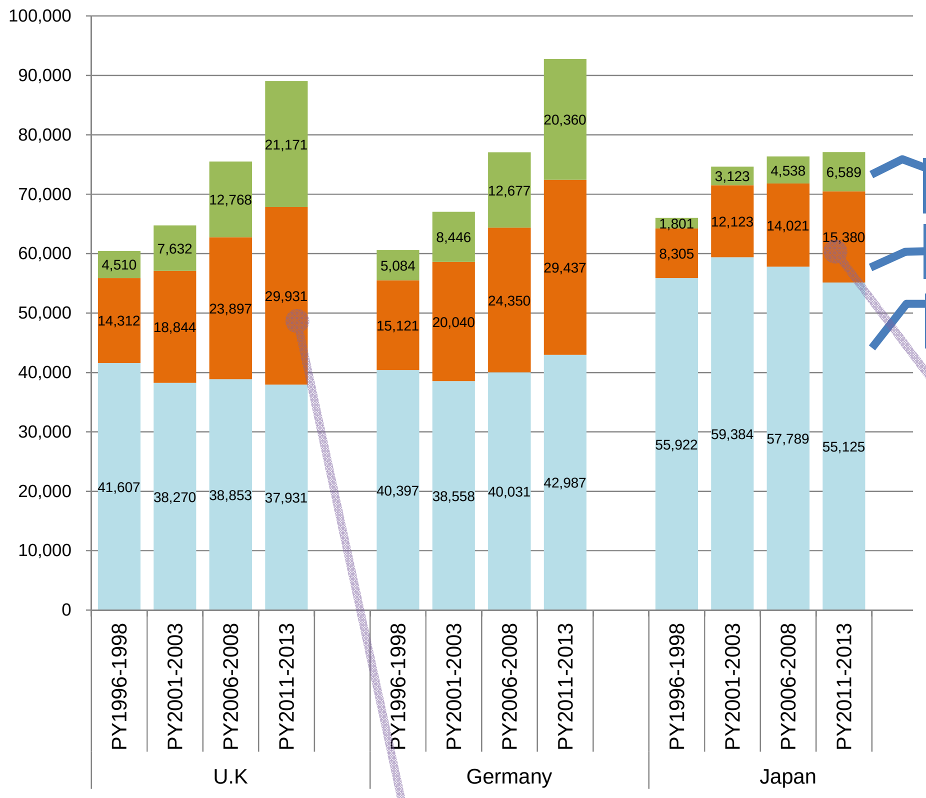
Top 10: the world ranking of the hot papers whose number of times cited is in the top 10% of the world.

Top 1: the world ranking of particularly hot papers whose number of times cited enters the top 1% of the world. The ranking at the bottom of the arrow shows the position of 2001–2003, and the ranking at the tip shows the position of 2011–2013.

(Source) Benchmarking Scientific Research 2015, NISTEP Research Material-239, released on August 5, 2015

◻ While the number of internationally co-authored papers in Japan has increased, that of domestic papers began declining.

<Forms of co-authorship in selected countries>



Note: The values are based on the whole counting method.

- For the U.K. and Germany, the number of internationally co-authored papers has remarkably grown and the number of domestic papers has remained at the same level since the late 1990s.

- While the number of internationally co-authored papers in Japan has increased, that of domestic papers began declining after having reached a peak in the early years between 2000 and 2010.

(Source) Benchmarking Scientific Research 2015, NISTEP Research Material-239, released on August 5, 2015

◻ While research activities have progressively become internationalized, Japan has been losing its presence.

<Top 10, main co-authoring countries and regions for the U.S. (2011–2013, %)>

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10
All fields	China 17.3%	U.K. 13.3%	Germany 12.4%	Canada 11.0%	France 8.2%	Italy 7.1%	Japan 6.3%	Australia 5.9%	Korea 5.8%	Spain 5.4%
Chemistry	China 23.2%	Germany 10.4%	Korea 8.3%	U.K. 8.3%	France 6.0%	Japan 5.8%	Canada 5.4%	Italy 4.7%	India 4.5%	Spain 4.4%
Materials sciences	China 29.1%	Korea 13.3%	Germany 8.3%	U.K. 6.9%	Japan 5.8%	France 5.1%	Canada 4.6%	India 4.2%	Australia 3.4%	Italy 3.2%
Physics	Germany 23.5%	U.K. 18.5%	China 17.5%	France 15.6%	Italy 11.7%	Japan 10.5%	Canada 9.9%	Spain 9.9%	Russia 7.9%	Switzerland 7.4%
Computer science/ Mathematics	China 22.9%	U.K. 8.6%	Canada 8.6%	Germany 8.0%	France 7.8%	Korea 6.5%	Italy 4.7%	Israel 4.0%	Spain 3.9%	Australia 3.2%
Engineering	China 26.6%	Korea 9.7%	Canada 7.2%	U.K. 5.9%	Germany 5.6%	France 5.2%	Italy 5.1%	Taiwan 4.0%	Japan 3.9%	Spain 3.5%
Environment/ Geosciences	China 18.2%	U.K. 14.6%	Canada 13.5%	Germany 11.7%	France 9.7%	Australia 8.7%	Japan 5.5%	Switzerland 5.1%	Italy 5.0%	Spain 4.8%
Clinical medicine	Canada 14.8%	U.K. 14.8%	Germany 12.8%	China 12.4%	Italy 9.8%	France 7.3%	Netherlands 7.2%	Australia 7.0%	Japan 6.2%	Spain 5.4%
Basic life sciences	China 15.3%	U.K. 13.4%	Germany 11.2%	Canada 11.0%	France 7.0%	Japan 6.5%	Australia 6.2%	Italy 6.0%	Spain 4.9%	Netherlands 4.7%

Japan No. 13 (Computer science/ Mathematics)

- China has strengthened its presence as an international co-author for the U.S. (No. 1 as an international co-author in all fields and in six out of eight fields)

- With regard to the U.S.'s international co-authoring countries, the position of Japan has been in decline. In particular, in materials science, Japan's position has moved down from No. 1 to No. 5.

Note: The values are based on the whole counting method. The position at the bottom of the arrow shows Japan's ranking during 2001–2003. The tip of the arrow shows Japan's ranking during 2011–2013. Shares refer to the percentages of co-authoring countries and regions in the U.S.'s internationally co-authored papers.

(Source) Benchmarking Scientific Research 2015, NISTEP Research Material-239, released on August 5, 2015

□ For any field, the main institutional division of the production of papers within Japan is national universities and colleges, and Japan's structure is designed in a way that their activities have an impact on the entire country.

<Structure of main institutional divisions for number of papers and hot papers (top 10%) (fractional counting)>

Changes from 2001–2003 to 2011–2013	Number of Papers						
	All of Japan	1st Institutional Division		2nd Institutional Division		3rd Institutional Division	
All fields	→ -3%	National universities	→ -4%	Private universities	↑ 12%	Sp. corp./ Ind. admin. corp.	↑ 8%
Chemistry	↓ -12%	National universities	↓ -12%	Private universities	↓ -9%	Sp. corp./ Ind. admin. corp.	→ 2%
Materials science	↓ -21%	National universities	↓ -12%	Sp. corp./ Ind. admin. corp.	↓ -22%	Business enterprises	↓ -40%
Physics	↓ -19%	National universities	↓ -14%	Sp. corp./ Ind. admin. corp.	↓ -13%	Private universities	↓ -15%
Computer science/ Mathematics	↑ 10%	National universities	↑ 15%	Private universities	↑ 28%	Business enterprises	↓ -43%
Engineering	→ -4%	National universities	↑ 7%	Business enterprises	↓ -37%	Private universities	↑ 27%
Environment/Geosciences	↑ 38%	National universities	↑ 41%	Sp. corp./ Ind. admin. corp.	↑ 43%	Private universities	↑ 37%
Clinical medicine	↑ 13%	National universities	→ 0%	Private universities	↑ 32%	Sp. corp./ Ind. admin. corp.	↑ 52%
Basic life sciences	→ 0%	National universities	↓ -6%	Private universities	↑ 15%	Sp. corp./ Ind. admin. corp.	↑ 17%

Changes from 2001–2003 to 2011–2013	Number of Adjusted Top 10% Papers						
	All of Japan	1st Institutional Division		2nd Institutional Division		3rd Institutional Division	
All fields	→ -2%	National universities	→ -1%	Sp. corp./ Ind. admin. corp.	↑ 11%	Private universities	↑ 9%
Chemistry	↓ -17%	National universities	↓ -13%	Sp. corp./ Ind. admin. corp.	→ 0%	Private universities	↓ -28%
Materials science	↓ -37%	National universities	↓ -36%	Sp. corp./ Ind. admin. corp.	↓ -7%	Private universities	↓ -48%
Physics	↓ -12%	National universities	→ -1%	Sp. corp./ Ind. admin. corp.	↓ -7%	Private universities	↓ -7%
Computer science/ Mathematics	↑ 16%	National universities	↑ 29%	Private universities	↑ 37%	Business enterprises	↓ -28%
Engineering	↓ -10%	National universities	→ -3%	Business enterprises	↓ -44%	Sp. corp./ Ind. admin. corp.	↑ 14%
Environment/Geosciences	↑ 73%	National universities	↑ 76%	Sp. corp./ Ind. admin. corp.	↑ 115%	Private universities	↑ 17%
Clinical medicine	↑ 29%	National universities	↑ 15%	Private universities	↑ 63%	Sp. corp./ Ind. admin. corp.	↑ 40%
Basic life sciences	→ 1%	National universities	→ 4%	Sp. corp./ Ind. admin. corp.	↑ 15%	Private universities	↑ 5%

- In chemistry, materials science and physics, Japan used to have a relatively high share of the number of papers. However, this share has now declined (under almost all the 1st to 3rd Institutional Divisions).

- Changes from 2001–2003 to 2011–2013 indicate that the slow growth in the number of papers in Japan is attributable to a slow growth in the number of papers produced by the 1st Institutional Division, i.e., national universities.

- Although the number of adjusted top 10% papers shows almost the same composition as that of the number of papers, special corporations/independent administrative corporations have the second largest share in five fields.

Note1: Fractional counting is employed for analysis. The growth rates (%) in the charts show the increase during the period of 2011–2013 on the basis of the period of 2001–2003.

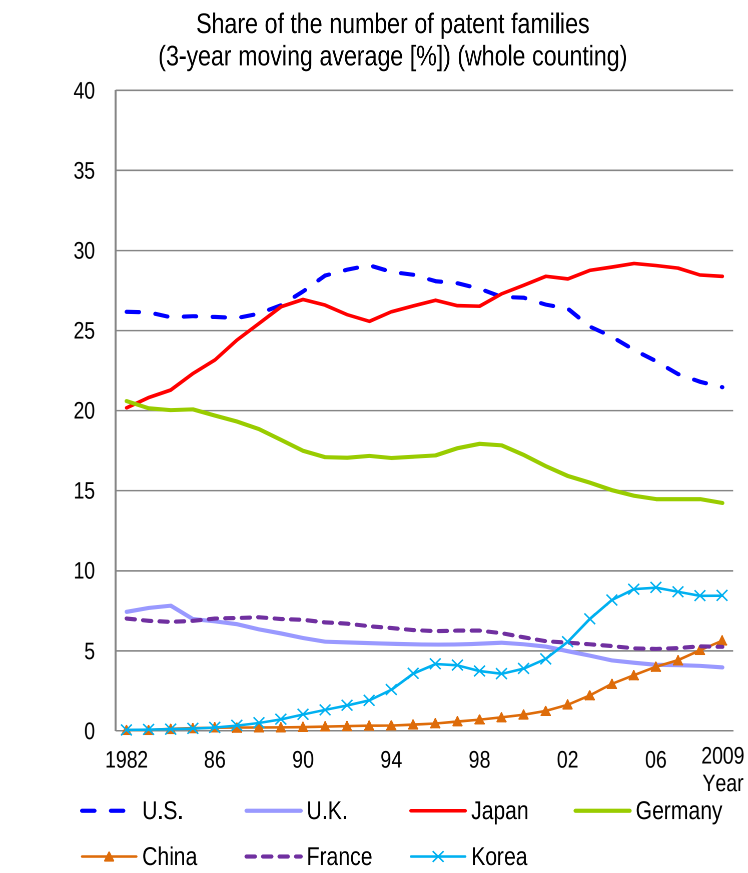
Note2: The 1st (2nd and 3rd) Institutional Division means the institutional division with the largest (second and third largest, respectively) percentage in the production of papers in Japan for each field. Among institutional divisions, this analysis focuses on the following five institutional divisions with large paper shares in Japan: national universities; public universities; private universities; special corporations/independent administrative corporations; and business enterprises.

Note3: In clinical medicine, “hospitals” played a larger role in terms of the number of papers during the period of 2011–2013, than special corporations/independent administrative corporations.

(Source) Benchmarking Scientific Research 2015, NISTEP Research Material-239, released on August 5, 2015

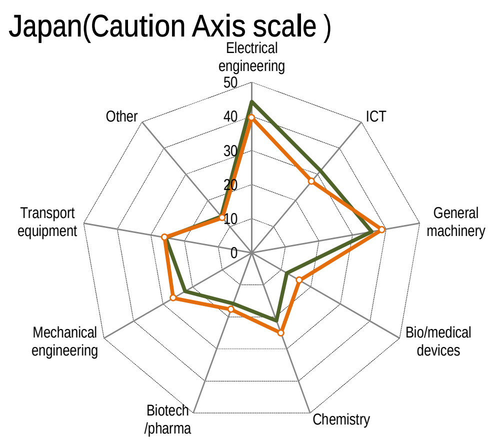
□ Japan has maintained a high share of the number of patents (the number of patent families) for the last 10 years, Korea and China are catching up with Japan in some technological fields.

<Shares of the number of patent families (whole counting method)>



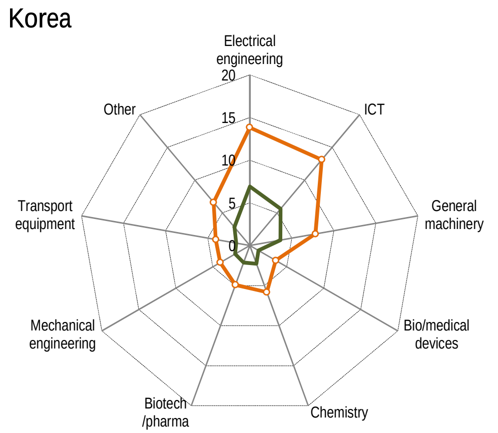
Note: Three-year moving averages of shares of the number of patent families in all technological fields (for 2009, the average of 2008, 2009 and 2010)

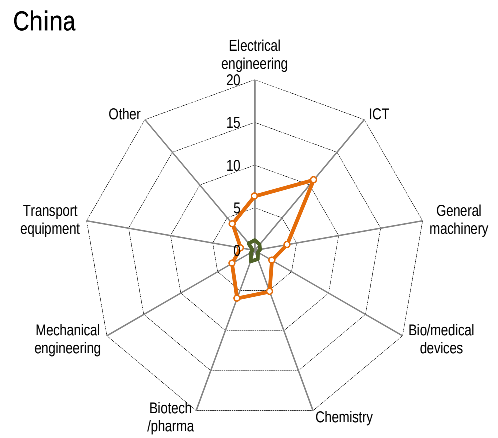
<Comparison of shares of the number of patent families for each technological field (%, 1998–2000 and 2008–2010, whole counting method)>



Note: "Patent family" refers to a group of patent applications made to two or more countries that are tied directly or indirectly by priority rights.

Patent family share (1998–2000)
Patent family share (2008–2010)

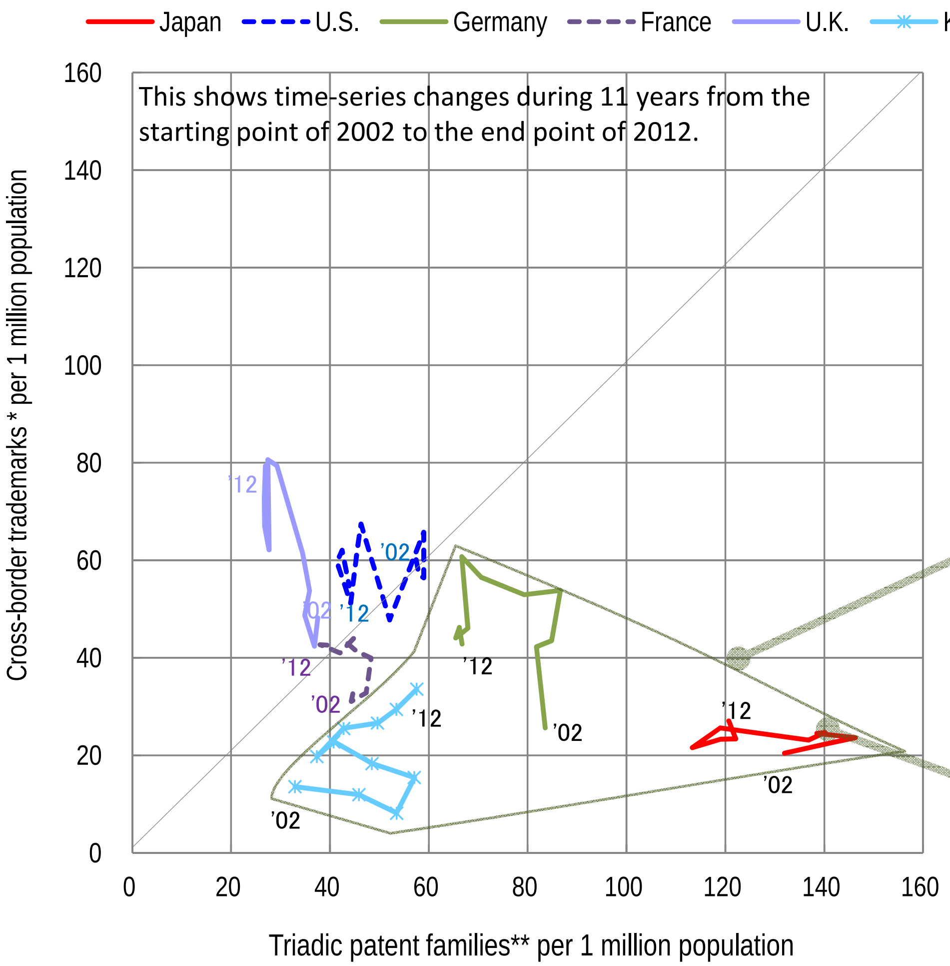




(Source) Science and Technology Indicators 2015, NISTEP Research Material-238, released on August 5, 2015

□ Although Japan's strength lies in technology (number of patent applications), it has not expanded such technology in the form of introducing new products and services on an international scale (number of trademark applications).

<Cross-border trademark applications* and patent applications (per 1 million population)>**



* Number of cross-border trademark applications: an indicator relating to the situation of the introduction of new products and services overseas

** Number of cross-border patent applications: an indicator to measure a technological level (triadic patent family)

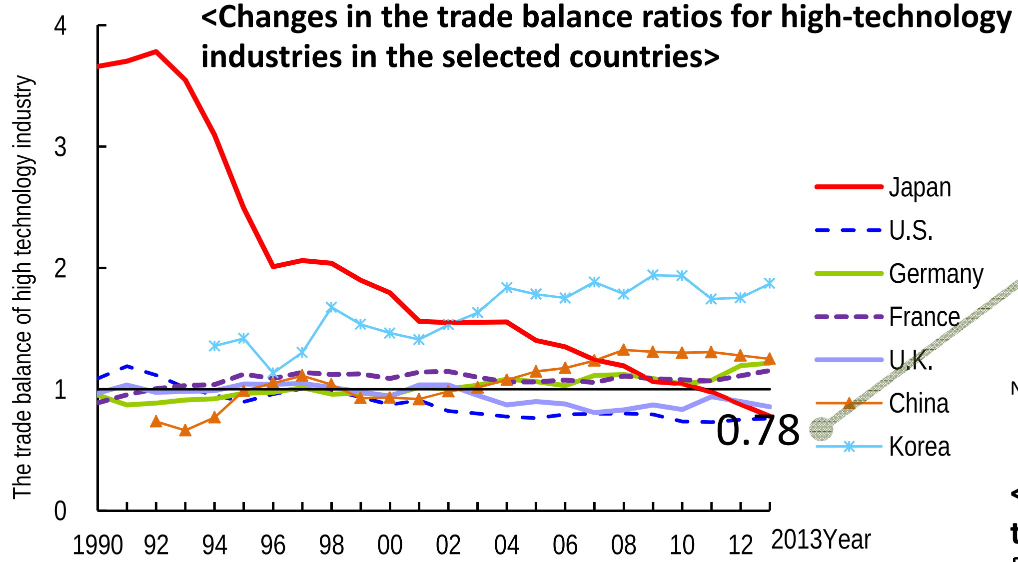
- The balance between the number of trademark applications and of patent applications indicates that Japan, Germany and Korea have a larger number of patent applications than that of trademark applications.
- Notably, Japan shows a strong trend of this kind with no significant change for 11 years from 2002 to 2012.

- Although Japan's strength lies in technology, it has not, as a whole, expanded such technology in the form of introducing new products and services on an international scale.

(Source) Science and Technology Indicators 2015, NISTEP Research Material-238, released on August 5, 2015

□ Japan's superior competitiveness in high-technology industries is eroding; however, it maintains its high competitiveness in medium-high technology industries.

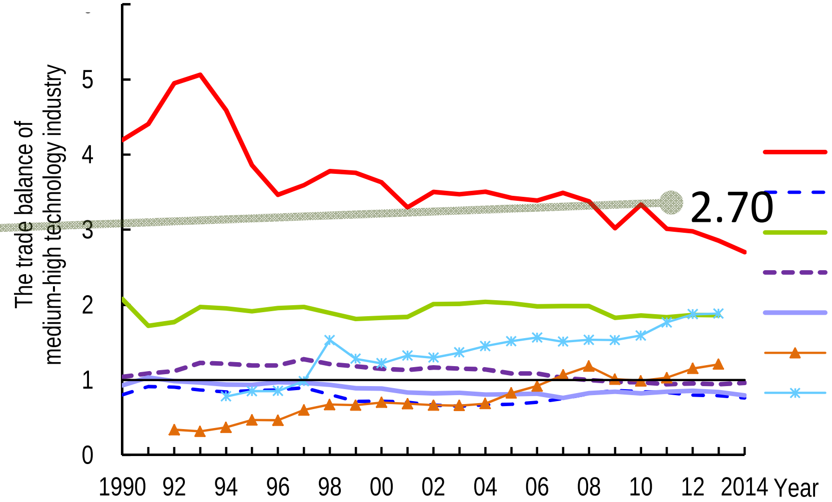
<Changes in the trade balance ratios for high-technology industries in the selected countries>



- Japan's trade balance in high-technology industries has fallen below 1, and has marked an import surplus since 2011.
- With regard to "Computer, electronic and optical", Japan had its first import surplus of approximately nine billion US dollars in 2013.
- "Pharmaceutical" continue to show an import surplus (an import surplus of approximately 18 billion US dollars in 2013).

Note: High-technology industries refer to "Pharmaceutical," "Computer, electronic and optical," and "Aerospace,"

<Changes in the trade balance ratios for medium high-technology industries in the selected countries>



- Japan's trade balance ratio for medium high-technology industries is 2.70, which ranks it as number one among the selected countries.
- As of 2014, "Motor vehicles, trailers and semi-trailers" has an export surplus of approximately 120 billion US dollars, and "Machinery and equipment n.e.c." has an export surplus of approximately 81 billion US dollars.

Note: Medium high-technology industries refer to "Chemicals and chemical products," "Electrical equipment," "Machinery and equipment n.e.c.," "Motor vehicles, trailers and semi-trailers," "Railroad equipment and transport equipment n.e.c.," and "Other."

(Source) Science and Technology Indicators 2015, NISTEP Research Material-238, released on August 5, 2015

Summary

- Of the total R&D expenditure of Japan, the proportion that the government bears is low among the selected countries. Of the R&D expenditure of universities and colleges, the proportion that business enterprises bear is also the lowest among the selected countries.
- The number of researchers per ten thousand labor force in Japan is at a relatively high level among the selected countries. In the past 10 years, many of the selected countries increased the number of their researchers, whereas the number of Japan's researchers remained mostly flat.
- The numbers of students newly enrolled in graduate schools for doctoral programs began decreasing after reaching a peak in 2003. In particular, the number of enrolled students other than adult students has fallen. On the other hand, the percentage of adult students among newly enrolled students has increased.
- Although the volume of scientific papers produced in Japan has remained at the same level in recent 10 years, Japan has dropped in rank due to increasing volume of papers produced by other countries. The presence of Japan as a co-author for the U.S. has been weakened.
- Japan has maintained its high share of the number of patents (the number of patent families) for the last 10 years, Korea and China are catching up with Japan in the information and communication field and the electrical engineering field.
- Japan's superior competitiveness in high-technology industries is eroding. However, Japan maintains high competitiveness in medium high-technology industries.

Presented by

Research Unit for Science and Technology Analysis and Indicators

National Institute of Science and Technology Policy (NISTEP)

Ministry of Education, Culture, Sports, Science and Technology, Japan（MEXT）

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