RESEARCH MATERIAL No.314

Survey of research activities in Japanese universities using a database for comprehension of research activities (Labo-Panel Survey 2020): Summary of basic findings

April 2022

Center for S&T Foresight and Indicators, National Institute of Science and Technology Policy (NISTEP), MEXT
MATSUMOTO Kuniko, YAMASHITA Izumi,
and IGAMI Masatsura

This document is the English version of the executive summary of the “*NISTEP RESEARCH MATERIAL* No.314” which was published by NISTEP in October 2021. The English version was prepared by YAMASHITA Izumi.

【Authors】

MATSUMOTO Kuniko	Research Fellow, Center for S&T Foresight and Indicators, National Institute of Science and Technology Policy (NISTEP), MEXT
YAMASHITA Izumi	Senior Research Fellow, Center for S&T Foresight and Indicators, National Institute of Science and Technology Policy, MEXT
IGAMI Masatsura	Director, Center for S&T Foresight and Indicators, National Institute of Science and Technology Policy, MEXT

MATSUMOTO Kuniko, YAMASHITA Izumi and IGAMI Masatsura, “Survey of research activities in Japanese universities using a database for comprehension of research activities (Labo-Panel Survey 2020): Summary of basic findings,” RESEARCH *MATERIAL* No.314, National Institute of Science and Technology Policy, Tokyo.

DOI: https://doi.org/10.15108/rm314

Survey of research activities in Japanese universities using a database for comprehension of research activities (Labo-Panel Survey 2020): Summary of basic findings

MATSUMOTO Kuniko, YAMASHITA Izumi and IGAMI Masatsura
Center for S&T Foresight and Indicators, National Institute of Science and Technology Policy (NISTEP), MEXT

ABSTRACT

For the enhancement of the research capacity of Japan, it is necessary to develop datasets that are not merely for understanding specific information about inputs and outputs of research activities. Datasets that allow us to also analyze the process of research activities are required. Based on the recognition, the National Institute of Science and Technology Policy (NISTEP) has set up a Labo-Panel Survey ("Survey for research activities in Japanese universities using a database for comprehension of research activities") aiming at understanding the actual status of research activities in the field of natural sciences carried out by respective laboratories and research groups of Japanese universities. The survey started in FY 2020 will be conducted annually until FY 2024 to construct panel data on a wide range of topics, including basic information about the respondents (faculty members) and their laboratories/research groups, the portfolio of research projects they are involved in, and the details of those projects. This report summarizes the basic findings from the initial survey conducted in FY 2020.

0. Overview of the Survey

0.1. Background of the Survey

The National Institute of Science and Technology Policy (NISTEP) has conducted various analyses of research papers to understand the actual status and challenges of scientific research activities in Japan. For example, country-wise analysis of research papers has revealed that the selected countries have seen an increase in the number of papers since mid-2000s while Japan has experienced stagnation and as a result the Japanese relative status has been declining [1]. The declining international status of Japan in terms of research capacity is also pointed out in the Nature Index 2017 [2] and the White Paper on Science and Technology 2018 [3].

NISTEP analyzed Japanese university system, which accounts for around 70% of research papers produced in Japan, classifying the universities into groups based on the number of papers. The study has revealed that the volume of universities ranked after top-notch universities is not sufficient in Japan when compared with the UK and, therefore, the volume of middle-level universities should be promoted in order to increase the production of research papers from universities as a whole [4]. Further, the analysis of respective universities indicates that each Japanese university has a distinctive “characteristic (research portfolio structure)” [5] and such characteristic is the product of the “characteristics” of the internal organizations of a university [6].

The above-mentioned analyses are focused on the outputs of R&D activities that is observed in the form of research papers. Those outputs are based on inputs such as R&D funding and R&D human resources. The analysis of the input structure of the Japanese university system using data collected from respective universities by the Survey of research and development shows that the amount and the percentage of R&D funding received from outside have increased for around ten years and that the balances of job positions of researchers vary among university groups [7].

It can be said that we have come to have a deeper understanding of the Japanese university system in terms of both inputs and outputs. However, it cannot be said that we now have a clear understanding of the connection between inputs and outputs, or in other words, the process of outputs being created from inputs in research activities. While the relative decline of the Japanese research capacity is being pointed out, we are seeing increasing expectations for findings that can contribute to the enhancement of the research capacity going beyond the description of the actual status of research activities in Japan.

In order to contribute to the enhancement of Japanese research capacity in response to such expectations, we are required to develop datasets that may lead to the understanding of the process of R&D activities and to carry out analysis based on such datasets that goes beyond the provision of specific information about inputs for and outputs from R&D activities.

As the first step toward the goal, we summarize in this report the basic findings from the Labo-Panel Survey we conducted.

0.2. Purpose of the Survey

Considering the recognized issues as mentioned above, the National Institute of Science and Technology Policy has embarked on the annual survey (Labo-Panel Survey) laboratory/research group R&D activities by seeking information from the research leaders".

The Labo-Panel Survey aims to achieve the following through the collection and analysis of chronological data collected from university faculty on the environment and management of their laboratories/research groups, R&D expenditures and outputs from their research activities. The survey findings will be used as data that contribute to the formulation of science and technology/academic policies and to improve and promote research environments in Japan.

- Establishing datasets for laboratories and research groups,
- Understanding the process of creating outputs from inputs in research activities,
- Providing policy bodies with implications and incentive designs for improving research capacity of Japan,
- Tracking changes in research style before and after the COVID-19 infection outbreak.

The survey is conducted annually during a five-year period from 2020 to 2024. In order to understand the effect of changes in researchers' affiliations on their R&D activities, respondents transferring to other organizations will be asked for their continued responses to the survey. Through these efforts, the Labo-Panel Survey aims to provide empirical answers to the following questions about the actual status of scientific research activities in Japan.

(1) Perspective of R&D funding
- How do external funds (such as competitive research grants by the government and funds provided by private companies) work to vitalize research activities (e.g., the diversification of a research theme portfolio and the acquisition of research talents)?
- What are the roles of stable research funding in R&D activities? Are there any differences in R&D activities and knowledge generated by laboratories with and without stable funding?

(2) Perspective of Research management
- Will differences in research management by laboratory leaders lead to differences in their R&D activities and knowledge generated by them (e.g., challenging or not), even among laboratories with the same amount of R&D funding?
- What differences in knowledge generated from research laboratories will be caused by differences in the way for determining a research theme (top-down vs bottom up)? What are the characteristics of the management of those laboratories continuously producing research papers that earn significant attention?

(3) Perspective of independence of researchers
- Does being tenured or not have anything to do with research theme development?
- Is the level of independence of researchers affected by the scale of universities?

(4) Perspective of laboratory members
- What roles do junior researchers (undergraduate students, master's students, doctoral students and post-doctoral research fellows) play in R&D activities?
- What influences do the diversity of fields and of skills of laboratory members and of research management over such diversity have on knowledge generation?

(5) Perspective of research achievement
- What side effects may be expected from continuing to produce research papers that earn significant attention (Top 10% papers)?

0.3. Prior studies

Historical background of laboratories/research groups in Japan

The development of laboratories/research groups of Japanese universities should be significantly influenced by the structures of internal organizations of universities. This section explores the development of laboratories/research groups of Japanese universities by looking at the historical background of internal organizations of Japanese universities by referring to Amano [8, 9, 10].

Under the post-secondary education system prior to the World War II, research functions were virtually monopolized by a small number of universities, most of which were imperial universities. After the war, all universities became expected to perform research functions. However, there was evidently a large gap in research capacity between “universities established under the new education system” after the war and “those established under the old system” whose research functions had already been recognized as one of their roles in the prewar period. This is reflected in the difference in the structures of their internal organizations, namely the academic chair system of universities established before the war and the department system of those established after the war.

On the one hand, universities established under the “old” system adopted the academic chair system where “fields of study required from viewpoints of education and study are defined and faculty members qualified to impart knowledge and promote research in those defined fields are appointed”. The adoption of the academic chair system as the internal structure of universities is dated back to 1893 and was intended to encourage the professors to realize their responsibilities for their fields of study. Chair means a field of study and a professor is appointed for each chair to assume responsibility for education and research in his or her field of study. The academic chair system is further classified into the small academic chair system and the large academic chair system. The former is a traditional academic chair system where one professor is appointed for one chair. The latter is a structure where several laboratories (departments) are organized under one chair and several professors are appointed to them. The adoption of the system through the integration of several small chairs increased around 2006 mainly among national universities established as Imperial University under the old system. The academic chair system is an academic structure focusing on research activities and the system was closely linked to the generous allocation of human resources and budgets as well as the establishment of a graduate school.

On the other hand, universities established under the “new” system adopted the “department system” where “subjects required from an educational perspective are defined and faculty members qualified to impart knowledge of the subject and promote research related to the subject are appointed”. Universities that adopted the department system were ranked below those with the academic chair system in terms of the allocation of human resources and budgets and, for the long period they were not allowed to establish courses of graduate studies until 1964 when the establishment of master’s courses was admitted. Then following the revision of “University Establishment Standards” in 1974, universities with the department system were allowed to have doctoral courses. Under the department system, professors, associate professors, lecturers and assistant professor are arbitrarily appointed.

The academic chair system and the department system legally stipulated in the University

Establishment Standards had been two major structures of internal organizations of Japanese universities for a long time, but the stipulation was removed following the amendment of the Standards on April 1, 2007, and the systems were abolished in legal terms. And following the simultaneous amendment of the “School Education Act”, the stipulation that associate professors (jo-kyoju) and research associates (joshu) shall “assist” professors was removed, and the job positions of associate professors (jun-kyoju) and assistant professors (jokyo) were newly created. These changes may be causing certain changes in the way laboratories/research groups are organized.

As seen above, it may be suggested that laboratories/research groups in Japan may have: 1. a hierarchical structure having one professor at the top based on the small academic chair system; 2. a hierarchical structure having several professors based on the large academic chair system; 3. a flat structure that is based on the department system; or 4. other structures (developed after the abolition of the academic chair system and the department system). However, no empirical analysis of these situations can be found.

Research laboratory management in Japan

Several surveys and case studies can be found as prior studies on the management of research laboratories in Japan.

Shibayama et al. [11] studied the role sharing in respective laboratories through a survey on laboratory management in the field of life science. The study revealed that there exist certain patterns of research laboratory management such as the leader of a laboratory assuming managerial tasks and students carrying out experiments and other labor-intensive tasks. As for what type of management pattern leads to higher scientific productivity, the survey revealed that it depends on the type of research activities carried out by laboratories. More specifically, while in basic research, it would be more efficient if tasks are overlapping among laboratory members, in applied research, it would be more efficient if tasks are clearly divided among members.

Murayama et al. [12] studied the relation between serendipity and the separation of managerial tasks and scientific research activities through a survey among Japanese and American scientists. The study revealed that serendipity promotes the quality of research activities on average. Additionally, it revealed that if the researcher leading a research team is assuming responsibilities for managerial tasks, it promoted the quality of research papers though facilitating the pursuit of serendipity by other members of the team. While, if the managerial tasks and the research leader role are separated, the number of papers generated from research activities tend to increase.

Morichika et al. [13] studied the relation of the way of succession called “Inbreeding” seen in research laboratories of Japanese universities (recruitment within a laboratory) and the performance of laboratories through the survey on the internal organizations of The University of Tokyo. The study revealed that Inbreeding tends to work negatively on the performance of a department as a whole due to the insularity of the recruitment process, and that if most of the members of a laboratory are recruited from within the laboratory, performance tends to be lower.

As seen above, there are certain findings about the relation between the management of research laboratories and the productivity of research activities. However, we can find no empirical study dealing with a wide range of organizations as well as research fields and providing data on chronological changes in research environments.

Research project management

As a prior study on research project management in Japan, the above-mentioned survey among Japanese and American scientists by Murayama et al. [12] can be pointed out. The survey by Murayama et al. [12] collected data on the sizes of research projects (the number of members involved in respective projects), the periods of research projects and the amount of expenditures of research projects. They compiled the data and obtained a conclusion that the size of a research project has a negative influence on the quality of the project on average. However apart from this study, we can find few studies targeted on research activities in Japan.

As examples of cases abroad, there is a study dealing with research project management through the review of literature in the field of drug development [14], a case study on guidelines for research project management in Brazil [15] and a case study on research project management through interviews with research project managers in the field of life science [16]. There is a certain number of prior studies dealing with research project management in other countries, but we can find no empirical study dealing with a wide range of organizations and research fields and providing data on chronological changes.

0.4. Conditions for respondent selection

In the Labo-Panel Survey, data on the environment and management of laboratories/research groups and on R&D expenditures and outputs are collected on a continuous basis from faculty members with authority to manage research activities for chronological analyses. The focus of the study is placed on university divisions in the field of natural sciences among other actors engaging in R&D activities. Accordingly, the respondents are selected from faculty members of divisions engaging in a certain level of R&D activities in the field of natural sciences.

More specifically, the following three conditions are applied:

1) Faculty members of 184 universities whose domestic share of research papers in the field of natural sciences (2009 to 2013) is 0.05% or higher[1];
2) Faculty members belonging to university divisions in the fields of Science, Engineering, Agriculture, Health (medical)[2] and Health (excl. medical)[3]; and
3) Faculty members whose position is assistant professor (jokyo) or above.

---

[1] Universities whose domestic share (2009 – 2013) of papers in the fields of natural sciences is 1.00% or higher are classified as universities with large-scale research activities (1G, 2G), and those whose domestic share is 0.05% or higher but less than 1.00% are classified as universities with small-scale research activities (3G, 4G).

[2] University divisions classified as "health" in the Survey of research and development and whose name contains Medical (excluding internal research institutes).

[3] It contains pharmaceutical sciences, dentistry, and nursing science.

0.5. Procedures for selecting respondents

Respondents for the survey are selected in two methods, namely, random sampling (hereinafter RS) and over sampling (hereinafter OS). RS is a sampling method that does not take the scale of R&D activities into consideration. OS is for obtaining a certain number of samples on research leaders of large-scale R&D activities[4]. In either method, respondents have been selected with the help of university divisions having faculty members satisfying the conditions for respondent selection. The selection procedures for these methods are as described below.

(1) Selection procedures in RS
  1) Identifying populations of respondents (RS)
  2) Determining the number of RS respondents to be sourced from respective university divisions
  3) Finalizing respondents (RS): selection of RS respondents by university divisions

(2) Selection procedures in OS
  1) Identifying populations of respondents (OS)
  2) Determining the number of OS respondents to be sourced from respective university divisions
  3) Finalizing respondents (OS): selection of OS respondents by university divisions

0.6. The number of respondents for the study

In deciding RS and OS respondents for the study, 678 university divisions were asked to select a total of 4,000 respondents. With the help of the university divisions, a total of 3601 faculty members from 568 university divisions were selected as respondents (2,914 RS respondents and 687 OS respondents). Figure 1 shows the breakdown of the number of respondents by attribute.

Figure 1 Breakdown of the number of respondents by attribute

Univ. groups based on volume of research activities	Job position	Number of respondents					
		Science	Engineering	Agriculture	Health (medical)	Health (excl. medical)	Total
Relatively large (1G and 2G)	Prof.	113 (24)	112 (21)	108 (20)	125 (23)	122 (25)	580 (113)
	Assoc. Prof.	111 (22)	109 (21)	109 (22)	125 (24)	123 (22)	577 (111)
	Asst. Prof.	137 (26)	130 (26)	119 (21)	150 (26)	145 (26)	681 (125)
	Subtotal	361 (72)	351 (68)	336 (63)	400 (73)	390 (73)	1838 (349)
Relatively small (3G and 4G)	Prof.	104 (22)	110 (21)	107 (21)	108 (19)	120 (24)	549 (107)
	Assoc. Prof.	105 (20)	120 (25)	114 (20)	107 (21)	118 (23)	564 (109)
	Asst. Prof.	127 (22)	130 (23)	126 (25)	131 (26)	136 (26)	650 (122)
	Subtotal	336 (64)	360 (69)	347 (66)	346 (66)	374 (73)	1763 (338)
Total		697 (136)	711 (137)	683 (129)	746 (139)	764 (146)	3601 (687)

Note: Parenthesized figures are the number of OS respondents.

[4] Conditions for OS respondents are defined for each position. In the case of professors, those who have acquired the KAKEN research grants for “Specially Promoted Research”, “Scientific Research (S)” or “Scientific Research (A)” as a principal researcher. As for associate professors, lecturers and assistant professors, those who have acquired the KAKEN research grants for those mentioned for professors as well as for “Young Scientists”, “Challenging Exploratory Research” or other similar research categories as a principal researcher.

0.7. Survey method and period

A questionnaire survey was carried out among 3,601 respondents whose names and contact details were provided by university divisions. The questionnaire survey was conducted online during the period from December 11, 2020 to March 31, 2021.

0.8. The number of valid responses and response rate

Figure 2 shows the number of valid responses[5] for 30 strata established according to fields, project scales and job positions.

The (online) questionnaire survey was conducted among 3,601 respondents and 2,542 valid responses were collected. This means the response rate is 70.6%. As for RS respondents, 2,028 out of 2,914 respondents provided valid responses (response rate: 69.6%). As for OS respondents, 514 out of 687 respondents provided valid responses (response rate: 74.8%).

Figure 2 Breakdown of the number of valid responses by attribute

Univ. grouping by research activity volume	Job position	Number of respondents					
		Science	Engineering	Agriculture	Health (medical)	Health (excl. medical)	Total
Relatively large (1G and 2G)	Prof.	72 (17)	68 (12)	68 (13)	64 (10)	81 (19)	353 (71)
	Assoc. Prof.	84 (18)	68 (10)	77 (16)	74 (16)	93 (19)	396 (79)
	Asst. Prof.	87 (14)	95 (18)	82 (19)	84 (17)	107 (19)	455 (87)
	Subtotal	243 (49)	231 (40)	227 (48)	222 (43)	281 (57)	1204 (237)
Relatively small (3G and 4G)	Prof.	84 (18)	91 (17)	79 (16)	64 (12)	90 (16)	408 (79)
	Assoc. Prof.	93 (18)	105 (20)	86 (15)	79 (17)	101 (23)	464 (93)
	Asst. Prof.	89 (20)	105 (21)	96 (23)	75 (19)	101 (22)	466 (105)
	Subtotal	266 (56)	301 (58)	261 (54)	218 (48)	292 (61)	1338 (277)
Total		509 (105)	532 (98)	488 (102)	440 (91)	573 (118)	2542 (514)

Note: Parenthesized figures are the number of OS respondents.

[5] Those responding in compliance with instructions to 90% or more questions of each of the three parts of the questionnaire were considered as a valid response. Respondents who ticked "5. Others" in the question about job position (Q101030) were excluded.

0.9. Structure of questionnaire

The questionnaire is largely divided into three parts and each part contains several sub-parts. Figure 3 lists the sub-parts of respective parts. The questionnaire contains a total of 24 sub-parts.

Figure 3 Structure of questionnaire

【Part 1】Information about faculty members and their laboratories/research groups (5 sub-parts)

○ Respondent's basic information
○ Basic information of the laboratory/research group to which the respondent belongs
○ Respondent's authority and experience in research activities
○ Respondent's work activities
○ What is important for the respondent's research activities

【Part 2】Details of laboratories/research groups and their research management (7 sub-parts)

○ Number of the respondent's laboratory/research group members
○ R&D expenditure in the laboratory/research group
○ Management of the laboratory/research group
○ Communication within the laboratory/research group
○ Access to literature materials from the laboratory/research group
○ Situation of digital data/tools use in the laboratory/research group
○ Interactions with other laboratories/research groups

【Part 3】Details of research projects conducted by laboratories/research groups (12 sub-parts)

○ Research portfolio in the laboratory/research group
○ Basic information of the research project
○ Expenditures of the research project
○ Objectives of the research project
○ The role the respondent played in the research project
○ Details of the laboratory/research group members who worked on the research project
○ Decision-making in the research project
○ Details of external co-investigator organizations to the laboratory/research group in the research project
○ Use of external research equipment/facilities/analysis services for the research project
○ Papers produced from the research project
○ Patent applications made from the research project
○ Other outputs from the research project

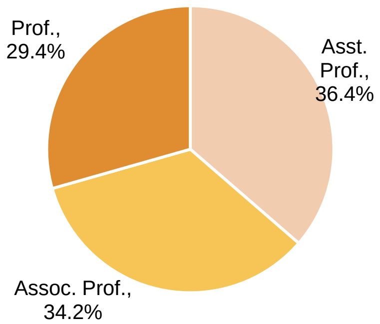
1. Characteristics of university faculty

1.1. Basic information about university faculty

○ Job position

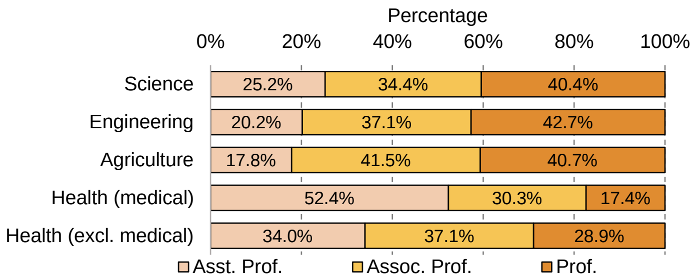
- Regarding the job positions of the faculty in natural sciences[6] (all fields) at Japanese universities, assistant professors, associate professors[7] and professors respectively account for roughly one third each. As for composition by field, the percentage of assistant professors is higher, and they account for almost half of the faculty in Health (medical). Meanwhile in the fields of Science, Engineering and Agriculture, the percentage of professors is around 40% and that of assistant professors is lower, 20% or so.

Figure 4 Job position of university faculty (all fields)



Note: Based on valid responses in RS (2,028). Obtained from population estimation.

Figure 5 Job position of university faculty (by field)



Note: Based on valid responses in RS (2,028). Obtained from population estimation.

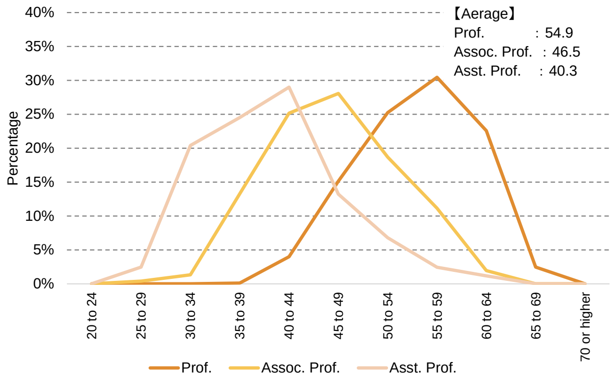
○ Age

- The position-wise average age of university faculty is 54.9 for professors, 46.5 for associate professors and 40.3 for assistant professors.
- In Health (medical), the range of age distribution for each position is smaller as compared to other fields and distributions for respective positions have a similar shape. This suggests that in Health (medical), as compared to other fields, importance tends to be placed on experience (age) in deciding who should be promoted.

[6] Faculty members of Japanese universities producing a certain number of research papers in the area of natural sciences.

[7] Although the category of "associate professors" includes "lecturers", it is described in the report as "associate professors" for simplification.

Figure 6 Age distribution of university faculty (by position)



Note: Based on valid responses in RS (2,027). Obtained from population estimation.

○ Types of employment contracts (tenured or non-tenured)

- The percentage of those under a fixed-term contract tends to be higher in a lower job position. The percentage of fixed-term contract assistant professors is the lowest, 45.0% in Agriculture and the highest in Health (medical), 61.6%. However, in Health (medical) and Health (excl. medical), even for professors, those fixed-term contract account for large percentages, 34.9% and 38.2% respectively.

Figure 7 Percentages of fixed-term contract faculty members (by field and position)

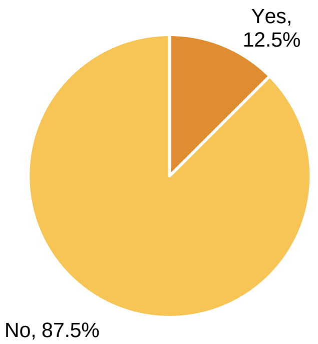
	Science	Engineering	Agriculture	Health (medical)	Health (excl. medical)
Prof.	3.4%	3.9%	7.7%	34.9%	38.2%
Assoc. Prof.	9.4%	12.6%	15.4%	41.7%	28.5%
Asst. Prof.	51.9%	55.3%	45.0%	61.6%	56.6%

Note: Based on valid responses in RS (2,028). Obtained from population estimation.

○ Life events affecting career

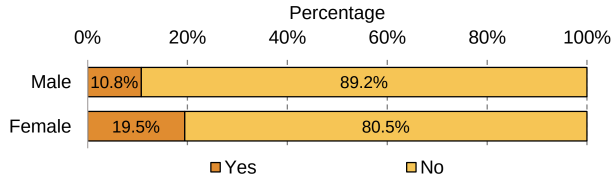
- University faculty who experienced events that brought about significant changes to their life and career (such as childbirth, childcare and nursing) in 2019 stand at 12.5%. However, gender analysis indicates a striking difference: male faculty members experiencing such life events stand at 10.8%, while for female members, it is 19.5%, or double the percentage of male faculty members.

Figure 8 University faculty experiencing life events (all fields)



Note: Based on valid responses in RS (2,027). Obtained from population estimation.

Figure 9 University faculty experiencing life events (by gender)



Note: Based on valid responses in RS (1,939). Obtained from population estimation.

1.2. Situations of university faculty at laboratories/research groups

○ Existence of supervisors

- The percentage of those having supervisors in their laboratories/research groups tends to be higher in a lower job position. In Agriculture around 60% of assistant professors have supervisors, and the percentage stands at around 70% in Science and Engineering and around 90% in Health (medical) and Health (excl. medical). This means most assistant professors are conducting R&D activities under supervisors in their laboratories/research groups.
- As for associate professors, those having supervisors stand at around 30% in Science, Engineering and Agriculture, meanwhile the percentage is higher in Health standing at 75.4% in Health (medical) and 60.2% in Health (excl. medical).

Figure 10 Percentages of faculty members having supervisors in their laboratories/research groups (by field and position)

	Science	Engineering	Agriculture	Health (medical)	Health (excl. medical)
Prof.	5.9%	8.1%	4.9%	16.9%	10.2%
Assoc. Prof.	29.2%	27.6%	30.0%	75.4%	60.2%
Asst. Prof.	66.8%	67.7%	56.1%	90.7%	86.9%

Note: Based on valid responses in RS (2,028). Obtained from population estimation.

○ Existence of subordinates (excluding students)

- The percentage of those having subordinates in their laboratories/research groups tends to be higher in a higher job position. However, in Health (medical) rather higher percentage, 36.0% of assistant professors have subordinates. As for associate professors, the percentage of those having subordinates is lower in Engineering and Agriculture than in other fields.

- As for professors, the percentage of those having subordinates is around 50% in Science, Engineering and Agriculture, while the percentage is 86.2% in Health (medical) and 73.0% in Health (excl. medical).

Figure 11 Percentages of faculty having subordinates in laboratories/research groups (by field and position)

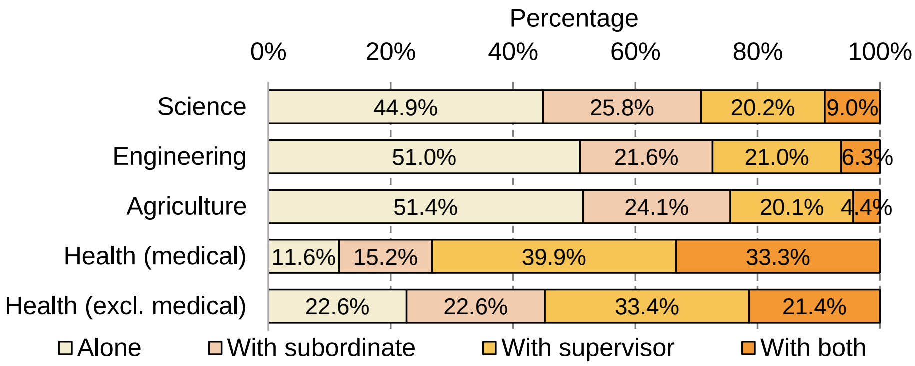
	Science	Engineering	Agriculture	Health (medical)	Health (excl. medical)
Prof.	52.4%	48.3%	49.6%	86.2%	73.0%
Assoc. Prof.	29.1%	13.7%	16.5%	48.6%	40.2%
Asst. Prof.	14.7%	11.2%	8.2%	36.0%	23.5%

Note: Based on valid responses in RS (2,028). Obtained from population estimation.

○ Structure of laboratories/research groups

- The field-wise analysis of the structure of laboratories/research groups shows that some half of the laboratories/research groups in Science, Engineering and Agriculture are of a flat structure having no supervisors or no subordinates, more specifically, an organization consisted mainly of undergraduate and graduate students other than the faculty. While, in Health (medical), the percentage of faculty members with a supervisor/subordinate(s) is 33.3%, suggesting that many of the laboratories/research groups in the field are of a hierarchical structure where a professor presides over other faculty members.

Figure 12 Situations of university faculty at laboratories/research groups (by field)



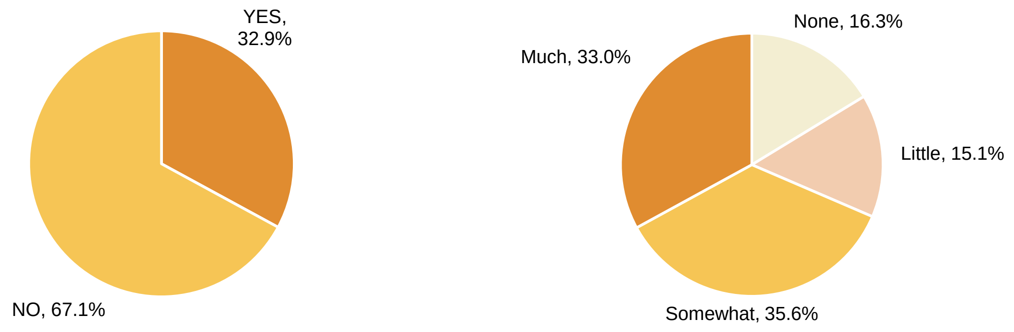
Note 1: Based on valid responses in RS (2,028). Obtained from population estimation.
Note 2: “Alone” means that the faculty member has no supervisor or subordinate (other than students) in his/her laboratories/research groups.

○ Predecessors and their influence

- University faculty who have succeeded their laboratories/research groups form their predecessors stand at 32.9%[8]. As for the influence of predecessors, 68.6% consider the research themes of their predecessors "somewhat" or "much" influence on the current research themes of their laboratories/research groups.

Figure 13 Predecessors for laboratories/research groups (all fields)

(a) Existence of predecessors (b) Influence of predecessors



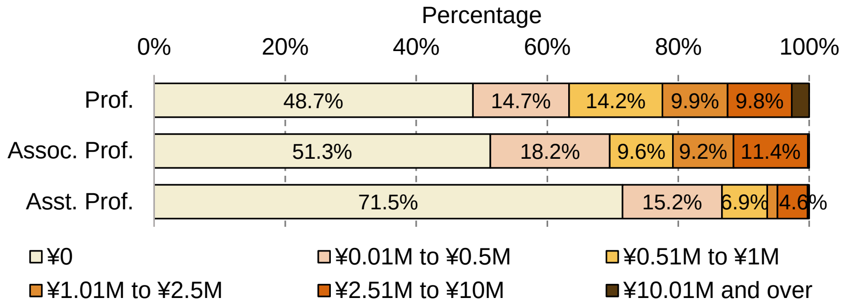
Note: Based on valid responses in RS (1,141). Obtained from population estimation.

Note: Based on valid responses in RS (374). Obtained from population estimation.

○ Amount of startup funding[9]

- Around 70% of assistant professors and 50% of professors and associate professors replied they had (received) no startup funding. Although the amount of startup funding is larger in a higher job position, the median is 0 yen for all job positions.

Figure 14 Startup funds provided to laboratories/research groups (by position)



Note: Based on valid responses in RS (765). Obtained from population estimation.

---

[8] Based on respondents who replied they had no supervisor.

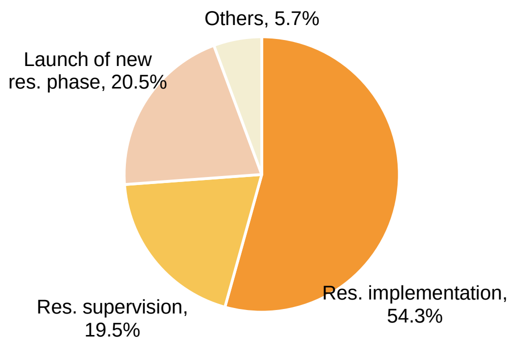
[9] Based on responses to the question on the amount of startup funding they had received from their universities/divisions in establishing their laboratories/research groups by respondents who replied they had no predecessors to the prior question.

1.3. Use of research time by university faculty and their sense of values

○ Use of research time

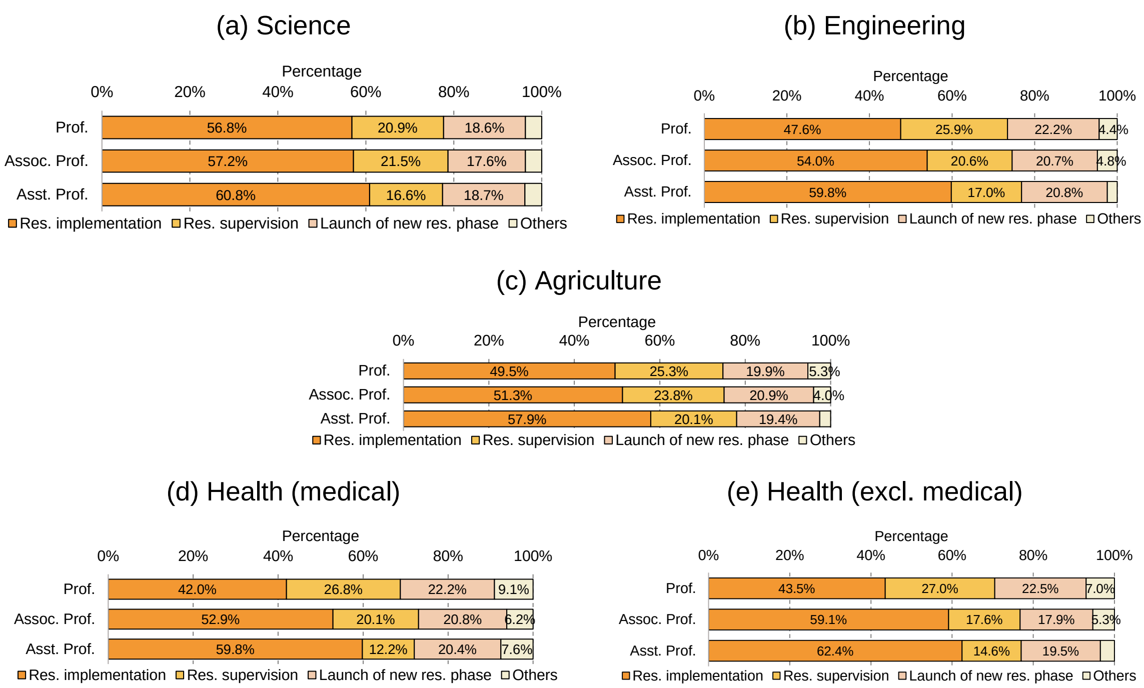
- Regarding the overall tendency about the use of research time by university faculty, 54.3% of research time is used for conducting research activities and about 20% is spent for research management and for the launch of a new research phase respectively.
- As for difference in the use of research time by job position, time spent on research activities tends to decrease and time spent on research management tends to increase as position becomes higher. Especially in Health (medical) and Health (excl. medical) the percentage of time spent on research management is high. As for the launch of a new research phase, there is no significant difference by job position.

Figure 15 Research efforts by university faculty (all fields)



Note: Based on valid responses in RS (2,018). Obtained from population estimation.

Figure 16 Research efforts by university faculty (by field and job position)

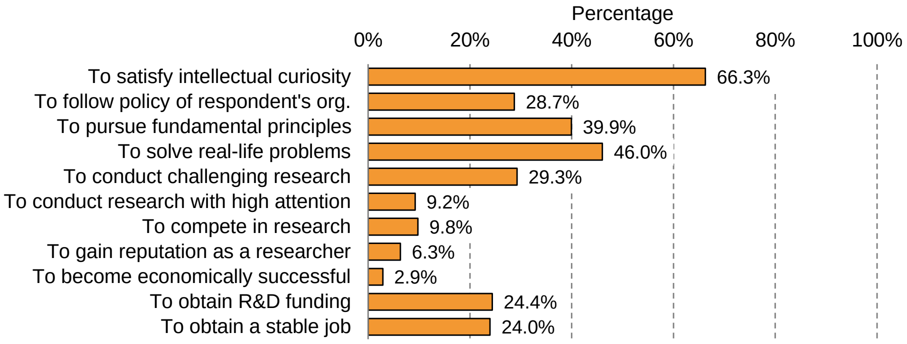


Note: Based on valid responses in RS (2,018). Obtained from population estimation.

○ Sense of values

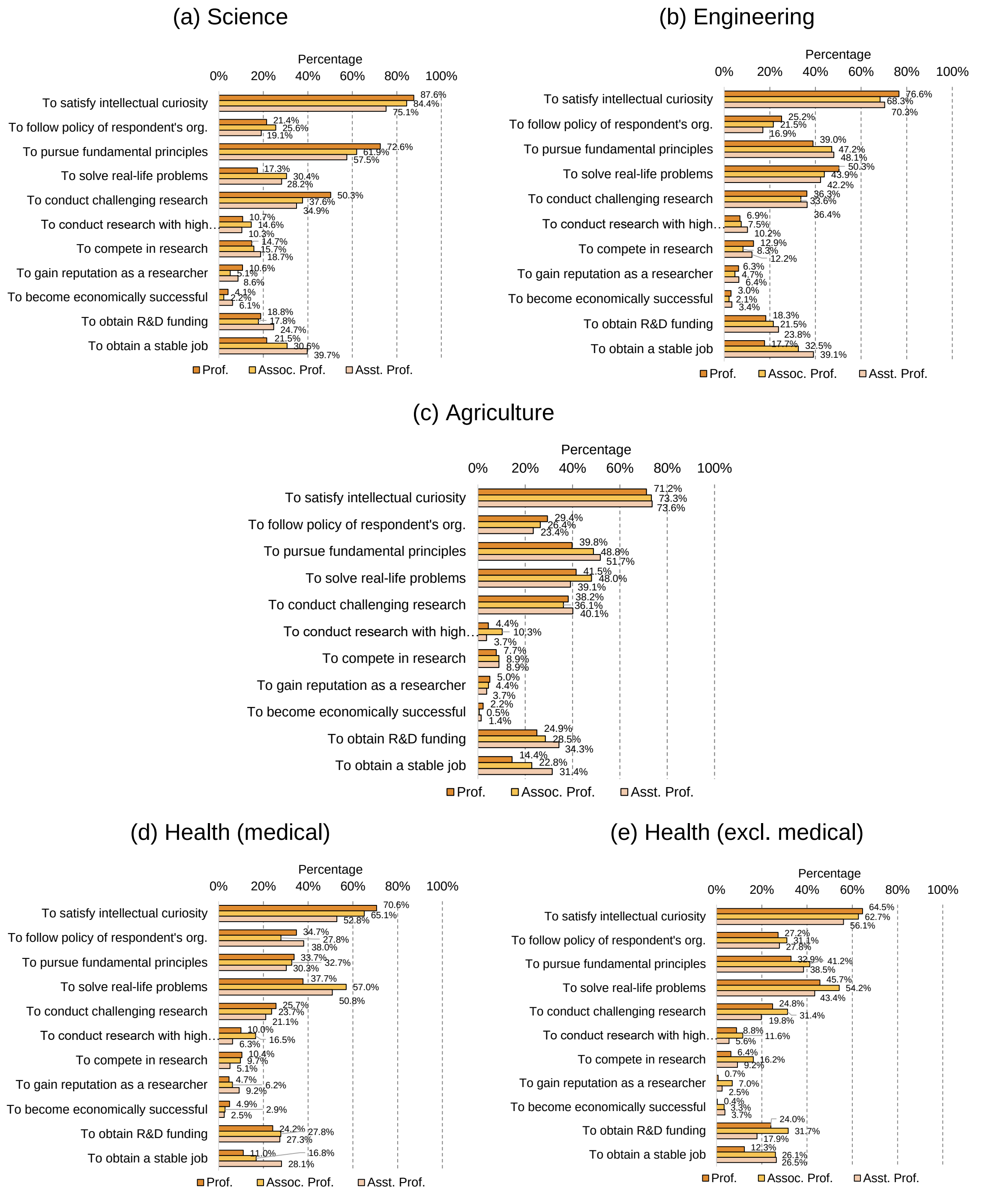
- The overall tendency among university faculty about the sense of values concerning research motivation, the percentage of those placing emphasis on “To satisfy intellectual curiosity” is the highest, 66.3% and after that comes “To solve real-life problems” and “To pursue fundamental principles”. The percentages of those placing emphasis on “To conduct research with high attention”, “To compete in research”, “To gain reputation as a researcher” and “To become economically successful” are lower than 10%.
- Regarding motivation for research by field and position, it is indicated that overall, more assistant professors are placing emphasis on “To obtain a stable job”, while the percentage of “To satisfy intellectual curiosity” is the highest among professors in Science, Engineering, Health (medical) and Health (excl. medical).
- In Science, the percentage of “To pursue fundamental principles” and “To conduct challenging research” is the highest among professors, while the percentage of “To solve real-life problems” is the highest among associate professors and assistant professors. In Health (medical), associate professors and assistant professors tend to place more emphasis on “To solve real-life problems” than professors.

Figure 17 Sense of values concerning motivation for research among university faculty (all fields; percentage of those “placing emphasis”)



Note: Based on valid responses in RS (2,028). The number of valid responses concerning “policy of respondent’s organization” and “acquisition of R&D expenditures” is 2,027. Obtained from population estimation.

Figure 18 Sense of values concerning research motivation among university faculty (by field and job position; percentage of those "placing emphasis")



Note: Based on valid responses in RS (2,028). The number of valid responses concerning "policy of respondent's organization" and "acquisition of R&D expenditures" is 2,027. Obtained from population estimation.

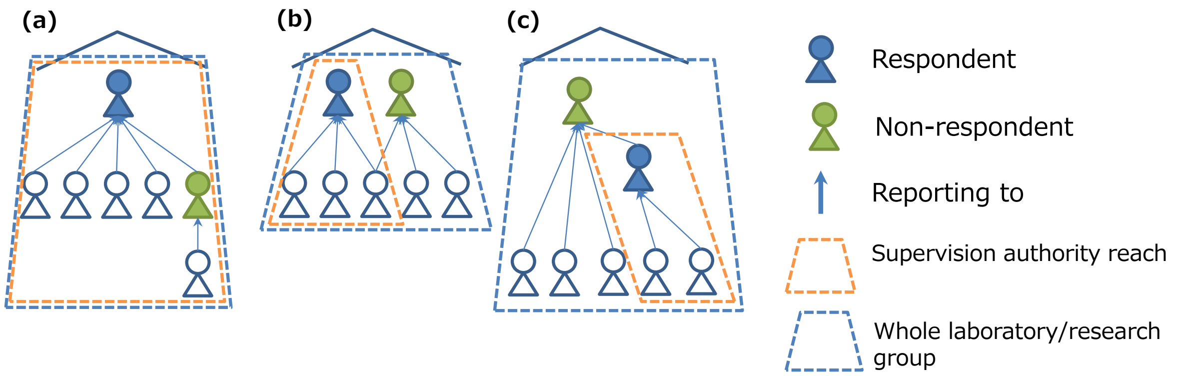
2. Characteristics of laboratories/research groups and research environment

2.1. Whole laboratories/research groups and the scope of management by respondents as analysis range

In this chapter, two analysis ranges, namely a whole laboratory/research group and the scope of management by a respondent in a laboratory/research group are defined in order to investigate into the characteristics of laboratories/research groups and research environment. As for the characteristics of laboratories/research groups and research environment, the analysis is focused on the whole laboratory/research group. As for resources under the management of respondents in their laboratories/research groups, the focus is placed on the scope of management by respondents in the laboratories/research groups.

It should be noted that the scope of management by a respondent is not always the whole laboratory/research group. For example, in the case of a laboratory/research group consisted of several faculty members (such as a laboratory carrying more than one name like the (b) in the figure below), if management authority is divided among or allocated to several of them (like the (c) in the figure below), the respondent's scope of management is more restricted than the whole laboratory/research group. Figure 19 illustrates the relations between the whole laboratory/research group and the scope of management by a respondent in a laboratory/research group.

Figure 19 Structure of laboratories/research groups and scopes of management

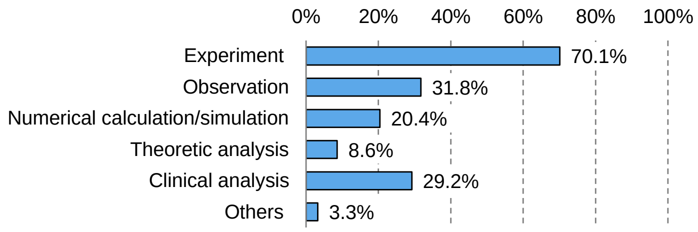


2.2. Characteristics of laboratories/research groups

○ Research methods

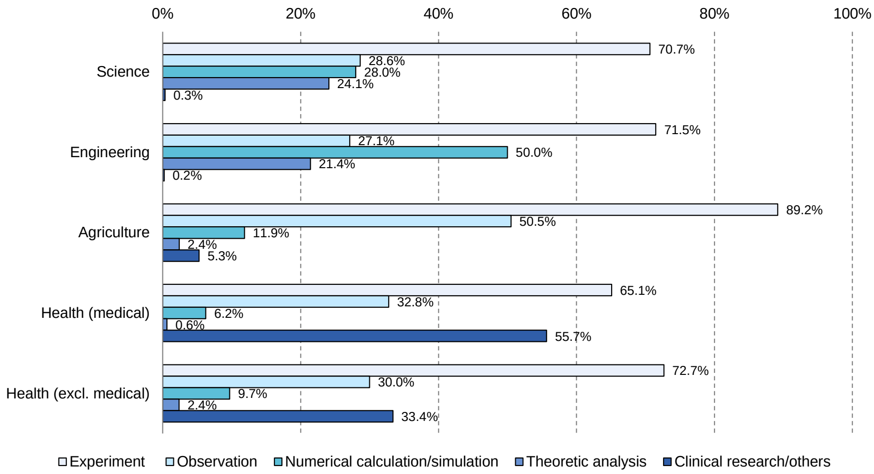
- The research methods most often used by university laboratories/research groups in natural sciences [10] in Japan is "experiments" and the tendency is common across all fields of the area.
- The second most popular research methods vary among fields: "observation" and "numerical calculation/simulation" in the field of Science, "numerical calculation/simulation" in Engineering, "observation" in Agriculture, "clinical research/others" in Health (medical) and "clinical research/others" and "observation" in Health (excl. medical).

Figure 20 Research methods used (all fields)



Note: Based on valid responses to the question in RS (2,024). Obtained from population estimation.

Figure 21 Research methods used (by field)



Note: Based on valid responses to the question in RS (2,024). Obtained from population estimation.

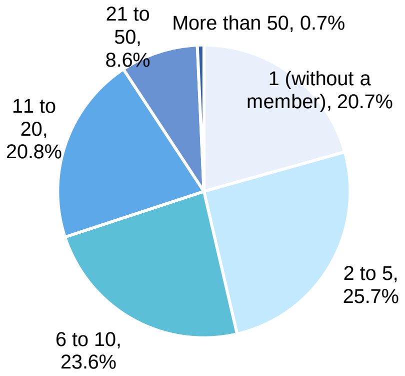
[10] Faculty members of Japanese universities producing a certain number of research papers in natural sciences.

2.3. Resources placed under the management of faculty members in laboratories/research groups

○ The number of research members under the management of faculty members

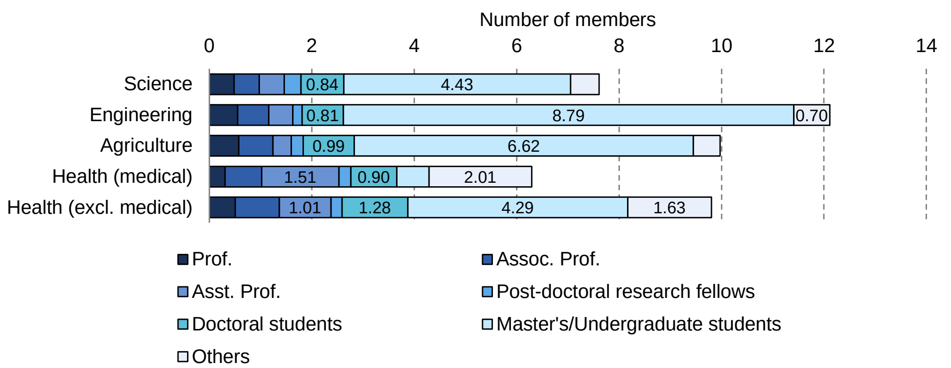
- The most common scale of research staff placed under the management of a faculty member in a laboratory/research group is two to five (25.7%), and after this comes six to ten (23.6%). Faculty members carrying out R&D activities alone account for 20.7%.
- The average number of research members working under the faculty members' management is the highest in Engineering (12.1) and many of them are master's/undergraduate students. The average is the smallest in Health (medical) (6.3) and the percentage of faculty members carrying out R&D activities alone is the highest. One of the reasons for this is that the assistant professors account for the larger portion of the entire faculty and the number of staff under their management is small. In Health (medical), two thirds of assistant professors are carrying out R&D activities alone without other research members.
- The total number of research members under supervision tends to be larger in a higher job position, as well as the number of members other than researchers. (Figure 24 illustrates situations in Science for example.)

Figure 22 Distribution of the number of members (including respondents) (all fields)



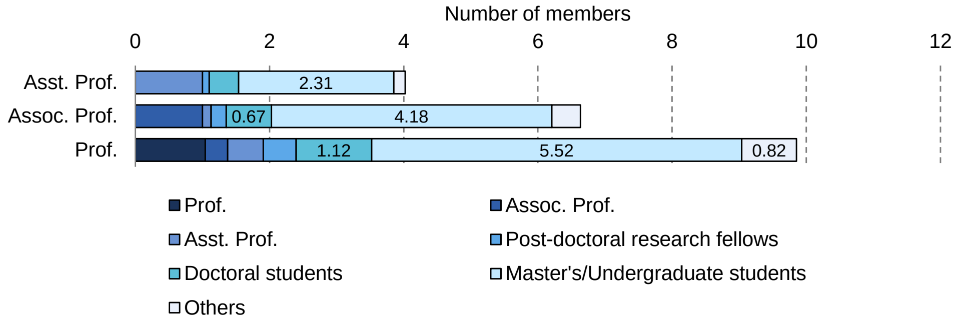
Note: Based on valid responses to the question in RS (1,576). Obtained from population estimation.

Figure 23 Average of the number of members (including respondents) in each field and position-wise distribution



Note 1: Based on valid responses to the question in RS (1,576). Obtained from population estimation.
Note 2: Others include medical staff, visiting researchers, research assistants, technical staff and secretaries.

Figure 24 Average of the number of members (including respondents) and position-wise distribution in Science

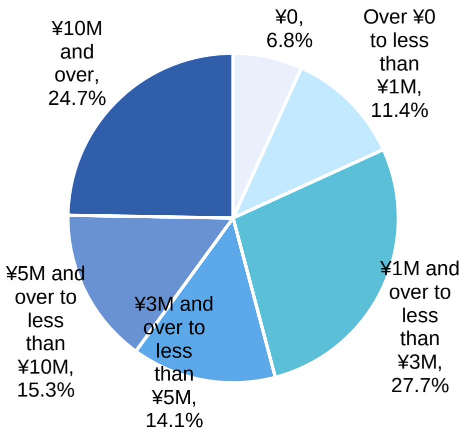


Note 1: Based on valid responses to the question for Science in RS (339). Obtained from population estimation.
Note 2: Others include medical staff, visiting researchers, research assistants, technical staff and secretaries.

○ R&D expenditures under the management of faculty members

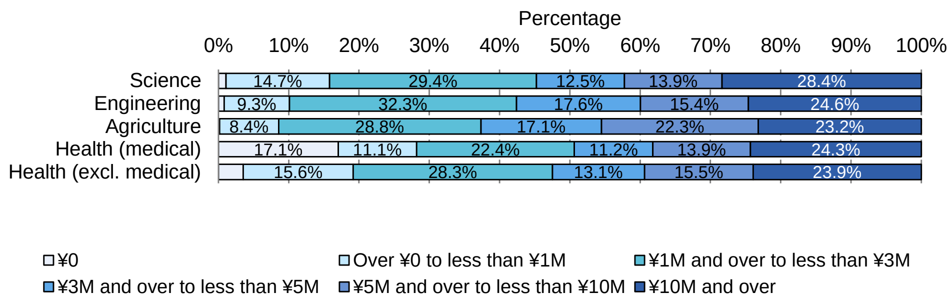
- The percentage of laboratories/research groups whose R&D expenditures are one million yen and over to less than three million yen is the largest (27.7%), and this is followed by ten million or higher (24.7%).
- Meanwhile, 6.8% replied their R&D expenditures in total is 0 yen. In terms of field, the percentage is the highest in Health (medical) (17.1%).

Figure 25 Distribution of the scales of R&D expenditures (in total) (all fields)



Note: Based on valid responses to the question in RS (1,561). Obtained from population estimation.

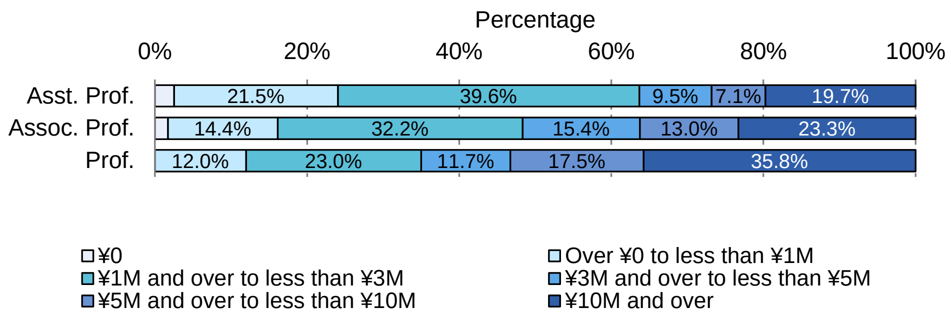
Figure 26 Distribution of the scales of R&D expenditures (in total) (by field)



Note: Based on valid responses to the question in RS (1,561). Obtained from population estimation.

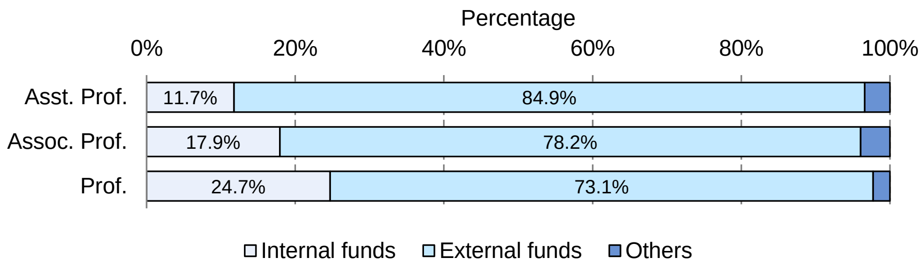
- The scale of R&D expenditures under management tends to be larger in a higher job position and the major sources of the funding changes as position becomes higher. As for assistant professors, the major source is external funds obtained by themselves or by their supervisors. As for associate professor to professor, climbing the ladder, the percentage of external funds acquired by respondents themselves and funding provided by their organizations becomes larger. (Figure 27, Figure 28, Figure 29 illustrates situations in Science)

Figure 27 Distribution of the scales of R&D expenditures (in total) by position in Science



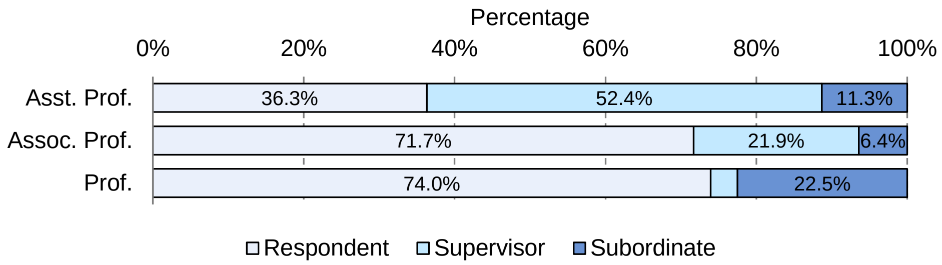
Note: Based on valid responses to the question for Science in RS (337). Obtained from population estimation.

Figure 28 Shares of respective funding sources for R&D expenditures (in total) by position in Science



Note 1: Based on valid responses to the question for Science in RS (337). Obtained from population estimation.
Note 2: Others mean "funding acquired by joint research counterpart organizations".

Figure 29 Procurers of external funds in respective positions in Science



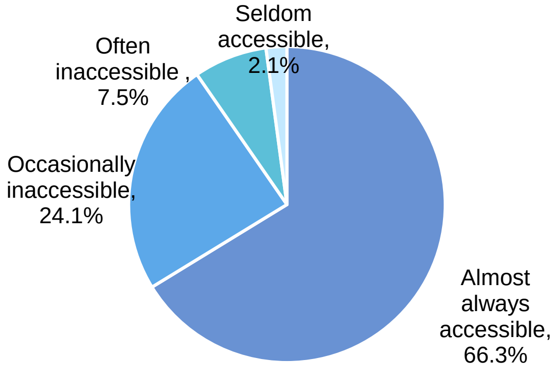
Note: Based on valid responses to the question for Science in RS (337). Obtained from population estimation.

2.4. Environments of laboratories/research groups

○ Accessibility to literature

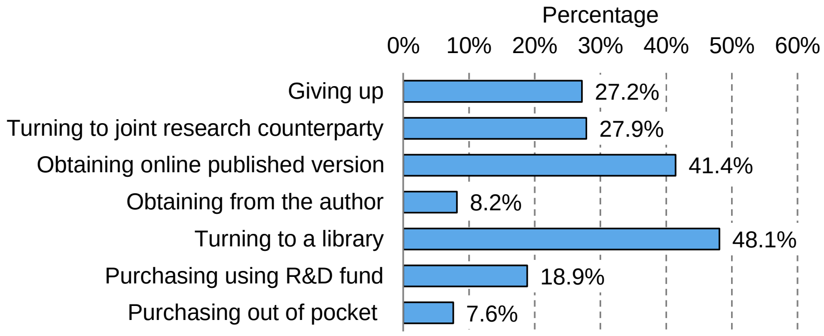
- 90.4% of laboratories/research groups have access to more than half of the literature they want to consult.
- As for laboratories/research groups without access to more than half of literature they want to consult, “Library” is the most popular access means (48.1%), and “Online published version” (41.4%) comes next.

Figure 30 Accessibility to literature (all fields)



Note 1: Based on valid responses to the question in RS (2,027). Obtained from population estimation.
Note 2: “Almost always accessible” means access is successful 8 to 10 times every 10 tries; “Occasionally inaccessible” means 6 to 7 times every 10 tries; “Often inaccessible” means 3 to 5times every 10 tries; and “Seldom accessible” means 0 to 2 times every 10 tries.

Figure 31 Alternate means to access to literature (all fields)

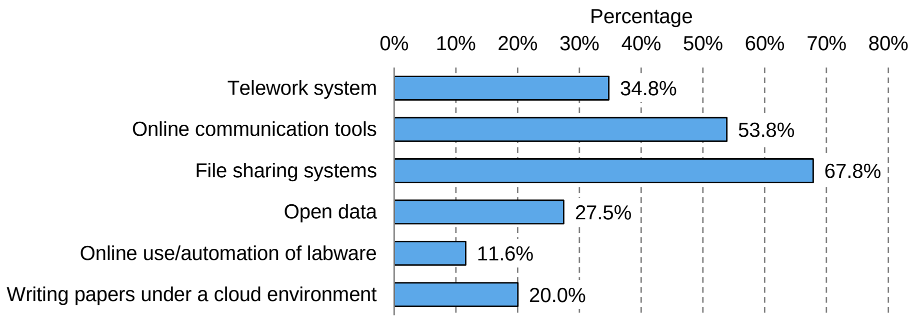


Note: Based on valid responses to the previous question (for Figure 30) that replied “Often inaccessible” and “Seldom accessible”. Obtained from population estimation.

○ Use of digital data/tools[11]

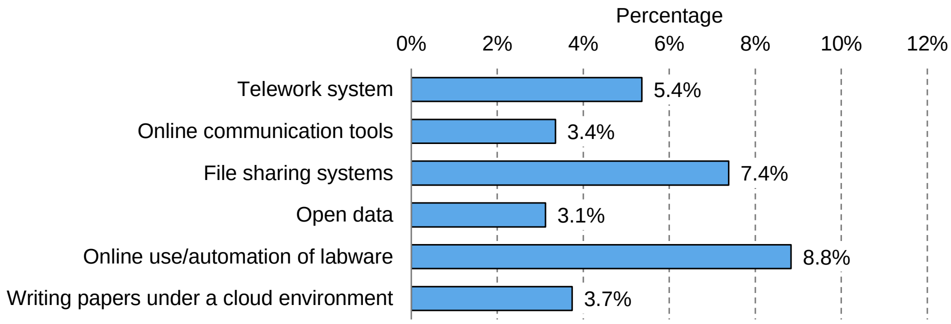
- Digital data/tools most often used by laboratories/research groups is "File sharing systems" which are used by 67.8% of laboratories/research groups. This is followed by "Online communication tools" used by 53.8% of laboratories/research groups. While the least common digital data/tools are "Online use/automation of labware" (11.6%).
- Digital data/tools with the highest demands is "Online use/automation of labware" whose utilization is the lowest, and 8.8% of laboratories/research groups without "Online use/automation of labware" want to use them. The second most popular is "File sharing systems" and 7.4% of laboratories/research groups without such systems want to use them. Although "File sharing systems" are already diffused digital data/tools, it is suggested that the systems should be promoted further.

Figure 32 Utilization of digital data/tools (all fields)



Note 1: Based on valid responses to the question in RS (2,027). Obtained from population estimation.
Note 2: Based on the situations before the influence of COVID-19 pandemic emerged.

Figure 33 Demands for digital data/tools that are not yet in use (all fields)



Note 1: Based on valid responses to the question in RS (2,027). Obtained from population estimation.
Note 2: Based on the situations before the influence of COVID-19 pandemic emerged.

[11] Based on the situations in FY 2019 before the influence of COVID pandemic emerged.

3. Portfolio/characteristics of research projects

The survey asked about the details of research projects being conducted by respective laboratories/research groups in its part 3. The definition of a research project for the survey is as follows:

> ○ A series of R&D activities※1, ※2 conducted to acquire the understanding of and a solution for a research subject/theme.
>
> (Types of research projects)
>
> - Projects whose goals and period are defined; and
> - Projects whose goals are defined but whose period cannot be fixed (such as exploratory study, theorem proving, experiments/observations conducted regularly).
>
> ※1 Both research funding for and members involved in R&D activities should be taken into consideration. Respective research projects don't require one-on-one correspondence with respective research funds including KAKEN research grants.
>
> ※2 Below you will be asked about research funding for and members involved in R&D activities.

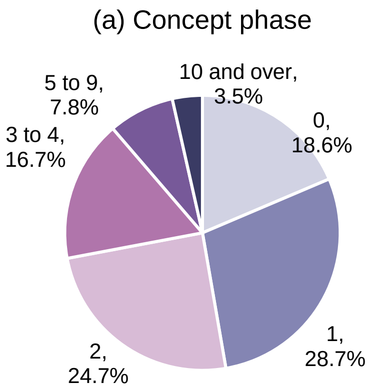
3.1. Portfolio of research projects (within respondents' management authority)

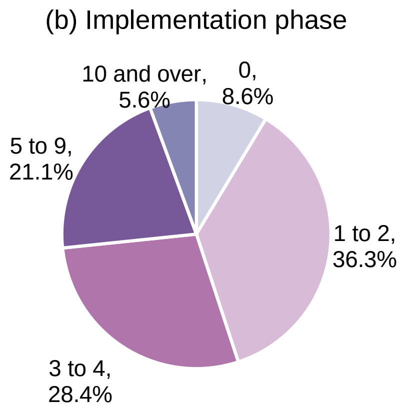
○ The number of research projects

- 81.4% of university faculty have research projects in concept phase. The percentage of those having one research project in concept phase is the highest, 28.7% and this is followed by those with two such projects, standing at 24.7%. The average number of research projects in concept phase is 2.3 and the median is 2 and the maximum, 45.
- Meanwhile, 36.3% of university faculty have one or two research projects in implementation phase. The average number of research projects in implementation phase is 3.5. The median is 3 and the maximum, 40.
- University faculty in higher job positions tend to have more research projects in implementation phase. While the percentage of university faculty[12] without any research project in implementation phase is 15.2% in the case of assistant professors, it stands at 3.0% for professors. The percentage of university faculty with 5 or more research projects in implementation phase is 15.8% for assistant professors, while it stands at 39.2% for professors. The average number of research projects in implementation phase is 2.5 in the case of assistant professors and 3.6 for associate professors and 4.6 for professors.

[12] Faculty members of Japanese universities producing a certain number of research papers in natural sciences.

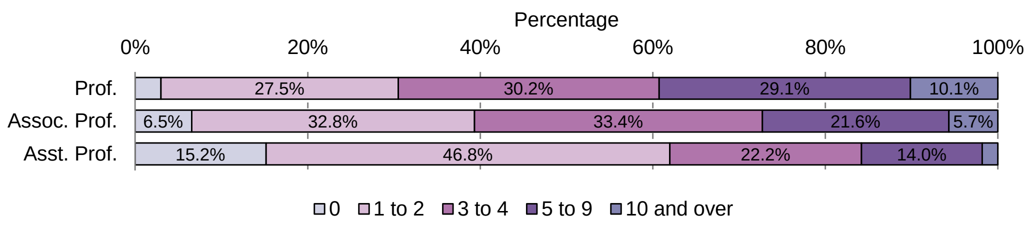
Figure 34 The number of projects (within respondents' management authority) (all fields)





Note: Based on valid responses in RS (2,018). Obtained from population estimation.

Figure 35 The number of projects (within respondents' management authority) under implementation (by position)

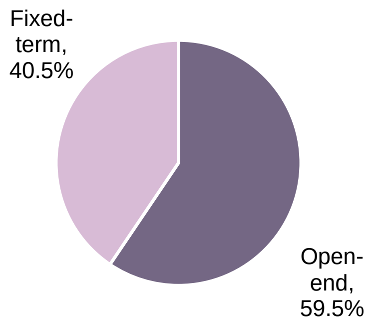


Note: Based on valid responses in RS (2,018). Obtained from population estimation.

○ Research project period: fixed-term or open-end

- Overall, the percentage of research projects whose period is fixed is 59.5%, while that of open-end projects is 40.5%. Accordingly, around 40% of research projects have no fixed period.

Figure 36 Fixed-term or open-end for research projects (all fields)

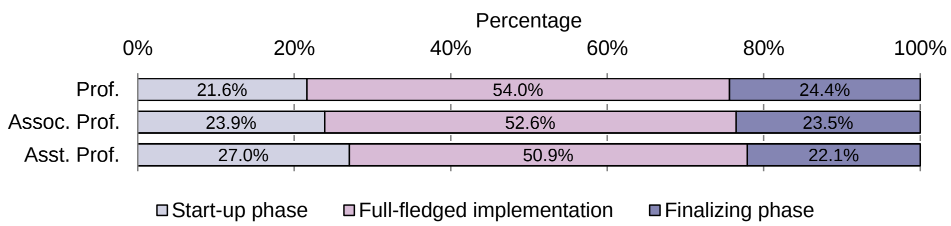


Note: Based on valid responses in RS (1,902). Obtained from population estimation.

○ Breakdown of research projects by progress

- The percentage of university faculty having research projects at full-fledged implementation/finalization phases tends to be somewhat larger in a higher job position. The percentage is 73.0% for assistant professors, while it is 78.4% in the case of professors. In other words, the relatively higher percentage of assistant professors have projects at a start-up phase.
- Overall, research projects given up before completion account for 19.3% of ended projects. As the job position becomes higher, the percentage becomes lower; it is 26.6% for assistant professors while 13.4% for professors.

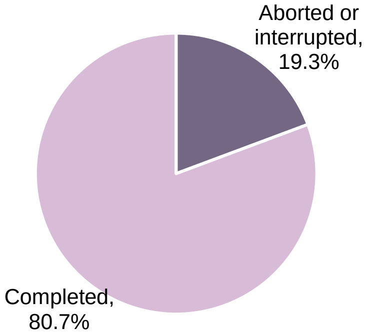
Figure 37 Progress of research projects (by position)



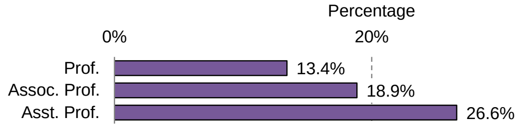
Note: Based on valid responses in RS (1,829). Obtained from population estimation.

Figure 38 Percentage of research projects given up to those ended in 2019

(a) All fields



(b) By position



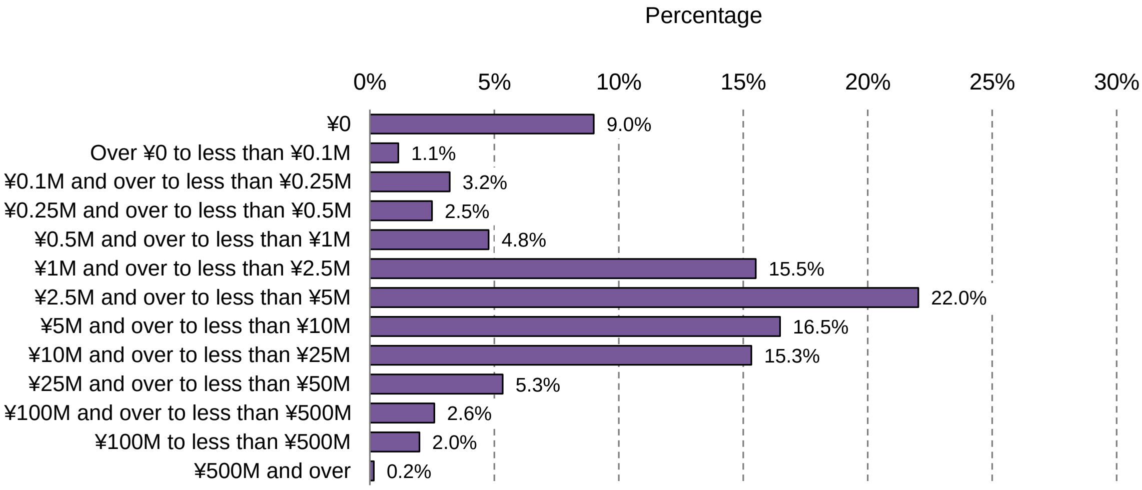
Note: Based on valid responses in RS (835). Obtained from population estimation.

3.2. Characteristics of research projects (in which respondents have poured the highest amount of their efforts)

○ Amount of project expenditures under respondents' management

- Project expenditures of ¥2.5M and over to less than ¥5M stand at the highest percentage, 22.0%, and that is followed by expenditures of ¥5M and over to less than ¥10M, those of ¥1M and over to less than ¥2.5M and those of ¥10M and over to less than ¥25M, standing at a little more than 15.0% respectively. 10.1% of projects expended ¥25 million and over and the percentage include those whose expenditures are ¥100M and over (2.2%).
- Expenditures for 20.6% of projects is less than ¥1M and 9.0% of which has no expenditure which means ¥0. Although not illustrated in the figure, the percentage of ¥0 is the highest, 17.5% in Health (medical) by field. Overall and position-wise, the percentage is the highest for assistant professors, 18.8%, and 5.8% for associate professors, and the smallest for professors, 0.9%.

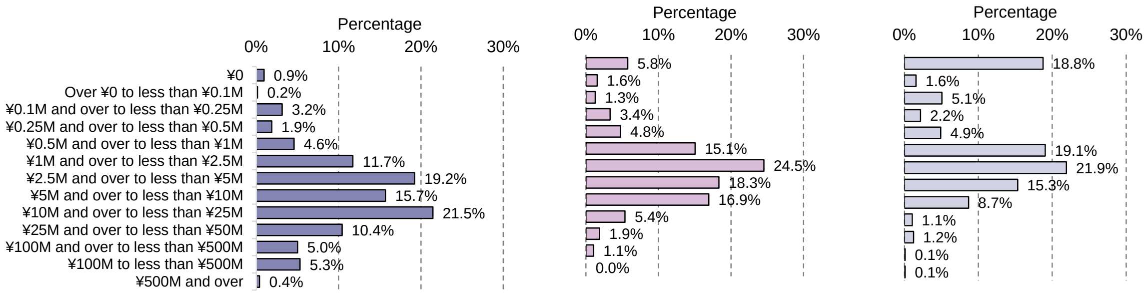
Figure 39 Project expenditures (under respondents' management) (all fields)



Note: Based on valid responses in RS (1,940). Obtained from population estimation.

Figure 40 Distribution of project expenditures (under respondents' management) (by position)

(a) Prof.　　(b) Assoc. Prof.　　(c) Asst. Prof.

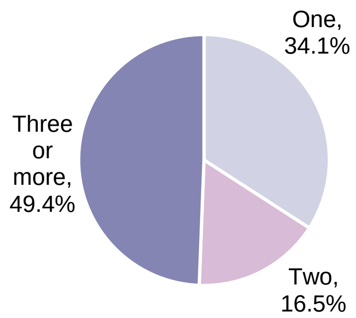


Note: Based on valid responses in RS (1,940). Obtained from population estimation.

Funding sources for project expenditures

- Overall, the number of funding sources for project expenditures is one in 34.1% of projects, two in 16.5% and three or more in 49.4%.
- As for the types of funding sources[13], different tendencies are observed among fields. The percentage of internal funds is the highest (24.6%) in Health (excl. medical), that of KAKEN research grants is the highest (69.7%) in Science and that of Japanese private companies is the highest (9.7%) in Engineering.

Figure 41 The number of funding sources (all fields)

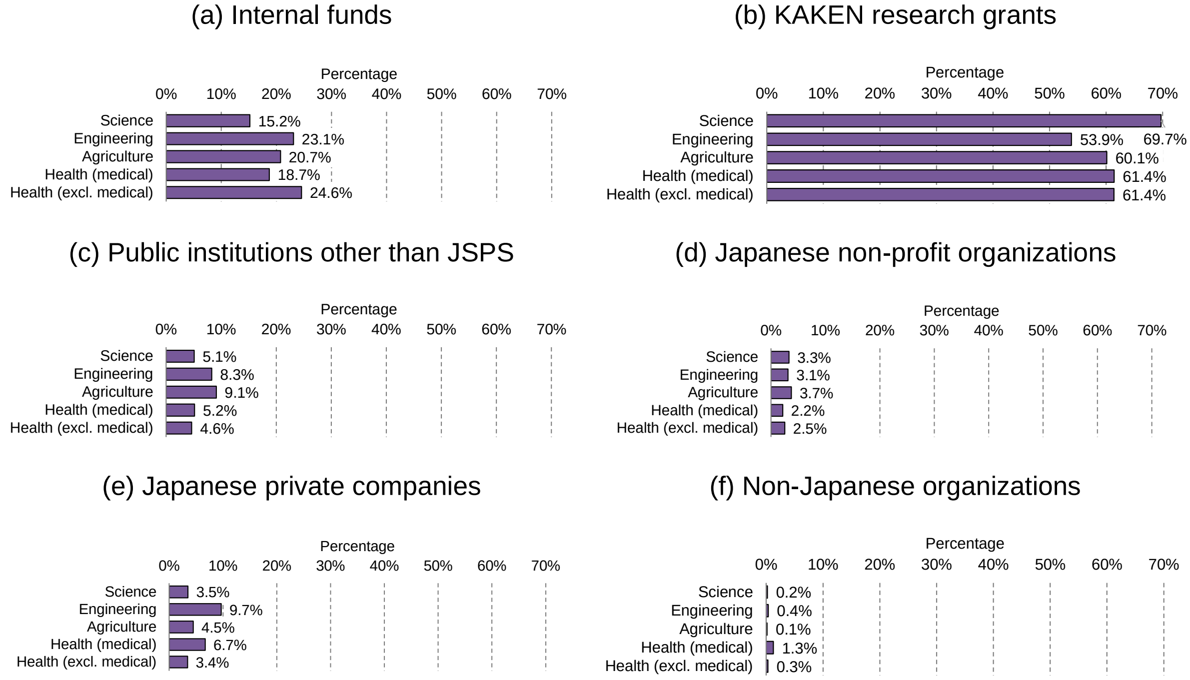


Note 1: Based on valid responses in RS (1,853). Obtained from population estimation.

Note 2: Respondents were asked to provide up to three funding sources. Those providing three funding sources are included in the category of Three or more.

[13] Respondents were asked about up to three funding sources for their research projects. The percentages by funding source type are the averages of percentages by funding source type of respective respondents. For example, if one respondent replied he/she used two funding sources, the respondent's organization and KAKEN research grants, then the percentages by funding source type for the respondent are considered that "respondent's organization is 50% and KAKEN research grants is 50% (Others is 0%)".

Figure 42 Types of funding sources (by field)

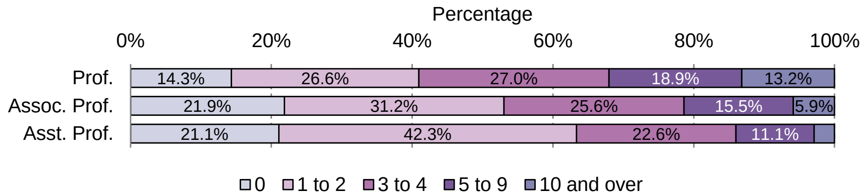


Note 1: Based on valid responses in RS (1,853). Obtained from population estimation. Obtained from population estimation.
Note 2: Other funding sources include funds provided by an individual, cloud funding and respondent's own money.

○ Project members

- The number of project members other than respondents tends to be larger in a higher job position. The percentage of projects with no members other than a respondent is 21.1% and 21.9% respectively for assistant professors and associate professors, these are relatively higher as compared to the percentage for professors, 14.3%. The percentage of projects with 5 or more members is 14.0% for assistant professors and the percentage is 32.1% for professors, higher by 18.1%.
- The percentage distribution[14] by position of major research members other than respondents varies considerably among academic fields. In Health (medical) and Health (excl. medical) assistant professors account for 50% or more of the major members, while in Science, Engineering and Agriculture master's/undergraduate students account for 40% or more of the major members.

Figure 43 The number of project members other than respondents (by position)

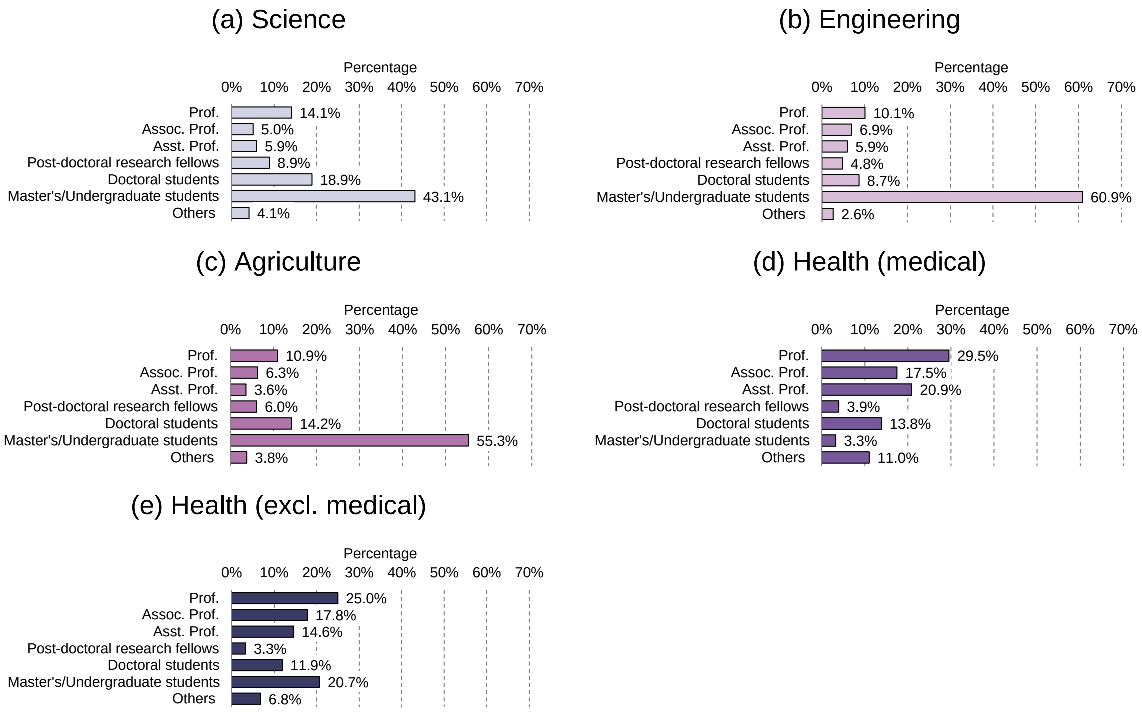


Note: Based on valid responses in RS (1,948). Obtained from population estimation.

---

[14] Respondents were asked about the positions of up to five major members of their research projects. The percentages of positions of major project members are based on the averages of such percentages for respective respondents. For, example, if one respondent provided information about the positions of five members and replied "one professor, one assistant professor and three master's/undergraduate students", then the percentages of positions for the respondent are "20% for professor, 20% for assistant professor and 60% for master's/undergraduate students (the percentage of other positions is 0%)". Hereinafter the same calculation method is applied as for the employment types of and the funding sources for human resources concerning major members.

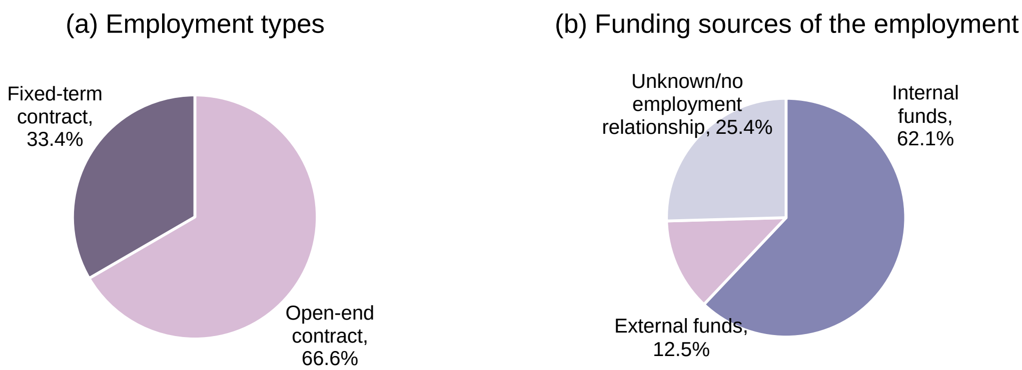
Figure 44 Positions of major members (by field)



Note: Based on valid responses in RS (1,552). Obtained from population estimation.

- As for the employment types of major project members, open-ended contract members account for 66.6% and fixed-term contract members, 33.4%. Accordingly, around two thirds of the major members excluding students are being employed on a tenure basis.
- Overall, the funding sources for employing major project members are internal funds accounting for 62.1% and external funds accounting for 12.5%. Meanwhile, those categorized in Unknown/no employment relationship account for 25.4%.
- As for funding sources for employing major project members, in Health (medical) and Health (excl. medical) the percentage of internal funds is the highest standing at the 60% range, while that percentage is around 50% in Science, Engineering and Agriculture. In the former the percentage of external funds is low, just short of 10% but in the latter the percentage is in the range of just short of 20% to just short of 30%.

Figure 45 Employment situations of major members

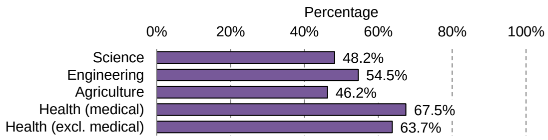


Note: Based on valid responses in RS (1,087). Obtained from population estimation.

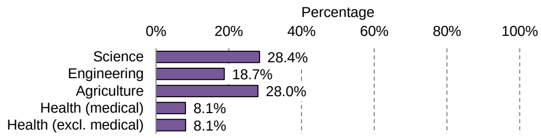
Note: Based on valid responses in RS (1,085). Obtained from population estimation.

Figure 46 Funding sources for employing major project members (by field)

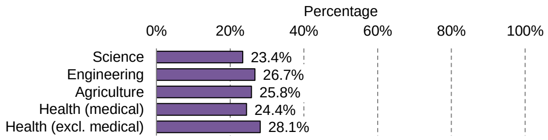
(a) Internal funds



(b) External funds



(c) Unknown/not applicable

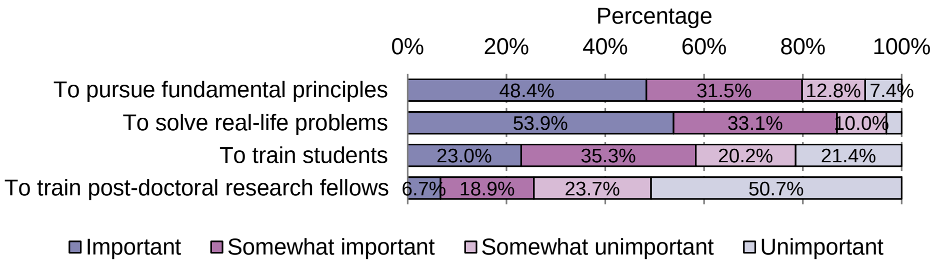


Note: Based on valid responses in RS (1,085). Obtained from population estimation.

○ Purposes of research projects

- Overall, as purposes regarded as important among respondents, “To solve real-life problems” comes on top with 90%, and this is followed by “Pursuit of fundamental principles” standing at 80%.
- As for “To pursue fundamental principles”, the percentage of those placing emphasis on it is the highest in Science standing in the middle 70% range, while in Health (medical) and Health (excl. medical) that percentage is in the 40% range.
- As for “To solve real-life problems”, in Science the percentage of those placing emphasis on it is the lowest, in the 30% range, but in other fields, the percentage is in the range of 50% to 60%.
- Though not illustrated in the figure below, emphasis on “To train students” tends to be larger in a higher job position. While over 70% of professors replied “important” or “somewhat important”, the percentage is in the middle 40% range for assistant professors.

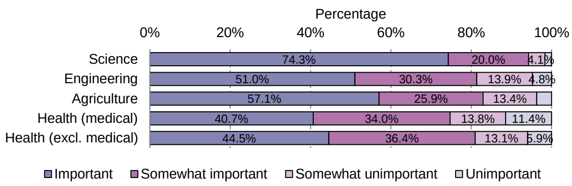
Figure 47 Purposes of research projects (all fields)



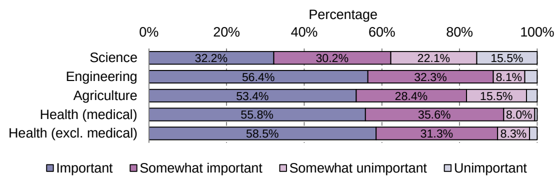
Note: Based on valid responses in RS (1,952). Obtained from population estimation.

Figure 48 Purposes of research projects (by field)

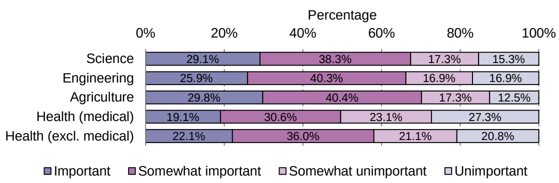
(a) To pursue fundamental principles



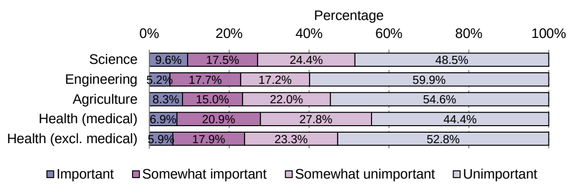
(b) To solve real-life problems



(c) To train students



(d) To train postdoctoral research fellows

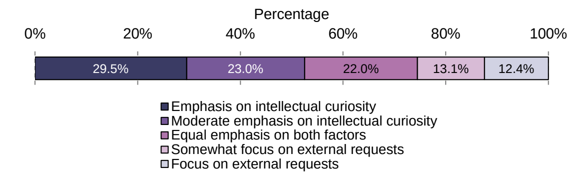


Note: Based on valid responses in RS (1,952). Obtained from population estimation.

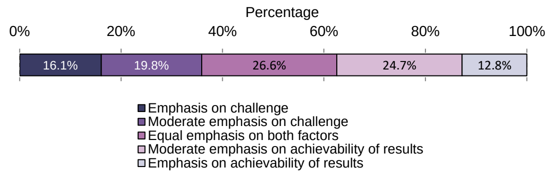
- Overall, the percentage of respondents placing more emphasis on “intellectual curiosity” than “responding to requests from outside” is around 50%, while the percentage of those placing more emphasis on “challenge” than “achievability of results” stands at around 40%.
- In Science, more emphasis is placed on “intellectual curiosity” (around 70%) than “responding to requests from outside”. In other fields, “intellectual curiosity” is important motivation for research activities, but the percentage stands at 50% or so.
- As for “challenge” and “achievability of results”, the percentage of those placing more emphasis on “challenge” is higher in Science, standing at little more than 50%, while in Health (medical) the percentage remains at little more than 40% and “achievability of results” comes before “challenge”.
- The percentage of those placing emphasis on “intellectual curiosity” and “challenge” tends to be slightly larger in a higher position. The percentage of professors placing more emphasis on “intellectual curiosity” than on “responding to requests from outside” is a little more than 50% and the percentage of those placing more emphasis on “challenge” than on “achievability of results” is around 40%, while the percentages are short of 50% and short of 30% respectively in the case of assistant professors.

Figure 49 Stance for research projects (all fields)

(a) intellectual curiosity



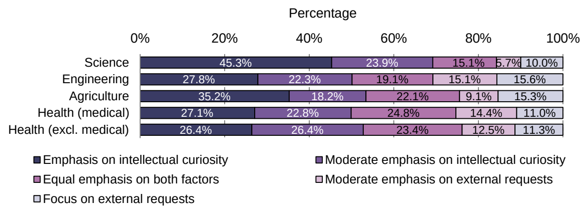
(b) challenge



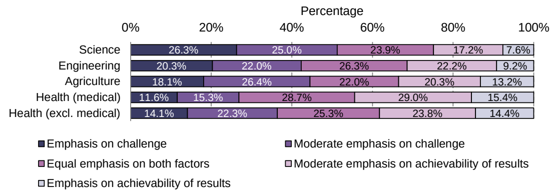
Note: Based on valid responses in RS (1,951). Obtained from population estimation.

Figure 50 Stance for research projects (by field)

(a) intellectual curiosity



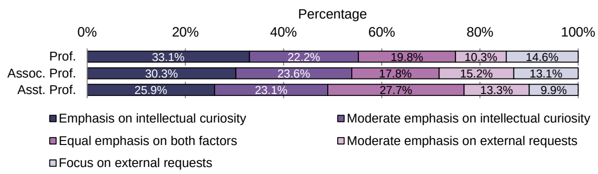
(b) challenge



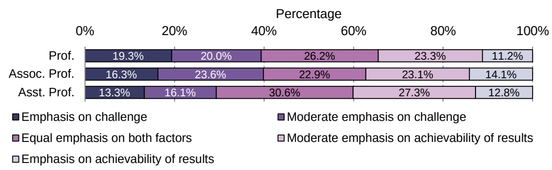
Note: Based on valid responses in RS (1,951). Obtained from population estimation.

Figure 51 Stance for research projects (by position)

(a) intellectual curiosity



(b) challenge

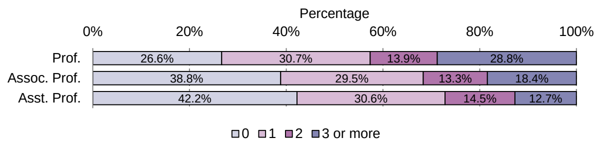


Note: Based on valid responses in RS (1,951). Obtained from population estimation.

○ Counterparts for joint research projects

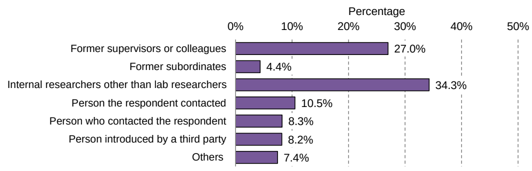
- The number of joint research counterpart organizations tends to be larger in a higher position. While 57.8% of assistant professors have one or more counterparts, that percentage is 73.4% for professors.
- As for the relation with counterparts, overall, the percentage of "Internal researchers other than lab researchers" is the highest, standing at 34.3% and "former supervisor/colleague" comes after that, standing at 27.0%. "Person the respondent contacted" and "Person who contacted the respondent" and "person introduced by a third party" account for around 10% respectively. Meanwhile, the percentage of "Former subordinates" is the lowest, 4.4%.
- The percentage of "Former subordinates" tends to be larger in a higher position. While the percentage is 0.4% in the case of assistant professors, it stands at 9.3% for professors.

Figure 52 The number of joint research counterpart organizations (by position)



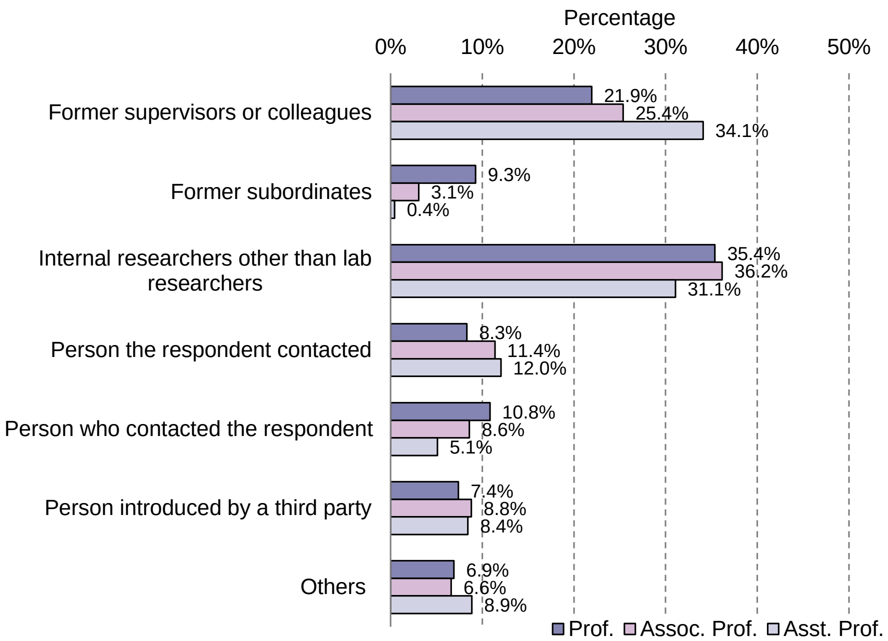
Note 1: Based on valid responses in RS (1,920). Obtained from population estimation.
Note 2: Respondents were asked to provide up to three counterparts. Responses providing three counterparts are included in the category of Three or more.

Figure 53 Relation with counterparts (all fields)



Note: Based on valid responses in RS (1,276). Obtained from population estimation.

Figure 54 Relation with counterparts (by position)

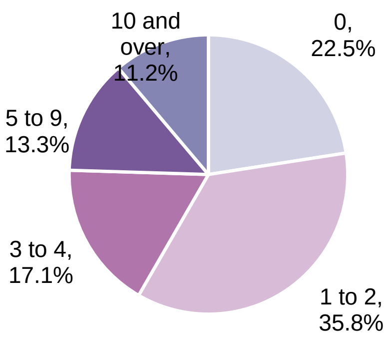


Note: Based on valid responses in RS (1,276). Obtained from population estimation.

○ Outputs from research projects

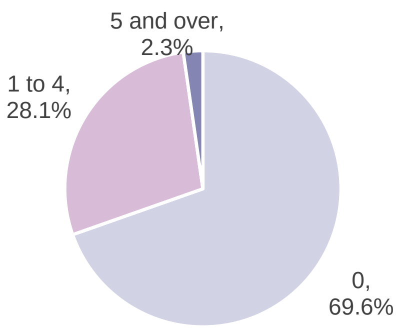
- Research projects that produced one or more published peer-reviewed papers stand at 77.5% and those with one or more peer-reviewed papers submitted but not yet published stand at 30.4%.
- The number of submitted but not yet published/published peer-reviewed papers from research project tends to be larger in a higher job position. While the percentage of assistant professors with one or more published peer-reviewed papers is 72.2%, that percentage is 84.7% for professors. And the percentage of assistant professors with one or more submitted but not yet published papers is 27.2%, while that percentage is 36.3% for professors.

Figure 55 The number of published peer-reviewed papers (all fields)



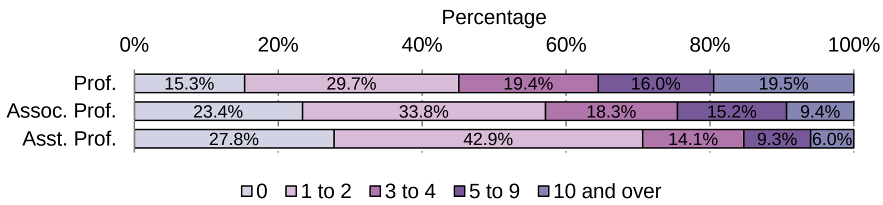
Note: Based on valid responses in RS (1,485). Obtained from population estimation.

Figure 56 The number of submitted but not yet published papers (all fields)



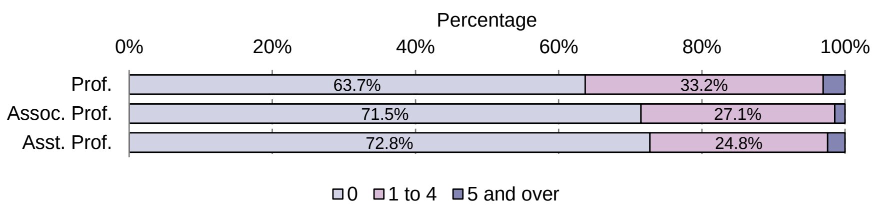
Note: Based on valid responses in RS (1,482). Obtained from population estimation.

Figure 57 The number of published peer-reviewed papers (by position)



Note: Based on valid responses in RS (1,485). Obtained from population estimation.

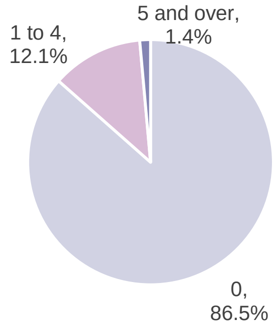
Figure 58 The number of submitted but not yet published papers (by position)



Note: Based on valid responses in RS (1,482). Obtained from population estimation.

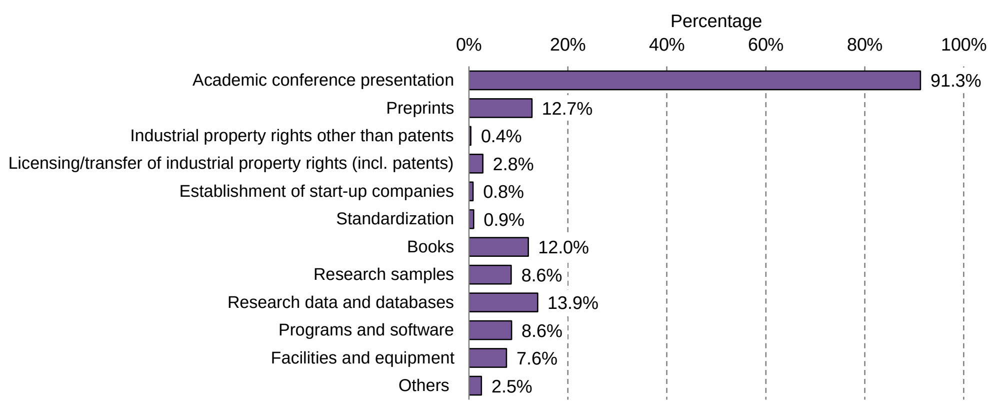
- Overall, research projects which produced no patent applications stand at 86.5%; 1 to 4 applications, 12.1%; and 5 or more applications, 1.4%. Accordingly, research projects with 1 or more patent applications account for 13.5%.
- Overall, the most common outputs from research projects other than research papers and patent applications is “Academic conference presentation”, accounting for a little more than 90% of projects. This is followed by “Research data and databases”, “Preprints” and “Books”, accounting for a little more than 10% of research projects. And this is further followed by “Research samples”, “Programs and software” and “Facilities and equipment” accounting for short of 10% respectively.

Figure 59 The number of patent applications (all fields)



Note: Based on valid responses in RS (1,484). Obtained from population estimation.

Figure 60 Outputs other than research papers and patents (all fields)



Note : Based on valid responses in RS (1,489). Obtained from population estimation.

【Acknowledgment】

We would like to express our gratitude to faculty members who spared their precious time to participate in our Labo-Panel Survey. We also feel extremely grateful for Dr. Yuko Harayama, the chair of the Advisory Expert Committee for Labo-Panel Survey and Dr. Toshiaki Enoki, Dr. Sotaro Shibayama, Dr. Hideaki Takeda, Dr. Ryuichi Tanaka, Dr. Masako Toritani and Dr. Sadao Nagaoka, members of the committee for their advice on the survey design and the compilation of the report.

We also would like to express our sincere gratitude to Mr. Yasuo Nakayama, Second Research Group, the National Institute of Science and Technology Policy, who provided data on patent applications for inventions by faculty members of Japanese national universities. The data was used to develop the R&D activities database which served as the auxiliary response input system for this survey.

【References】

[1] The latest information is found in the report: Research Unit for Science and Technology Analysis and Indicators, National Institute of Science and Technology Policy (2021), Digest of Japanese Science and Technology Indicators 2021, NISTEP Research Material-311. http://doi.org/10.15108/rm311

[2] Nature Index 2017 Japan: Vol. 543 No. 7646_supp ppS1-S40

[3] Ministry of Education, Culture, Sports, Science and Technology (2018). White Paper on Science and Technology 2018 (in Japanese). p.13-92.
https://www.mext.go.jp/b_menu/hakusho/html/hpaa201801/detail/1405921.htm, （Accessed on August 11, 2021).

[4] National Institute of Science and Technology Policy (2009). Analysis of the State of Japanese Universities System (in Japanese), National Institute of Science and Technology Policy, NISTEP REPORT No. 122. http://hdl.handle.net/11035/689

[5] Saka, A. & Kuwahara, T. (2012). University Research Benchmarking Series Benchmarking Research & Development Capacity of Japanese Universities 2011 (in Japanese), National Institute of Science and Technology Policy, Research Material-213.
http://hdl.handle.net/11035/1144

[6] Murakami, A., Igami, M., & Saka, A. (2017). Structure Understanding of the Research Activities of University Sub-Organization Level using Bibliometric Analysis (in Japanese), National Institute of Science and Technology Policy, Research Material-258.
http://doi.org/10.15108/rm258

[7] Kanda, Y. & Igami, M. (2017). Detailed analyses on full-time equivalent R&D expenditure and the number of researchers in Japanese universities (in Japanese), National Institute of Science and Technology Policy, Research Material-297. http://doi.org/10.15108/rm297

[8] Amano, I. (2019). Shinsei daigaku no jidai (in Japanese), The University of Nagoya Press.

[9] Amano, I. (2006). Daigaku kaikaku no shakaigaku (in Japanese), Tamagawa University Press.

[10] Amano, I. (1994). Daigaku－henkaku no jidai (in Japanese), University of Tokyo Press.

[11] Shibayama, S., Baba, Y., & Walsh, J. P. (2015). Organizational design of university laboratories: Task allocation and lab performance in Japanese bioscience laboratories. *Research Policy*, 44(3).

[12] Murayama, K., Nirei, M. & Shimizu, H. (2015). Management of science, serendipity, and research performance: Evidence from a survey of scientists in Japan and the U.S., *Research Policy*, 44(4), 862873 –.

[13] Morichika, N., & Shibayama, S. (2015). Impact of inbreeding on scientific productivity: A case study of a Japanese university department. *Research Evaluation*, 24(2), 146157–.

[14] Lippi, G., & Mattiuzzi, C. (2019). Project management in laboratory medicine. *Journal of Medical Biochemistry*, 38(4), 401406–.

[15] Pacheco Junior, M. A., Anholon, R., Rampasso, I. S., & Leal Filho, W. (2021). Improving research labs' performance through project management guidelines: a case study analysis. *International Journal of Productivity and Performance Management*, 70(3), 704-721.
[16] Beukers, M. W. (2011). Project management of life-science research projects: Project characteristics, challenges and training needs. *Drug Discovery Today*, 16(3–4), 93-98.
[17] Hicks, D., Wouters, P., Waltman, L., de Rijcke, S. and Rafols, I. (2015). The Leiden Manifesto for research metrics. *Nature*, 520(7548), 429–431.

RESEARCH MATERIAL -314

Survey of research activities in Japanese universities using a database for comprehension of research activities (Labo-panel survey 2020): The summary of basic findings

April 2022

MATSUMOTO Kuniko, YAMASHITA Izumi and IGAMI Masatsura
Center for S&T Foresight and Indicators
National Institute of Science and Technology Policy (NISTEP)
Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan

https://doi.org/10.15108/rm314

NATIONAL
INSTITUTE OF
SCIENCE AND
TECHNOLOGY
POLICY

https://www.nistep.go.jp