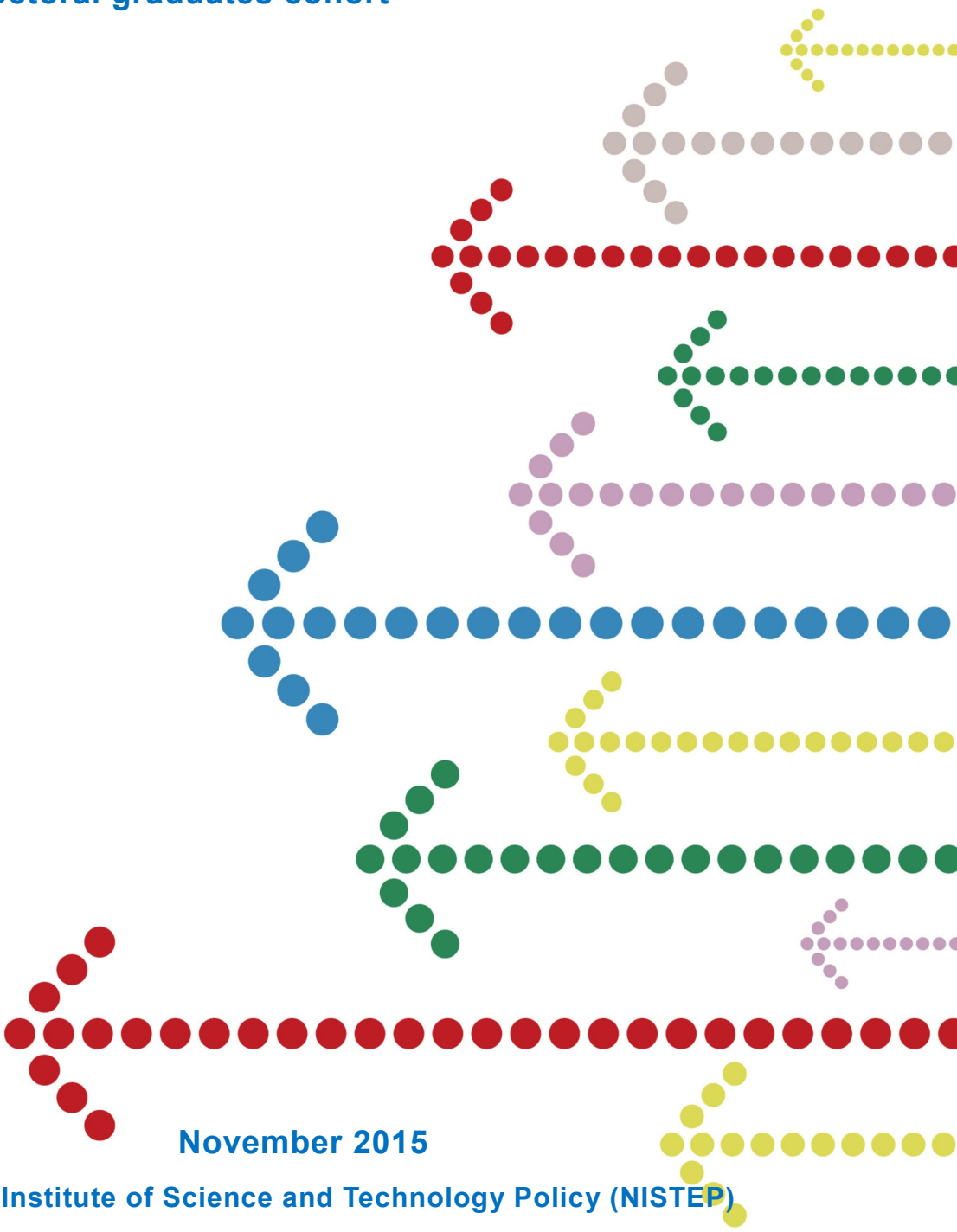
NISTEP REPORT No.165

1st Report of "Japan Doctoral Human Resource Profiling" —FY2012 doctoral graduates cohort-



November 2015

National Institute of Science and Technology Policy (NISTEP)

1st Policy-Oriented Research Group

Outline of Results

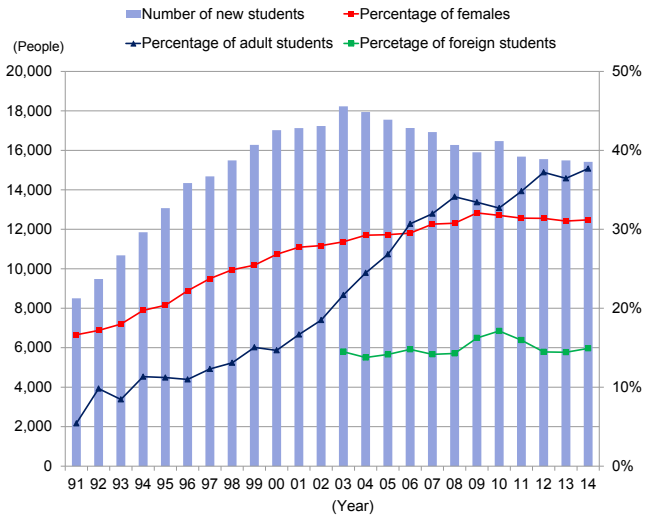
The Fourth Science and Technology Basic Plan set goals for the development of human resources that take the central role in science and technology: the drastic enhancement of graduate education and major viewpoints in the development of research personnel - "independence," "challenge," "Convergence" and "internationality." In order to verify the goals, the first Japan Doctoral Human Resource Profiling (JD-Pro) conducted research on the status of students when they were in a doctoral course and their current employment status, etc. The research was conducted for students who graduated a doctoral course in the 2012 academic year and it was responded by individuals. The number of valid responses was 5,052 and the collection rate calculated according to the number of requests was 38.1%. In order to correct non-response bias, we developed a weight from the mother group information such as the FY2012 School Basic Survey and summarized the results using the weight in this report[1].

1. Overview of doctoral courses and the status before entering a graduate school

In recent years, students in doctoral courses have become diverse and they have various reasons for going to a doctoral course. Looking at differences by type of student (regular students, adult students and foreign students), some regular students are highly interested in research itself and answered that they "would like to develop new fields that they explored in the master's course." Many adult students answered that they "were recommended by the company or needed an academic degree." As there are many students who wish to become doctors in the health field, the main purpose for these students is to acquire a qualification of specialist or certified physician, rather than a doctor's degree.

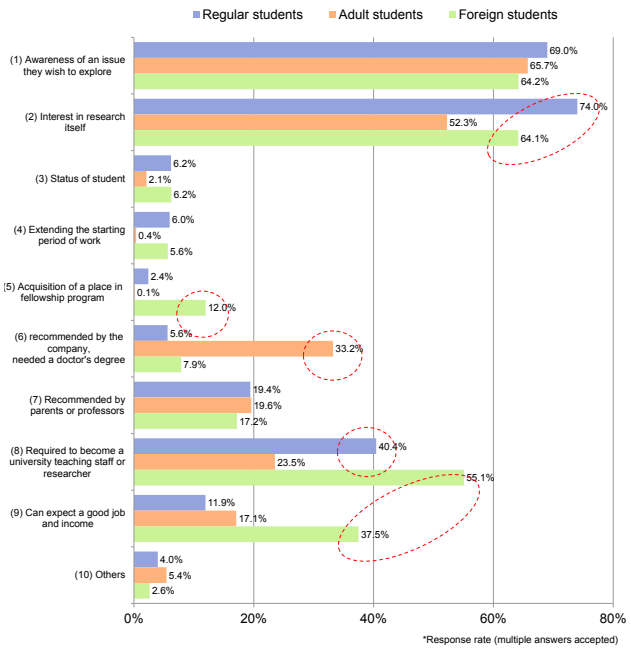
Many foreign students answered that they "needed a degree to become a university teacher or a researcher," "can expect a good job and high salary if they have a doctor's degree," and "received a fellowship, etc."

Overview Figure 1-1:
Number of students who started a doctorial course and their attribution



Source : Developed based on the School Basic Survey, Ministry of Education, Culture, Sports, Science and Technology

Overview Figure 1-2:
Reason of taking a doctoral course (by type of student)

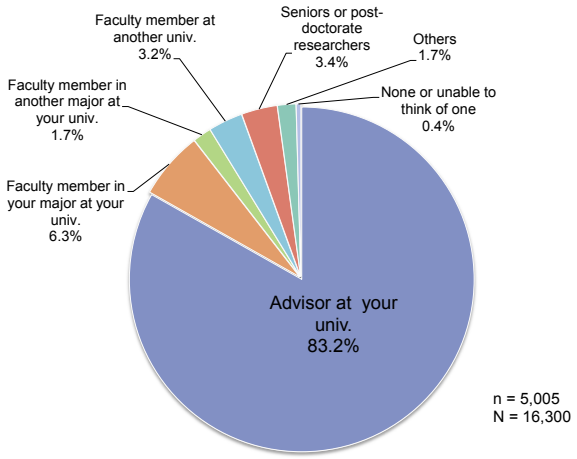


[1] In figures, "n" refers to the number of responses and "N" refers to values estimated for population using weight.

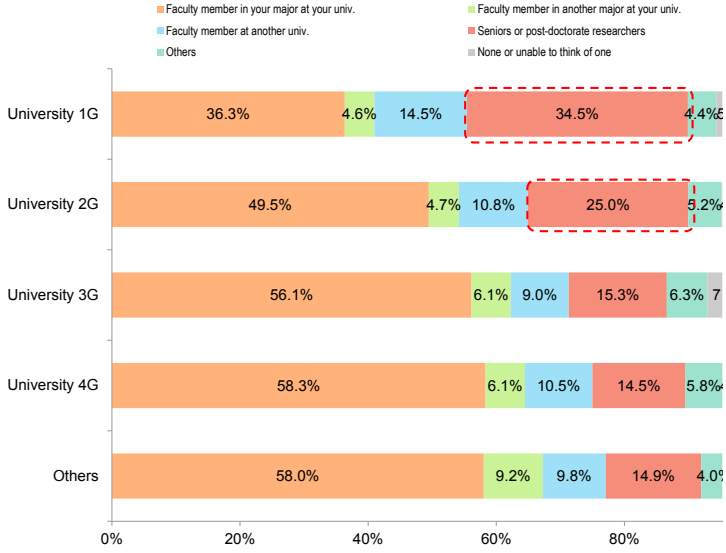
2. Tutoring in graduate schools and its effects

Doctoral advisers take up the largest percentage of tutors in doctoral courses of graduate, which is more than 80%. The second largest percentage was accounted for by "seniors or post-doctorate researchers" in the First Group and Second Group[2] of universities with a high share of research papers. The frequency of tutoring by tutors who take up the largest percentage shows positive influence on the satisfaction level in doctoral courses, acquisition of a doctor's degree and the number of research papers. However, although tutoring by "seniors or post-doctorate researchers" has a positive influence on the satisfaction level in graduate schools and the application for fellowship programs, it didn't affect research achievements such as acquisition of a doctor's degree, the number of research papers and acquiring a place in fellowship programs. More than half the number of regular students carry about 4.4 million yen of student loan on average when they graduate the doctoral course mostly from the Japan Student Services Organization.

Overview Figure 2-1:
Person most often providing guidance in a doctoral course



Overview Figure 2-2:
Person second most often providing guidance in a doctoral course
(If the advisor provided guidance most)



[2] Classified into five university groups by the share of papers in Japan. The First Group has a share of more than 5%, the Second Group has more than 1% and less than 5%, the Third Group has more than 0.5% and less than 1%, the Fourth Group is a group with more than 6 responses from other universities. For details, refer to page 17 of the report (Japanese version).

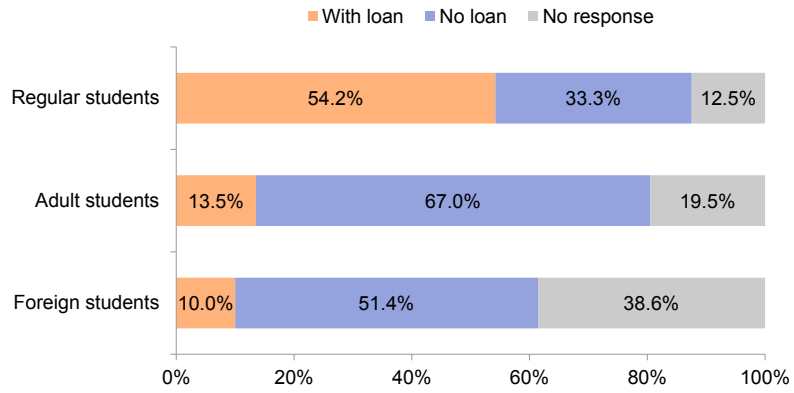
Overview Figure 2-3: Tutoring status and its influence on research achievements, etc. in doctoral courses

	(a) Satisfaction level in doctoral courses	(b) Doctor's degree	(c) Application for fellowship DC programs	(d) Acquiring a place in fellowship DC programs	(e) Overseas residence of Japanese	(f) Number of research papers
Tutoring frequency: Person most often providing guidance	○	△	–	–	–	△
Tutoring frequency: Person second most often providing guidance	○	–	–	–	–	–
Tutoring by seniors or post-doctoral researchers (The second largest number of tutors)	○	–	○	–	–	–

Note 1) The table shows results of a regression analysis. Refer to page 29 of the Report (Japanese version) for each analysis method.
Note 2) ○ refers to more positive influence with more tutoring frequency, △ refers to positive influence in part, and －refers to no influence.

More than half the number of regular students carry about 4.4 million yen of student loan on average when they graduate the doctoral course mostly from the Japan Student Services Organization.

Overview Figure 2-4: Student loan status at the time of graduation from a doctoral course

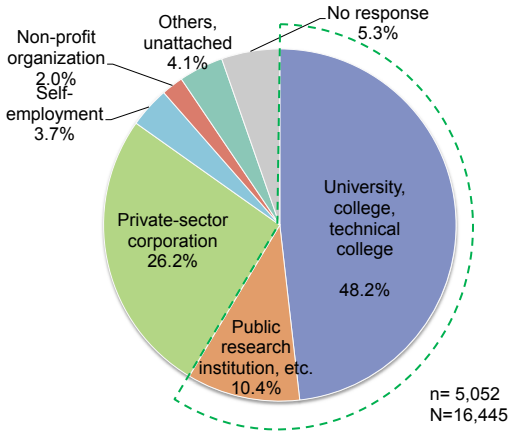


3. Present employers

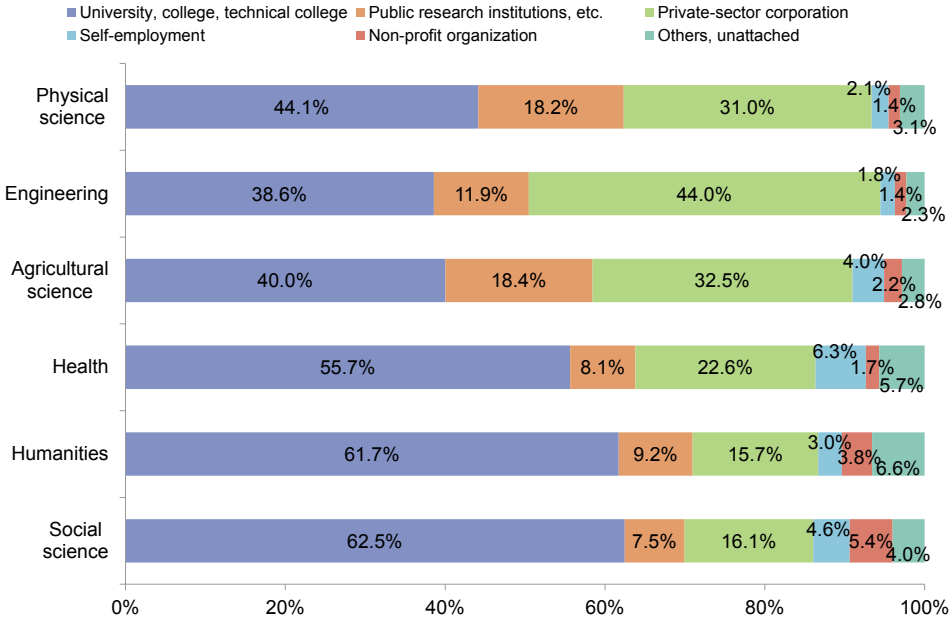
Half the number of employers are universities, collages and technical collages, followed by 10% of public research institutions, 30% of private companies and 10% of others. If universities and public research institutions are referred to as "academia," the employment rate in academia is about 60% of the total and that in non-academia is about 40%.

By field, the employment rate in university, etc. is higher in humanities and social sciences and relatively low in nature sciences. The employment rate in nature sciences is higher in public research institutions than humanities and social sciences, which shows that many graduates are employed by government agencies such as research and development corporations. A prominently high percentage (44%) of engineering graduates are working in private companies, but the percentage of graduates from humanities and social sciences is low (around 15%).

Overview Figure 3-1: Management organization (employer)



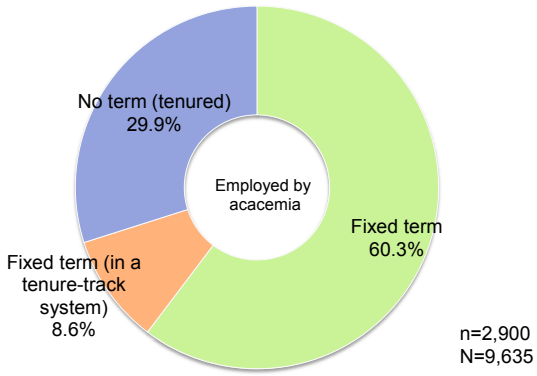
Overview Figure 3-2: Management organization (employer by field)



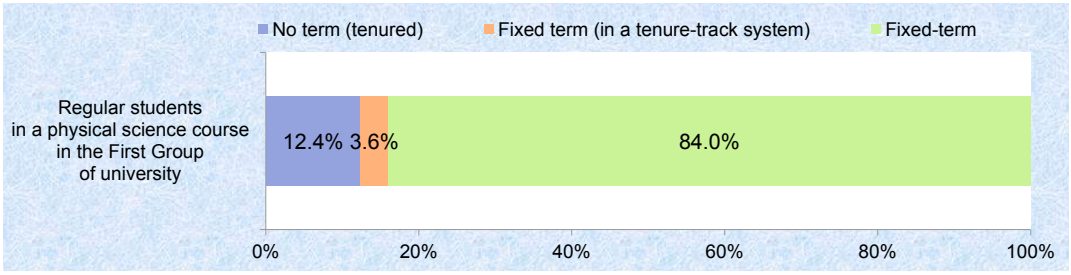
4. Present employment status of academia and non-academia

The following figure compares the employment status of doctoral course graduates between academia and non-academia. If the employer is academia, about 60% of the employment is based on a fixed term system. In particular, the system is applied in physical science and humanities courses and the First Group of universities which has the largest share of research papers. More than 80% of "regular students in a science course in the First Group of university" are employed for a fixed term. On the other hand, many graduates working in private companies are employed by large companies as full-time workers.

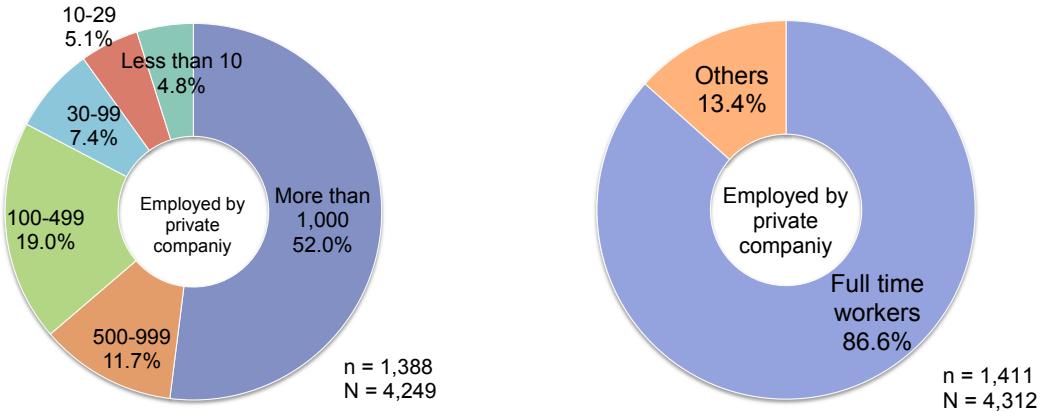
Overview Figure 4-1: Fixed term-based employment status in academia



Overview Figure 4-2: Fixed term-based employment in academia
(regular students in a physical science course in the First Group of university)



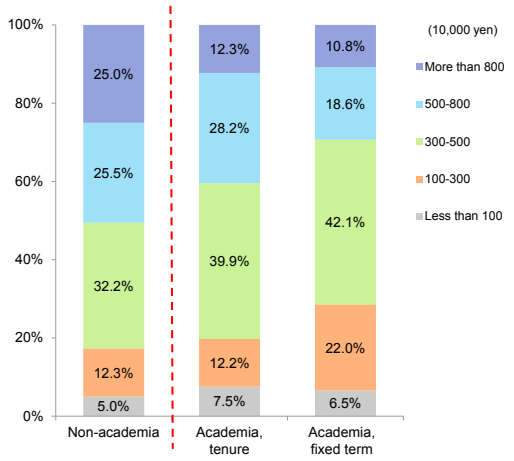
Overview Figure 4-3: Size of private companies (employers) and employment status



5. Income status

The following figure compares incomes of graduates employed by academia and non-academia. In academia, incomes are shown by tenure (including tenure-track) and fixed term system. A larger percentage of incomes in academia are between 3 and 5 million yen and the percentage of incomes more than 8 million yen is small compared to that in non-academia. Incomes of fixed-term employees in academia tend to be lower than those of tenure employees. Generally, it is said that incomes of fixed-term employees are higher than those of tenure employees if retirement benefits, etc. are added. However, the results of this profiling show that the percentage of employees whose incomes are more than 5 million yen is small and the percentage of those whose incomes are less than 3 million yen is high.

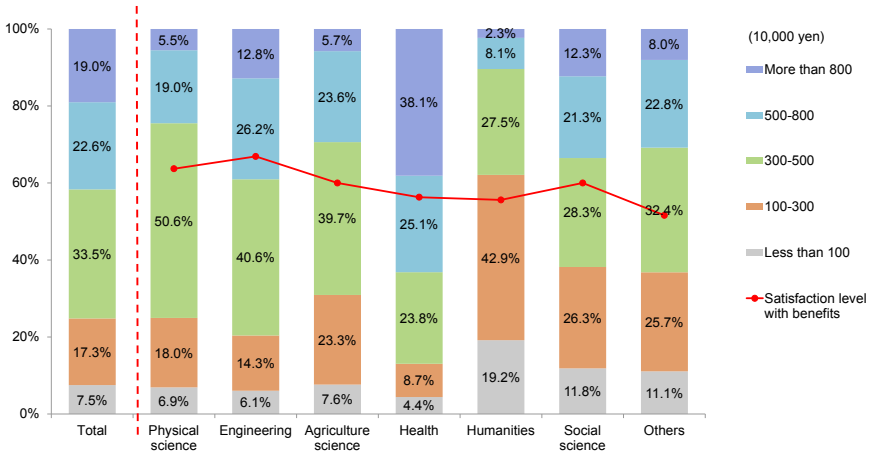
Overview Figure 5-1: Annual labour incomes including tax (by employment status)



Note) Data was calculated excluding employees with "no incomes" and only for regular students.

Annual labour incomes vary by field of study. Incomes of many employees in the physical science field are between 3 and 5 million yen, and the incomes of many employees in the health field are more than 8 million yen since medical doctors are included. Employees in the humanities field include many part-time tutors and most of their incomes are less than 3 million yen. Students in the humanities field receive tutoring in graduate schools less frequently and take a long time to acquire a doctor's degree. Their income level is low but there is little difference in satisfaction with incomes from that of other fields. This is considered to be because they hardly feel the difference of incomes from other fields when they are in the community of the same field.

Overview Figure 5-2: Annual labor incomes including tax and satisfaction with benefits (by field)

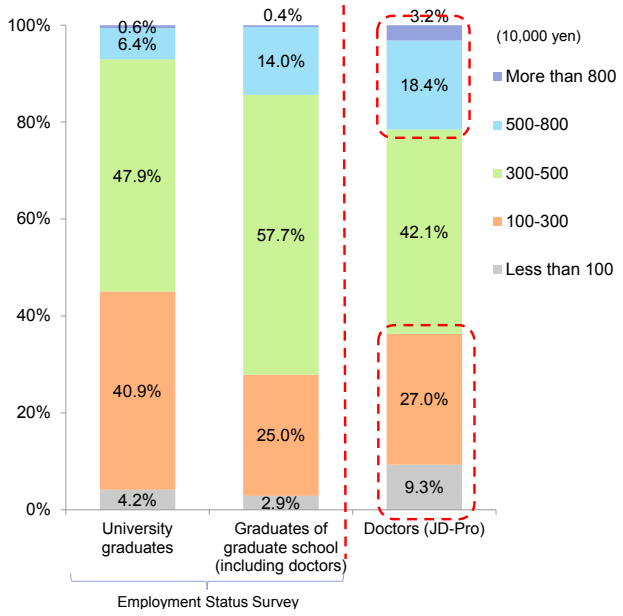


Are the incomes of doctors high in the entire society? Here, we compare our data with data from the 2012 Employment Status Survey for graduates of universities and graduate schools (including doctors) aged between 25 and 29. As the percentage of masters is high in graduates of graduate schools, the difference in incomes between masters and doctors can roughly be seen.

The JD-Pro used data of regular students aged under 29 and excluded the health field in which many medical doctors are included. Even after excluding the data in the health field, the percentage of doctors who receive an income of more than 5 million yen is high at around 20%. On the other hand, the percentage of doctors who receive an income of less than 3 million yen is more than that of graduates of graduate schools.

Masters do not always go on to doctoral courses from an economic incentive. However, the incentive to move up to a doctoral course wouldn't arise if they can't acquire "utility = benefits" that exceed the cost of education for the master's course plus another few years (direct cost) and the opportunity cost that they would be earning if they were working after graduating master's course (indirect cost). In order to encourage excellent students who would be earning high salary after graduating a master's course to move up to a doctoral course, it is important for them not only to receive support for their school fees (direct cost) but also to have a prospect of receiving high incomes throughout life.

Figure 5-3: Annual labour incomes including tax (by education)



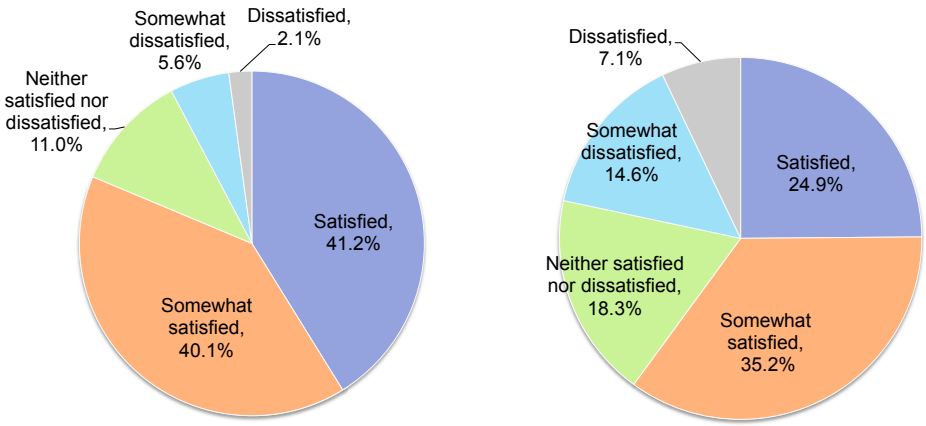
Note 1) Data was calculated excluding those with "no incomes."

Note 2) Data for graduates of universities and graduate schools was developed based on the Table 40 BO40(4) age 25-29, "Results of 2012 Employment Status Survey," Statistics Bureau, Ministry of Internal Affairs and Communications. http://www.e-stat.go.jp/SG1/estat/GL32020101.do?method=extendTclass&refTarget=toukeihyo&listFormat=hierarchy&statCode=00200532&tstatCode=000001058052&tclass1=000001059806&tclass2=000001059807&tclass3=&tclass4=&tclass5=. Incomes of doctors were calculated based on JD-Pro data for regular students aged under 29 excluding those in the health field.

6. Satisfaction with work

Next, we asked satisfaction levels with work and benefits. More than 80% of graduates answered that they are "satisfied" or "somewhat satisfied" with work, which is high as a whole. On the contrary, satisfaction level with benefits and working conditions is lower and the percentage of graduates who answered that they are "satisfied" or "somewhat satisfied" remained 60%.

Figure 6-1: Satisfaction with work and benefits

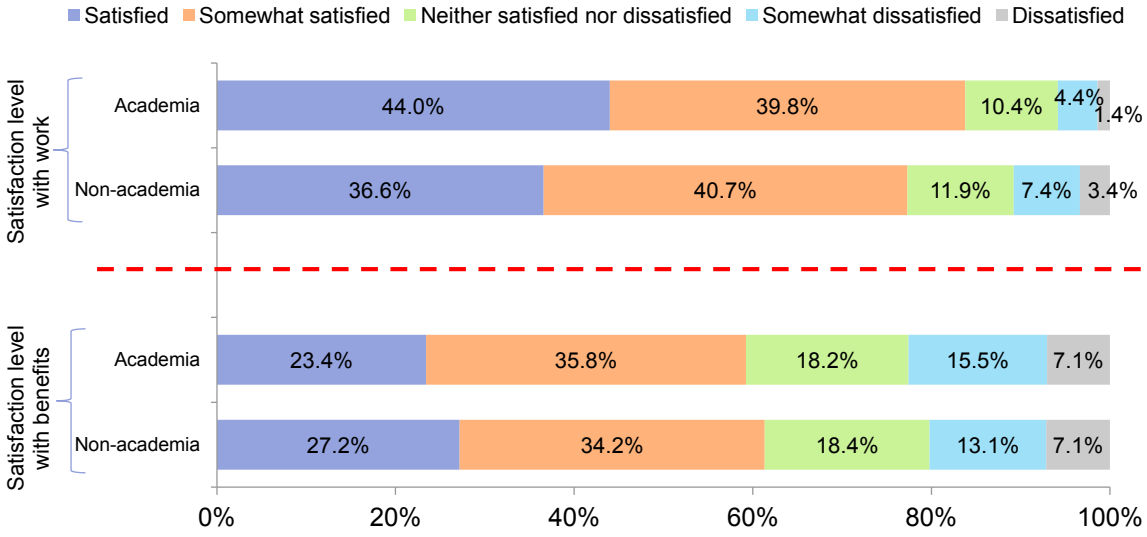


a. Satisfaction level with work

b. Satisfaction level with benefits

The following figure compares satisfaction levels with work and that with benefits and working conditions between academia and non-academia. Although the satisfaction level as a whole is high in both academia and non-academia, the satisfaction level with work is slightly higher in academia and the satisfaction level with benefits is slightly higher in non-academia. It is a huge decision for individuals whether to put priority on satisfaction with work and continue to work on research in academia despite unstable employment, or to put priority on satisfaction with benefits and work full time in non-academia with stable employment status.

Overview Figure 6-2: Satisfaction level with work (academia vs. non-academia)



7. Relation between research subject in doctoral course and present work

As for the relevance of doctors' present work to their subject in doctoral course, half the numbers answered that they are strongly related, and the number accounts for 90% when combined with those who answered that they are somewhat related. If the work is strongly related to their research subject in the doctoral course, the satisfaction level with work is prominently high. In order to expand doctors' career pass and promote their successful career in private companies, etc., it is important for individuals' satisfaction to "have work related to their research subject in the doctoral course" as well as employment stability and benefits.

Figure 7-1: Relevance of research subject in doctoral course to present work*

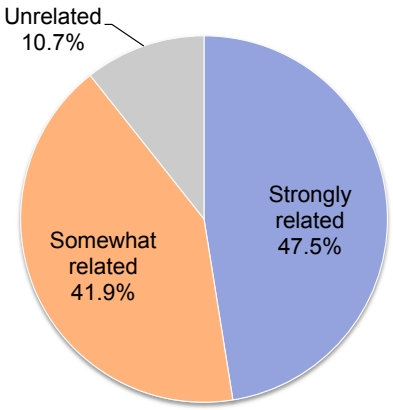
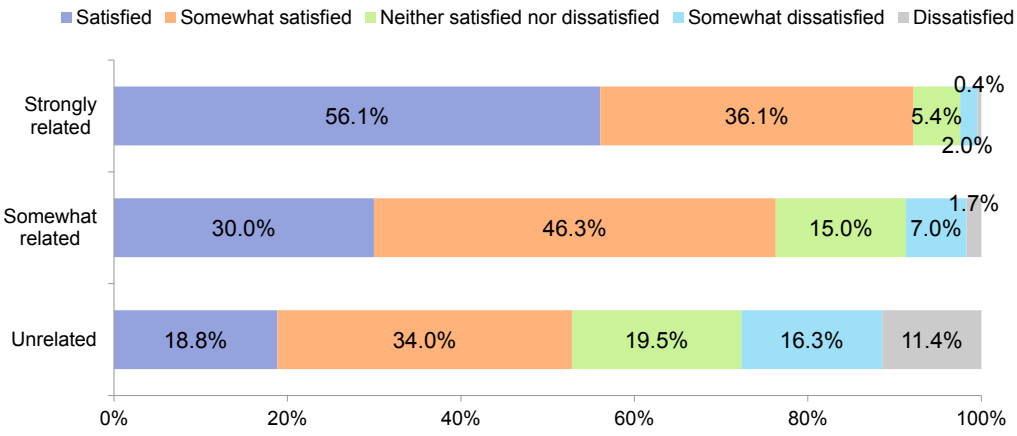


Figure 7-2: Relevance of the relation between research subject in doctoral course and present work* to satisfaction level with work**



Note) * is the answer to the question "how much are the present work related to your research subject in doctoral course?"
** is the satisfaction level with contents of work.

8. Status of research

We tried to grasp the current status of doctors including whether they continued research after graduating the doctoral course, application and acceptance of fellowship program, acquisition of competitive funds such as science and research expenses, research achievements, etc. Regardless of present occupation, 75% of the total doctors continue “research” for specific achievements including publishing research papers or acquiring patent rights. The application rate for the research fellowship programs (DC) of Japan Society for the Promotion of Science (JSPS) is about 30%, and it is clear that most applicants and the accepted are doctors from university groups with a large share of research paper publication.

Overview Figure 8-1:
Status of research activities

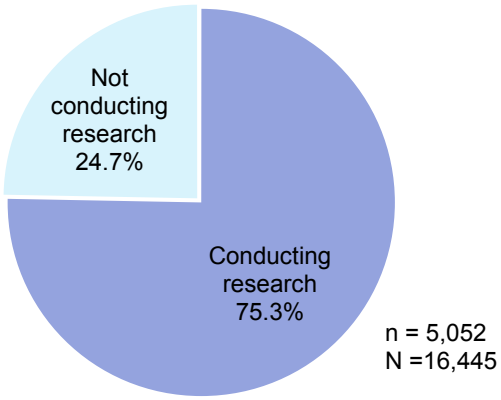
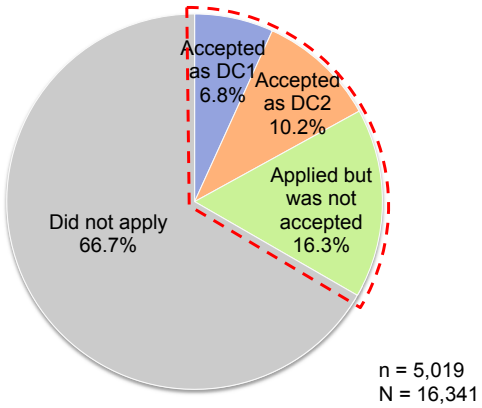
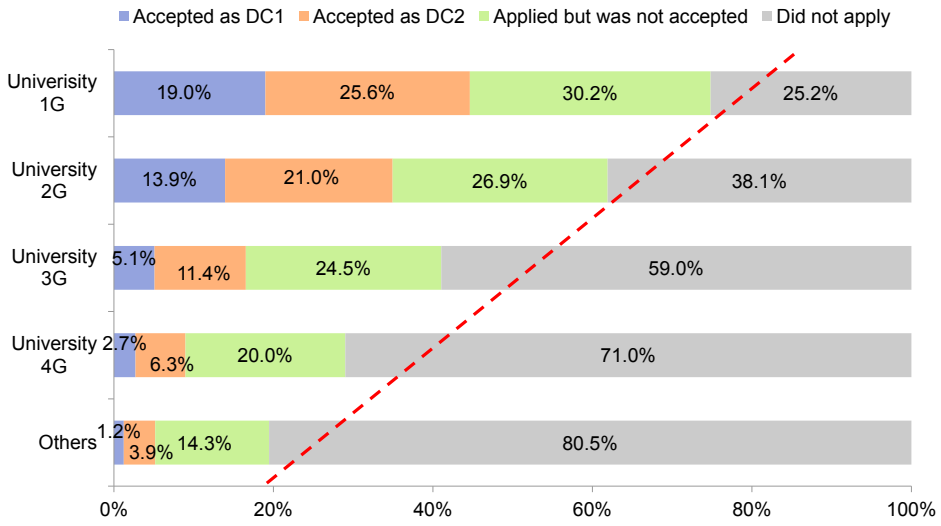


Figure 8-2:
Application and acceptance for research fellowship programs (DC) of JSPS



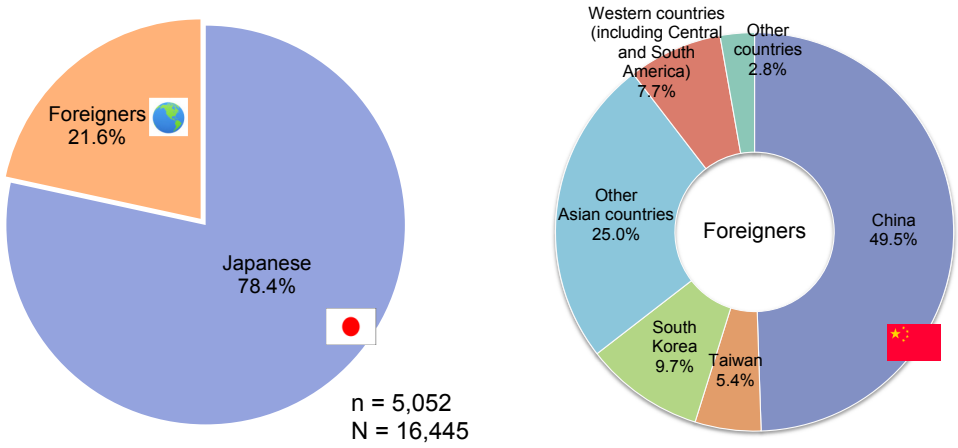
Overview Figure 8-3:
Application and acceptance for research fellowship programs (DC) of JSPS
(by university group, regular students only)



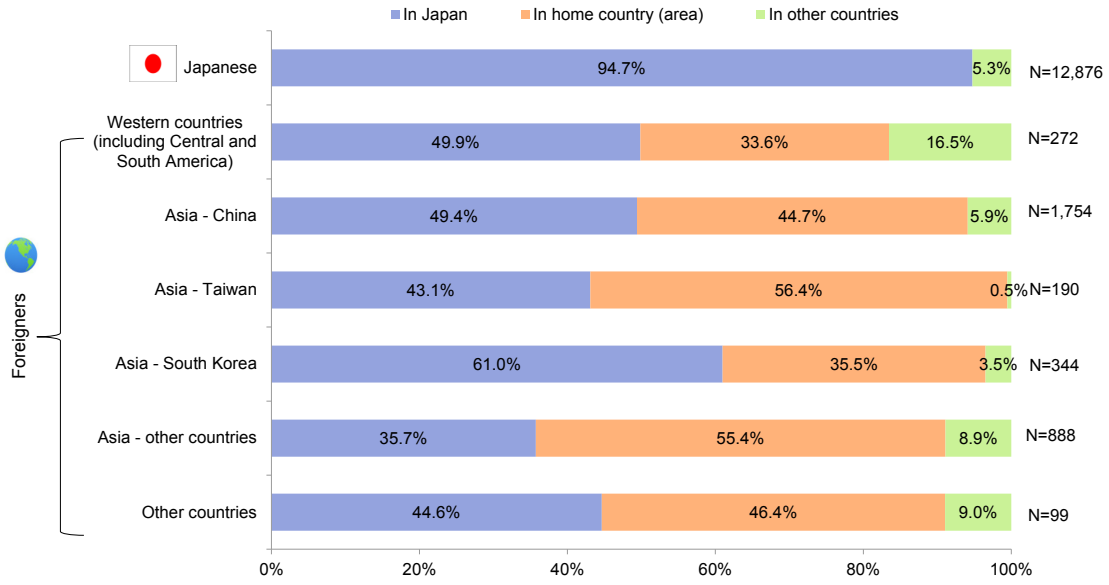
9. Status of foreign students

Many foreign students come to Japan from Asian countries nearby as they have accepted for a fellowship program or tuition fee exemption. They aim to become university teachers or gain a high salary. However, after graduating from the doctoral course, half the number of foreign students return to their home countries. Some wrote in the free description space that they "returned because they couldn't find a job in Japan." The United States successfully increased the settlement rate of foreign students in the 1990s. Japan is expected to use more foreigners who have acquired a doctor's degree in the country.

Overview Figure 9-1: Proportion of Japanese and foreigners

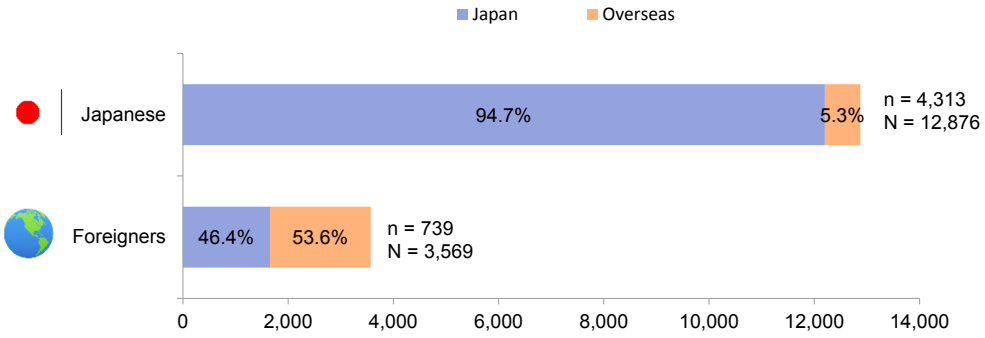


Overview Figure 9-2:
Present country of residence of people who graduated from a doctoral course

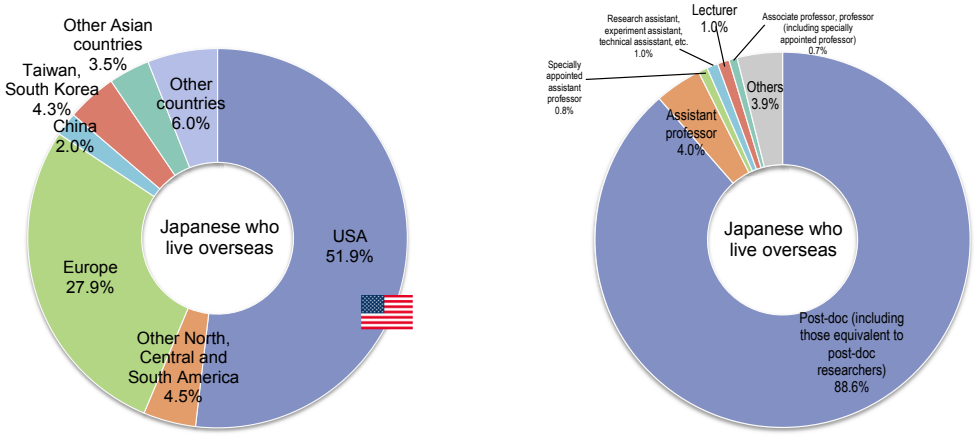


The percentage of Japanese who live overseas after graduating from a doctoral course was only 5%. Many of them are in post-doctorate courses in universities in western countries. It is important to continue to observe the career pass of these people.

Overview Figure 9-3: Present country of residence by nationality



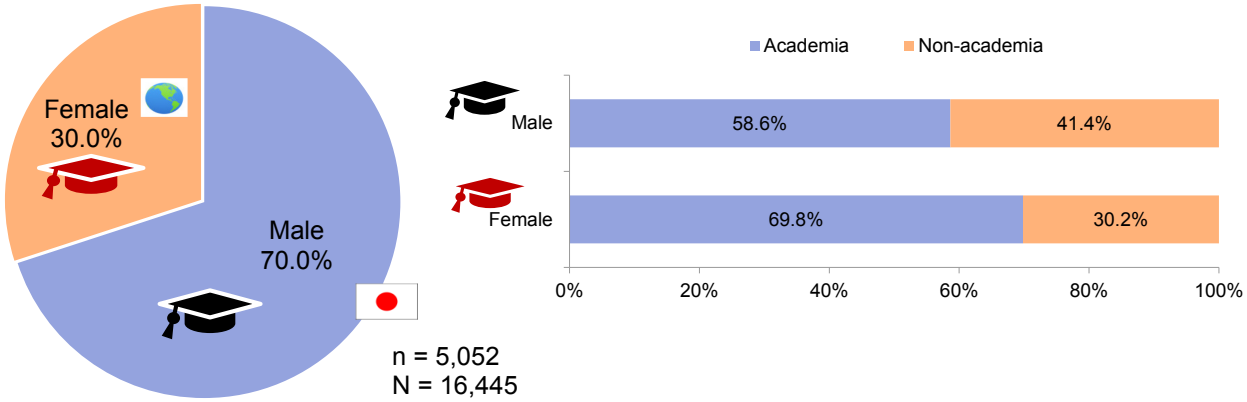
Overview Figure 9-4: Overseas countries and areas where Japanese live and their position



10. Career and work-life balance of female researchers

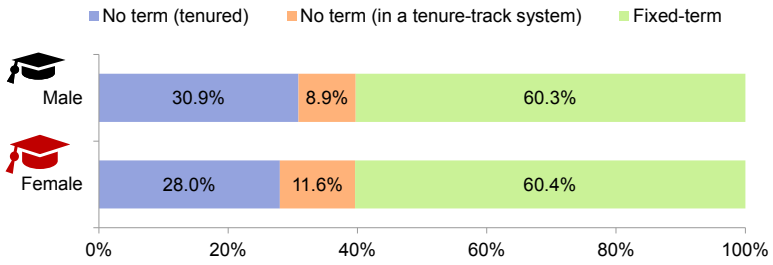
The proportion of females as a percentage of graduates from a doctoral course is about 30% and many women are employed in the academia field. Tenure employment rate (including tenure-track) is the same for males and females in academia but the employment rate as regular females is low in non-academia.

Figure Overview 10-1:
Proportion of males and females and employer by gender (academia vs. non-academia)

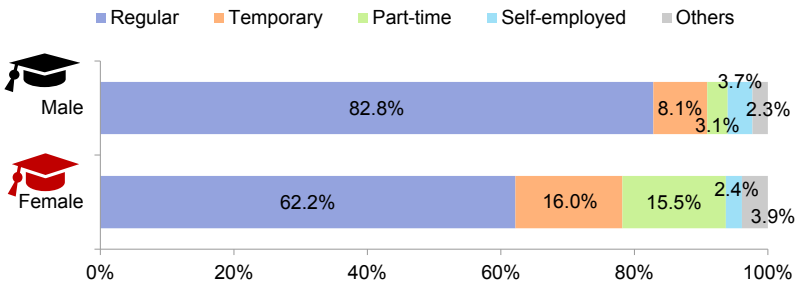


Overview Figure 10-2: Employment status by gender (academia vs. non-academia)

(a. Academia)

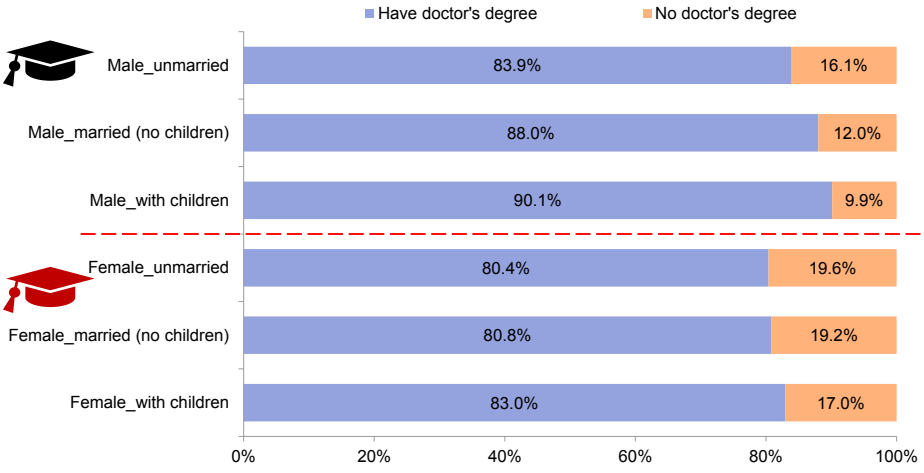


(b. Non-academia)



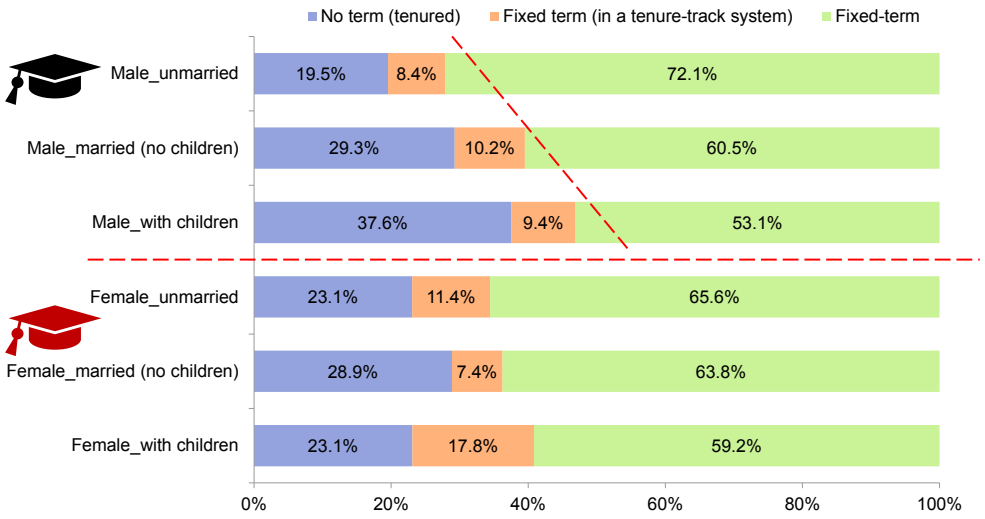
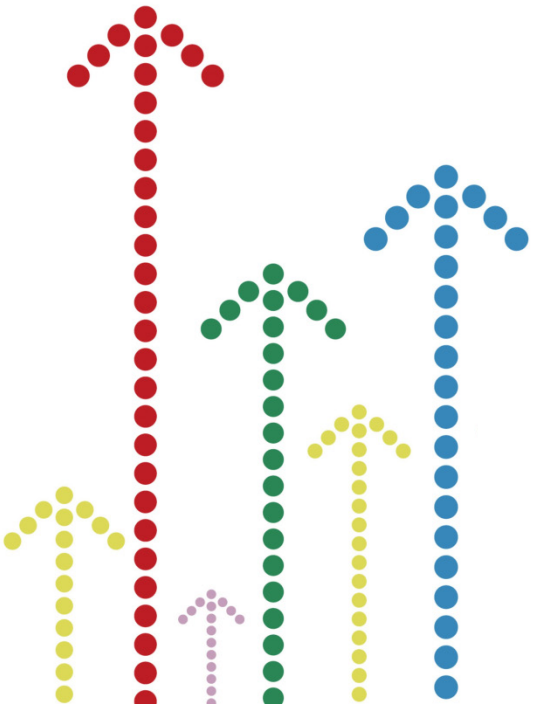
In the future, it is necessary to verify the relationship between life events and career development in a detailed manner through the development of tracking data. Looking at the single-year data of this JD-Pro, the rate of acquiring a doctor's degree and tenure employment rate for both male and female are high in order of the following status of doctors: married (with children), married (without children), and unmarried (those aged under 40 only). Although it is important to provide support for women with children, it should be noted that some women are unable to move to the life stage of marriage and child-rearing due to the ongoing unstable employment in academia.

Overview Figure 10-3:
Acquisition status of doctor's degree by gender in academia
(by marriage status and with/without child)



Note) People aged under 40 only.

Overview Figure 10-4:
Status of fixed-term employment by gender in academia
(by marriage status and with/without child)



Note) People aged under 40 only.