Clarivate™

For the Japan Society for the Promotion of Science

Analysis of International Mobility of Talented Researchers Affiliated with World Premier International Research Center Initiative (WPI) Based on Research Achievements

Summary

Consulting Services

Academica & Government Japan

The following document is a summary of the original full report written in Japanese on March 11, 2022.

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Background and Objective of the Project

- This project was conducted to advance World Premier International Research Center Initiative (WPI), that is led by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) and is supported by the Japan Society for the Promotion of Science (JSPS). The purpose of this project is to clarify how research experiences at WPI centers gave positive changes to young researchers' careers and to international mobility of talented researchers.

WPI Research Centers

Abbreviated Name	Host institution*	Full name	URL
iCeMS	Kyoto University	Institute for Integrated Cell-Material Sciences, Kyoto University	https://www.icems.kyoto-u.ac.jp/ja/
I^2CNER	Kyushu University	International Institute for Carbon-Neutral Energy Research, Kyushu University	https://i2cner.kyushu-u.ac.jp/ja/
MANA	National Institute for Materials Science	International Center for Materials Nanoarchitectonics	https://www.nims.go.jp/mana/jp/
IFReC	Osaka University	Immunology Frontier Research Center, Osaka University	http://www.ifrec.osaka-u.ac.jp/index.htm
AIMR	Tohoku University	Advanced Institute for Materials Research, Tohoku University	https://www.wpi-aimr.tohoku.ac.jp/jp/
Kavli IPMU	University of Tokyo	Kavli Institute for the Physics and Mathematics of the Universe, The University of Tokyo Institute for Advanced Study, The University of Tokyo	https://www.ipmu.jp/ja

*The names of universities and research institutions shown in this report are based on the affiliation-enhanced names of Web of Science.

Analysis Framework

1 Collect data on careers of WPI-affiliated researchers (web-based search and supplemental information provided by WPI centers)

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- Select researchers for analysis
- Web-based search

1-2 Analyze career patterns

1-3 Create job classifications

1-4 Retrieve and analyze researchers' publications

2 Career analysis of overall trend of WPI-affiliated researchers

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Analyze overall trend of WPI-affiliated researchers
- Career patterns
- Nationalities
- Mobility

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Research activities per career pattern
- The number of publications
- First-author publications / Corresponding-author publications
- International collaborations
- Citation index

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Job post advancement per career pattern

3 Analysis of WPI impact

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Framework for analyzing positive changes generated by WPI programs

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Career grouping for analysis of WPI impact

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Analysis of four career groups based on the following perspectives
- Researchers' attributes
- Diversity of researchers' nationalities
- Diversity of researchers' affiliated institutions before/after WPI
- Changes in producing research publications
- Job posts advancement

3-4

Discussion | Analysis of effect of WPI on promoting international mobility of talented researchers

Definitions

Several terms are often used in this report and are explained as follows.

Terms	Definitions
WPI host institutions (excl. WPI centers)	Host institutions for WPI centers. The examples of the host institutions were Kyoto University, Kyushu University, National Institute for Materials Science (MANA), Osaka University, Tohoku University and University of Tokyo, which were selected for this project. Researchers affiliated with “WPI host institutions (excl. WPI centers)” are those who belong to departments or centers in the above institutions other than WPI centers.
Non-WPI institutions	Institutions other than WPI host institutions
Pre-WPI experience	Research experience before joining WPI
Post-WPI experience	Research experience after leaving WPI
The 1st year	“The 1st year” means the first job-assigned year between 2008 to 2011.
The final year	“The final year” means the final job-assigned year between 2017 to 2020.
RU11	A consortium which was established in November 2009, consisting of the top 11 research universities in Japan.

Search Descriptions and Search Processes

1. Collected data on careers of WPI-affiliated researchers (web-based search and supplemental information provided by WPI centers)

1-1. Selected researchers for analysis / web-based search

- JSPS provided data on researchers hosted by WPI centers who held the posts of postdocs or assistant professors at any time between 2012 and 2016, and further web-based search was conducted to collect the researchers' affiliations and job posts during their 13-year careers from 2008 to 2020.
- In preparation for web-based search, duplicated researchers included in the provided data were eliminated based on matching of full names, job posts and nationalities, and one unique ID was given to each researcher.
- Web-based search was conducted for 1110 researchers, and it was found that some researchers were duplicated. As a result, 1,071 researchers were searched.
- The following Information was collected from Researchmap, KakenDB, universities' websites, researchers' websites, etc.
  - Collected data:
    - The names of researchers (English)
    - Job posts and affiliated institutions before/after WPI in 2008 to 2020 ("unknown" was marked when no information was identified.)
    - Referenced URLs
- Web-based research could not specify whether some researchers were affiliated with WPI before 2011 or after 2017. WPI centers checked whether those researchers were affiliated with WPI before 2011 or after 2017 and provided the supplemental data to us.
- Based on the web-based research and the additional information provided by WPI centers, researchers with careers for more than 10 years between 2008 and 2020 by web-based search were selected for detailed analysis. Some of those researchers had no data about job posts in several years.

*The reason why JSPS provided the list of researchers affiliated with WPI who held the posts of postdocs or assistant professors at any time between 2012 and 2016 was that it was assumed that job posts and affiliated institutions before/after WPI could be collected from 2008 to 2020.

** The reason why the search period was set after 2008 was that the linkage between authors and affiliations was identifiable with Web of Science for publications published from 2008.

*** Web-based search was conducted from March 30 to July 27, 2021. Collected data of researchers were based on the URLs referenced when the search was conducted. Even if any inconsistencies with the collected data and any update of referenced URLs or other data sources were found after the project was completed, these inconsistencies are not errors in the search result.

Search Descriptions and Search Processes

1. Collected data on careers of WPI-affiliated researchers (web-based search and supplemental information provided by WPI centers)

1-2. Analyzed career patterns

- Analyzed how researchers' careers improved through WPI experiences based on the data of researchers' affiliated institutions before/after WPI and job posts for thirteen (13) years.
- More specifically, various researchers' careers were classified into sixteen (16) career patterns as shown in the following table.
- "2.Career Analysis of WPI-affiliated researchers /Overview" and "3.Analysis of WPI Impact" were conducted based on these sixteen (16) career patterns.

Sixteen (16) Career Patterns (pattern A - P)

career patterns	Pre WPI	WPI	Post WPI
A	None(WPI in the 1st year)	WPI	None (WPI until the final year)
B	None(WPI in the 1st year)	WPI	WPI host inst (excl. WPI)
C	None(WPI in the 1st year)	WPI	Non-WPI Inst
D	None(WPI in the 1st year)	WPI	Non-Academia
E	WPI host inst (excl. WPI)	WPI	None (WPI until the final year)
F	WPI host inst (excl. WPI)	WPI	WPI host inst (excl. WPI)
G	WPI host inst (excl. WPI)	WPI	Non-WPI Inst
H	WPI host inst (excl. WPI)	WPI	Non-Academia
I	Non-WPI Inst	WPI	None (WPI until the final year)
J	Non-WPI Inst	WPI	WPI host inst (excl. WPI)
K	Non-WPI Inst	WPI	Non-WPI inst
L	Non-WPI Inst	WPI	Non-Academia
M	Non-Academia	WPI	None (WPI until the final year)
N	Non-Academia	WPI	WPI host Inst (excl. WPI)
O	Non-Academia	WPI	Non-WPI Inst
P	Non-Academia	WPI	Non-Academia

Search Descriptions and Search Processes

1. Collected data on careers of WPI-affiliated researchers (web-based search and supplemental information provided by WPI centers)

1-3. Created job post classifications

- Created the job post classifications shown in the right table based on the name variations of posts collected by web-based search to understand how researchers' posts advanced through WPI experiences .
- More specifically, compared the post advancement from pre-WPI and to post-WPI and from the 1st year (from 2008 to 2011) to the final year (from 2017 to 2020) of analysis.

Job post classifications

Level	Job post classification
8	Director/Executive
7	Professor
6	Associate professor
5	Lecturer
4	Assistant professor
3	Researcher/Postdoc
2	Research/Teaching assistant
C	Non-Academia (Public, Corp)
H	Health Care Worker
1	University Student

1-4. Retrieved and analyze researchers' publications

- Collected publications (articles and reviews) published from 2008 to 2020 based on researchers' full names alphabetically.
- Identified these publications with researchers' achievements of pre-WPI, WPI and post-WPI based on their affiliated institutions per year before/after WPI. Please refer to the original full report about more detailed publication-matching process.
- Evaluated researchers' publications in pre-WPI, WPI and post-WPI with indicators including the number of publications, the number of first-author publications and corresponding-author publications, international collaborations and citation index.

Search Descriptions and Search Processes

2. Career analysis of overall trend of WPI-affiliated researchers

2-1. Analyzed overall trend of WPI-affiliated researchers

- Classified researchers into 16 career patterns created in “1-2. Analyze Career patterns” and further clarified international mobility of researchers per nationality.
- Further, analyzed researchers’ publications and job posts in pre-WPI, WPI and post-WPI per career pattern. Then, clarified characteristics of each career pattern.

3. Analysis of WPI impact

- Analyzed how WPI programs achieved international mobility of researchers.
- Analyzed international mobility of researchers through WPI centers based on nationalities, publications, affiliated institutions before/after WPI, and job post advancement of researchers with both pre-WPI and post-WPI experiences, researchers with either pre-WPI or post-WPI experiences, or researchers affiliated with WPI for more than ten years.

Relations with Web-based Career Search and Publication Analysis

Search on careers of WPI researchers	The provided data including full names, nationalities, WPI centers affiliations, and posts between 2012 and 2016 were used to conduct web-based career search. Data collected by web-based career search
Analysis on publications per career pattern	# of publications in pre-WPI, WPI and post-WPI; these publications were collected based on researchers' full names and affiliated institutions before/with/after WPI per year
Analysis on the advancement of job posts	Classified job posts; the name variations of posts found by web-based search were classified into several names to show the advancement from posts in pre-WPI to posts in post-WPI and from posts in the 1st year to posts in the final year of analysis.

ID:P10251 example

ID	P10251	キャリアタイプ	K	国籍	日本

The following table was created to understand affiliated institutions before/after WPI, job posts and the number of publications per each researcher and was delivered in the format of Microsoft Excel.
As an example, when ID P10251 was entered, the table below per researcher was shown.

年	Organization	pre/wpi/post	機関タイプ	全論文数	pre期間	Pre論文数	WPI期間	WPI論文数	Post期間	Post論文数	その他論文	本人の所属に関わらずWPIが含まれる論文数	ポジション名(Web調査)	ポジション名統制
2008	Tohoku university	pre	same	1	●	1		0		0	0	0	JSPS 海外特別研究員	Researcher/Postdoc
2009	Tohoku university	pre	same	6	●	6		0		0	0	0	JSPS 海外特別研究員	Researcher/Postdoc
2010	Imperial College London	pre	acad_foreign	4	●	4		0		0	0	0	JSPS 海外特別研究員	Researcher/Postdoc
2011	Imperial College London	pre	acad_foreign	4	●	4		0		0	0	2	JSPS 海外特別研究員	Researcher/Postdoc
2012	Tohoku university	wpi	wpi	4		0	●	4		0	0	0	postdoc	Researcher/Postdoc
2013	Tohoku university	wpi	wpi	7		0	●	7		0	0	0	助教	Assistant professor
2014	Tohoku university	wpi	wpi	8		0	●	7		0	1	1	助教	Assistant professor
2015	Tohoku university	wpi	wpi	3		0	●	3		0	0	0	助教	Assistant professor
2016	Kanazawa university	post	acad_japan	6		0		4	●	4	0	1	准教授	Associate professor
2017	Kanazawa university	post	acad_japan	7		0		1	●	7	0	4	准教授	Associate professor
2018	Kanazawa university	post	acad_japan	2		0		1	●	2	0	0	准教授	Associate professor
2019	Kanazawa university	post	acad_japan	5		0		0	●	5	0	3	准教授	Associate professor
2020	Kanazawa university	post	acad_japan	6		0		0	●	6	0	2	准教授	Associate professor
				63		15		27		24	1	13		
					年数	年平均論文数	年数	年平均論文数	年数	年平均論文数				
			年平均論文数	4.8	4	3.8	4	6.8	5	4.8				

Databases

Web of Science Core Collection – WOS

- The world’s most trusted publisher-independent global citation database
- Web of Science Core Collection content is uniquely selective and our indexing is uniquely consistent. Our independent and thorough editorial process ensures journal quality, while more than 50 years of consistent, accurate and complete indexing has created an unparalleled data structure.
- Every article and all cited references from every journal have been indexed, creating the most comprehensive and complete citation network to power both confident discovery and trusted assessment. Only the Web of Science Core Collection indexes every piece of content cover-to-cover, creating a complete and certain view of over 115 years of the highest-quality research.

Journal Citation Reports –JCR

- Journal Citation Reports® offers a systematic, objective means to critically evaluate the world's leading journals, with quantifiable, statistical information based on citation data.

InCites Benchmarking –InCites

- InCites Benchmarking & Analytics™ provides you with the objective and reliable indicators you need to make confident, data-driven decisions about your research programs. Built upon the consistent, accurate and complete publications metadata in the Web of ScienceTM Core Collection, InCites supports both ad-hoc and regular reporting on a global scale.
- Quickly gain the context you need to accurately evaluate funding outcomes, assess collaborations, identify subject matter experts, benchmark against peers, and more.

Databases and Data Coverage

- **How we collected researchers' publications**
  - Collected publications based on full names of researchers alphabetically found by web-based search and identified researchers' publications based on the combination of full names and the affiliated institutions before/with/after WPI per year.
  - Publications written by authors with only initials were omitted.
- **Limitations of identifying researchers' publications**
  - Identified publications based on full names and the affiliated institutions before/with/after WPI. However, when too many publications were linked to one researcher, errors occurred due to those with the same first and last names. In such cases, publications were linked to the researcher in reference to the researcher's publications posted on the website.
- **Databases**
  - Global citation database :Web of Science Core Collection(WOS）(Clarivate）
    - File:International journals indexed to Science Citation Index Expanded(SCIE), Social Sciences Citation Index(SSCI）
  - Web-based research evaluation tool: InCites Benchmarking(Clarivate）
  - Journal database: Journal Citation Report(JCR）(Clarivate）
- **Data Coverage**
  - Publication year:2008 to 2020(13 years）
  - Document type: Articles, Reviews
  - Coverage: InCites dataset updated Aug. 27, 2021. Includes Web of Science content indexed through Aug. 27, 2021.
  - 22 areas of ESI (Essential Science Indicator）
  - Database retrievals of research articles were conducted from July 3, 2021 to August 12, 2021.

Indicators

- **Essential Science Indicators (ESI)**
  - The Essential Science Indicators schema includes all documents from Science Citation Index Expanded and Social Science Citation Index. However, Citations from all Web of Science core collection are accounted for in this schema. Each journal (in Web of Science Core Collection - Science Citation Index Expanded and Social Sciences Citation Index only) is assigned to one of 22 research fields. In ESI, a journal can be assigned to only one field.
- **The percentile of a publication**
  - The percentile of a publication is determined by creating a citation frequency distribution for all publications in the same year, subject category, and document type (arranging the papers in ascending order of citation count), and determining the percentage of papers at each level of citation. If a paper has a percentile value of 99, then 99% of the papers in the same subject category, year, and document type have a lower citation count.
- **Documents in Top 1% and 10%**
  - The % Documents in Top 1% or Top 10% indicators is the top one or ten percent most cited documents in a given subject category, year and publication type divided by the total number of documents in a given set of documents, displayed as a percentage.
- **Category Normalized Citation Impact (CNCI)**
  - The Category Normalized Citation Impact (CNCI) of a document is calculated by dividing the actual count of citing items by the expected citation rate for documents with the same document type, year of publication and subject area. When a document is assigned to more than one subject area an average of the ratios of the actual to expected citations is used. The CNCI of a set of documents, for example the collected works of an individual, institution or country/region, is the average of the CNCI values for all the documents in the set.

ESI Research Areas
Chemistry
Materials Science
Physics
Space Science
Computer Science
Mathematics
Engineering
Environment/Ecology
Geosciences
Clinical Medicine
Psychiatry/Psychology
Immunology
Neuroscience & Behavior
Pharmacology & Toxicology
Biology & Biochemistry
Molecular Biology & Genetics
Microbiology
Plant & Animal Science
Agricultural Sciences
Economics & Business
Social Sciences, general
Multidisciplinary

Indicators

- **Journal Impact Factor (JIF)**
  - The average number of times articles from a journal published in the past two years have been cited in the Journal Citations Report (JCR) year.
  - (Total number of citations from JCR year to items in “year -2” + citations from JCR year to items in “year -1”) ÷ (total number of citable items in “year -2” + citable items in “year -1”) = Journal Impact Factor
- **Documents in Q1 - Q4 Journals**
  - The number of documents that appear in a journal in a particular Journal Impact Factor Quartile in a given year. For instance, a value of 100 indicates 100 documents in the set were published in journals of the specified Journal Impact Factor Quartile in that year.
  - InCites uses the best quartile for journals that appear in multiple Web of Science Research Areas. When a research area is specified, the quartile for that particular journal and research area is used.

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Criteria | Analysis of Effect of WPI on Promoting International Mobility of Talented Researchers

- Finally, the following criteria were analyzed and summarized to clarify how WPI programs gave positive impact on international mobility of talented researchers.

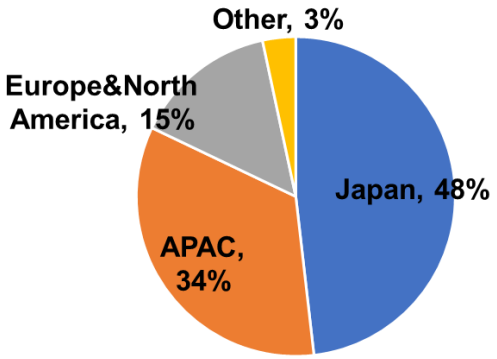
Goal	Criteria	Indicators
To achieve international mobility of talented researchers through WPI experiences	1. Hosting talented researchers	• The number of researchers that joined WPI from world-class universities and research institutions such as the world's top 50 universities of Times Higher Education World University (THE) Ranking and world-renowned research institutions (Max Plank Society, CNR, RIKEN, AIST and NIMS)
	2. Developing talented researchers	• The number of researchers that worked at WPI and then pursued their career at world-class universities and research institutions such as the world's top 50 universities of Times Higher Education World University (THE) Ranking and world-renowned research institutions (Max Plank Society, CNR, RIKEN, AIST and NIMS)
	3. Hosting young researchers and creating positive impact on their research careers	• The number of young researchers* that WPI centers hosted • Changes in the number of publications and citations after WPI experiences • Career development after WPI experiences
	4. Establishing an international research environment	• Diversity of nationalities and affiliated institutions of researchers prior to joining WPI • The number of international researchers who worked at WPI for more than ten years
	5. Effecting positive changes in the academia in Japan	• The number of researchers who worked at WPI and then pursued their career at renowned universities (RU11) and research institutions (RIKEN, AIST and NIMS) in Japan
	6. Effecting positive changes in the academia overseas	• Diversity of international research institutions that hired researchers with WPI experiences
	7. Improving mobility of talents with industries	• Mobility of researchers between WPI and industries
	8. Improving research activities after WPI experiences	• Changes in the number of publications and citations after WPI experiences

* "Young researchers" means university students and postdocs in the 1st year or in pre-WPI

Attributes of Researchers for Web-Based Search

- JSPS provided the name list of researchers who were affiliated with WPI at any time from the year 2012 to 2016, and the web-based career search was conducted to collect the names of the affiliated institutions before/after WPI of these researchers for the period of thirteen (13) years between 2008 and 2020. The researchers were postdocs or assistant professors when they joined WPI.
- The total of 1110 researchers was searched. As a result of the web-based search, 39 researches were found to be the same individuals and duplicated in the name list. Thus, 1071 researchers were selected for this analysis. The attributes of the researchers at WPI were summarized as follows.
  - The top nationality was Japan (48%). Approximately, a half of researchers were international.
  - The largest WPI center was MANA with 287 researchers. The second largest was iCeMS with 211 researchers.
  - 73% of total researchers were postdocs.

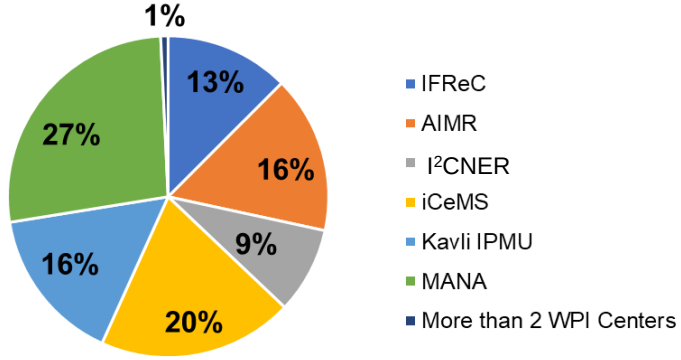
Nationality



	Total	Japan	APAC*	Europe & North America	Other*
# of Researcher	1,071	516	363	156	36
%	100%	48%	34%	15%	3%

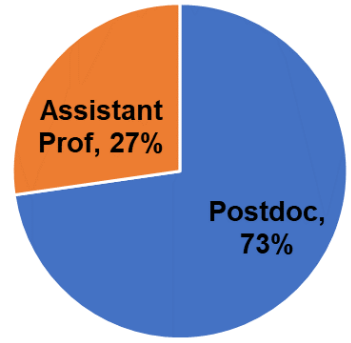
*APAC: Asia Pacific
Other: Latin America, Middle East and Africa
** Researchers had WPI experiences at more than two WPI centers
*** "Research Staff (Young)" as the post in MANA was classified as Assistant Professor.

WPI centers affiliated in 2012-2016



WPI Centers	# of Researchers	%
IFReC	134	13%
AIMR	170	16%
I^2CNER	93	9%
iCeMS	211	20%
Kavli IPMU	168	16%
MANA	287	27%
More than 2 WPI centers**	8	1%
Total	1,071	100%

Post at WPI



Post at WPI	# of Researchers	%
Postdoc	779	73%
Assistant Professor***	292	27%
Total	1,071	100%

The Number of Researchers per Career Pattern

- As a result of the web-based search, 734 researchers with more than ten-year careers of the total of 1071 were selected for detailed analysis.

 # or researchers per career pattern based on affiliated institutions before/after WPI

	Total	Japan	APAC	EU&NA	Other
All researchers on the list **	1071	516	363	156	36
Researchers for detailed analysis	734	366	226	112	30
Coverage	**69%**	**71%**	**62%**	**72%**	**83%**

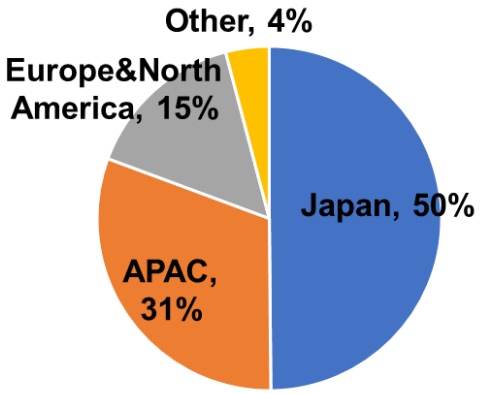
				# of researchers				
career pattern	Pre	WPI	Post	Total	Japan	APAC	EU&NA	Other
A	None (WPI in the 1st year)*	WPI	None (WPI until the final year)*	32	25	3	3	1
B	None (WPI in the 1st year)*	WPI	WPI host inst (excl. WPI)	15	14	** 1	0	0
C	None (WPI in the 1st year)*	WPI	Non-WPI Inst	36	23	7	4	2
D	None (WPI in the 1st year)*	WPI	Non-Academia	2	2	0	0	0
E	WPI host inst (excl. WPI)	WPI	None (WPI until the final year)*	53	43	6	3	1
F	WPI host inst (excl. WPI)	WPI	WPI host inst (excl. WPI)	55	44	7	3	1
G	WPI host inst (excl. WPI)	WPI	Non-WPI Inst	63	41	16	5	1
H	WPI host inst (excl. WPI)	WPI	Non-Academia	4	4	0	0	0
I	Non-WPI Inst	WPI	None (WPI until the final year)*	82	34	23	18	7
J	Non-WPI Inst	WPI	WPI host inst (excl. WPI)	52	35	13	4	0
K	Non-WPI Inst	WPI	Non-WPI inst	301	90	137	59	15
L	Non-WPI Inst	WPI	Non-Academia	21	3	9	8	1
M	Non-Academia	WPI	None (WPI until the final year)*	3	2	0	1	0
N	Non-Academia	WPI	WPI host Inst (excl. WPI)	1	1	0	0	0
O	Non-Academia	WPI	Non-WPI Inst	8	4	1	2	1
P	Non-Academia	WPI	Non-Academia	6	1	3	2	0
U	WPI periond unknown			0	0	0	0	0
Y	not for detailed analysis			337	150	137	44	6
Total				1071	516	363	156	36

* "The 1st year" means the first job-assigned year between 2008 and 2011, and "the final year" means the final job-assigned year between 2017 and 2020.
** Since several researchers were found to be duplicated by the web-based search, the total number of researchers was 1071. Duplicated researchers could not be found on the original list that included mixtures of the middle names, old Chinese characters, alphabetical names and the first and last names reversed.

Attributes of Selected Researchers for Detailed Analysis

- Nationalities, affiliations and posts in 2012 to 2016 of the 734 researchers for detailed analysis were as follows.
- The top nationality was Japan. A half of the researchers were international.
  - The largest WPI center was MANA (27%). The second largest centers were iCeMS and Kavli IPMU.
  - 67% of the researchers were postdocs, and 33% of the researchers were assistant professors.

Nationality

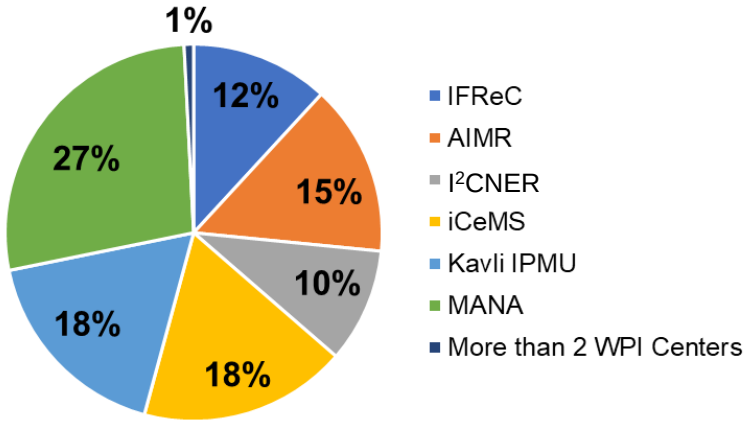


Nationality	# of researchers	%
China	117	16%
India	51	7%
US	21	3%
Germany	15	2%
France	15	2%
South Korea	15	2%
UK	15	2%
Iran	11	1%
Australia	10	1%
Spain	8	1%
Vietnam	7	1%
Italy	7	1%
Canada	6	1%
Indonesia	6	1%
Thailand	5	1%
Taiwan	5	1%

	Total	Japan	APAC*	Europe & North America	Other*
# of researchers	734	366	226	112	30
%	100%	50%	31%	15%	4%

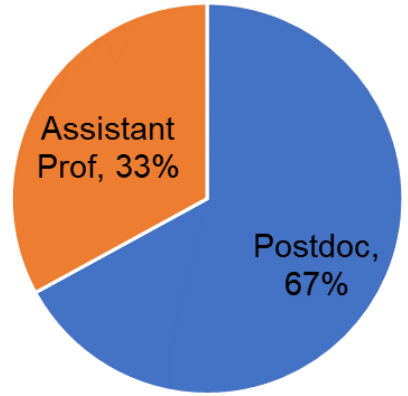
*APAC: Asia Pacific
Other: Latin America, Middle East and Africa
** Researchers had WPI experiences at more than two WPI centers
*** "Research Staff (Young)" as the post in MANA was classified as Assistant Professor.

Affiliated WPI centers in 2012-2016



WPI Center	# of researchers	%
IFReC	87	12%
AIMR	108	15%
I^2CNER	72	10%
iCeMS	131	18%
Kavli IPMU	129	18%
MANA	201	27%
More than 2 WPI centers**	6	1%
Total	734	100%

Post at WPI



Post at WPI	# of researchers	%
Postdoc	492	67%
Assistant Professor***	242	33%
Total	734	100%

Clarivate™

Analyzed Overall Trend of Researchers

- In reference to the number of researchers per career pattern, the largest number of researchers was classified as pattern (K) (those who joined WPI from non-WPI institutions and joined non-WPI institutions after WPI) , which had 301. The ratio of patten (K) was 41%.
- The researchers classified as pattern (I) (joined WPI from non-WPI institutions and affiliated with WPI until the final year) were 82, and the ratio of the researchers in patten (I) was 11%. The researchers classified as pattern (G) (those who joined WPI from WPI host institutions (excl. WPI centers) and joined non-WPI institutions after WPI） were 63 and the ratio of pattern (G) was 9%.
- The researchers in patterns (C/G/I/J/K/L/O) that joined WPI from non-WPI institutions and/or joined non-WPI institutions from WPI were 563. The ratio of patterns (C/G/I/J/K/L/O) was 77%.
- In all nationalities, the ratio of researchers classified as pattern (K) (those who joined WPI from non-WPI institutions and joined non-WPI institutions after WPI） was the highest.

# of researchers and % per career pattern based on the affiliated institutions before/after WPI

				# of researchers					% *				
career pattern	Pre	WPI	Post	Total	Japan	APAC	EU&NA	Other	Total	Japan	APAC	EU&NA	Other
A	None (WPI in the 1st year)	WPI	None (WPI until the final year)	32	25	3	3	1	4%	3%	0%	0%	0%
B	None (WPI in the 1st year)	WPI	WPI host inst (excl. WPI)	15	14	1	0	0	2%	2%	0%	0%	0%
C	None (WPI in the 1st year)	WPI	Non-WPI Inst	36	23	7	4	2	5%	3%	1%	1%	0%
D	None (WPI in the 1st year)	WPI	Non-Academia	2	2	0	0	0	0%	0%	0%	0%	0%
E	WPI host inst (excl. WPI)	WPI	None (WPI until the final year)	53	43	6	3	1	7%	6%	1%	0%	0%
F	WPI host inst (excl. WPI)	WPI	WPI host inst (excl. WPI)	55	44	7	3	1	7%	6%	1%	0%	0%
G	WPI host inst (excl. WPI)	WPI	Non-WPI Inst	63	41	16	5	1	9%	6%	2%	1%	0%
H	WPI host inst (excl. WPI)	WPI	Non-Academia	4	4	0	0	0	1%	1%	0%	0%	0%
I	Non-WPI Inst	WPI	None (WPI until the final year)	82	34	23	18	7	11%	5%	3%	2%	1%
J	Non-WPI Inst	WPI	WPI host inst (excl. WPI)	52	35	13	4	0	7%	5%	2%	1%	0%
K	Non-WPI Inst	WPI	Non-WPI inst	301	90	137	59	15	41%	12%	19%	8%	2%
L	Non-WPI Inst	WPI	Non-Academia	21	3	9	8	1	3%	0%	1%	1%	0%
M	Non-Academia	WPI	None (WPI until the final year)	3	2	0	1	0	0%	0%	0%	0%	0%
N	Non-Academia	WPI	WPI host Inst (excl. WPI)	1	1	0	0	0	0%	0%	0%	0%	0%
O	Non-Academia	WPI	Non-WPI Inst	8	4	1	2	1	1%	1%	0%	0%	0%
P	Non-Academia	WPI	Non-Academia	6	1	3	2	0	1%	0%	0%	0%	0%
			Total	734	366	226	112	30					

* % per career pattern and nationality when the population was 734 researchers.

International Mobility of Researchers

- When visualizing the mobility of researchers per nationality, the following trend was found.

[Japan]

- The number of researchers that joined WPI from non-WPI institutions located in Japan and pursued the next career at non-WPI institutions located in Japan was 56.
- The number of researchers that joined WPI from WPI host institutions (excl. WPI centers) and were affiliated with WPI host institutions (excl. WPI centers) after WPI was 44.
- 51 researchers joined WPI from overseas institutions, 22 researchers joined non-WPI institutions located in Japan after leaving WPI, and 5 researchers joined overseas institutions after WPI .

[APAC]

- The number of researchers that joined WPI from overseas and pursued the next career abroad were 92.
- The number of researchers that joined WPI from non-WPI institutions located in Japan and pursued the next career abroad were 21.

[Europe and North America]

- The number of researchers that joined WPI from overseas and pursued the next career abroad were 46.
- The number researchers that joined WPI from overseas and were affiliated with WPI until the final year were 16.

[Other]

- The number of researchers that joined WPI from overseas and pursued the next career abroad were 11. The number of researchers that joined WPI from overseas and were affiliated with WPI until the final year were 4.

There were many non-Japanese researchers that joined WPI from overseas and pursued the next career abroad. International mobility of researchers was enhanced through WPI.

Japan

Pre \ Post	WPI	WPI host Inst (excl. WPI)	Japan	Overseas	Non-Academia	Total	%
WPI	25	14	20	3	2	64	17%
WPI host Inst (excl. WPI)	43	44	29	12	4	132	36%
Japan	24	22	56	7	2	111	30%
Overseas	10	13	22	5	1	51	14%
Non-Academia	2	1	4	0	1	8	2%
Total	104	94	131	27	10	366	100%
%	28%	26%	36%	7%	3%	100%	

APAC

Pre \ Post	WPI	WPI host Inst (excl. WPI)	Japan	Overseas	Non-Academia	Total	%
WPI	3	1	1	6	0	11	5%
WPI host Inst (excl. WPI)	6	7	5	11	0	29	13%
Japan	5	3	9	21	4	42	19%
Overseas	18	10	15	92	5	140	62%
Non-Academia	0	0	1	0	3	4	2%
Total	32	21	31	130	12	226	100%
%	14%	9%	14%	58%	5%	100%	

Europe & North America

Pre \ Post	WPI	WPI host Inst (excl. WPI)	Japan	Overseas	Non-Academia	Total	%
WPI	3	0	1	3	0	7	6%
WPI host Inst (excl. WPI)	3	3	0	5	0	11	10%
Japan	2	1	0	3	0	6	5%
Overseas	16	3	10	46	8	83	74%
Non-Academia	1	0	0	2	2	5	4%
Total	25	7	11	59	10	112	100%
%	22%	6%	10%	53%	9%	100%	

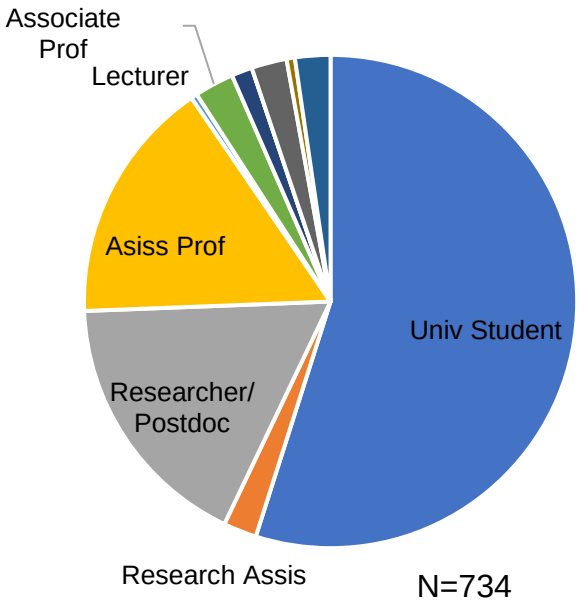
Other

Pre \ Post	WPI	WPI host Inst (excl. WPI)	Japan	Overseas	Non-Academia	Total	%
WPI	1	0	0	2	0	3	10%
WPI host Inst (excl. WPI)	1	1	0	1	0	3	10%
Japan	3	0	1	3	0	7	23%
Overseas	4	0	0	11	1	16	53%
Non-Academia	0	0	0	1	0	1	3%
Total	9	1	1	18	1	30	100%
%	30%	3%	3%	60%	3%	100%	

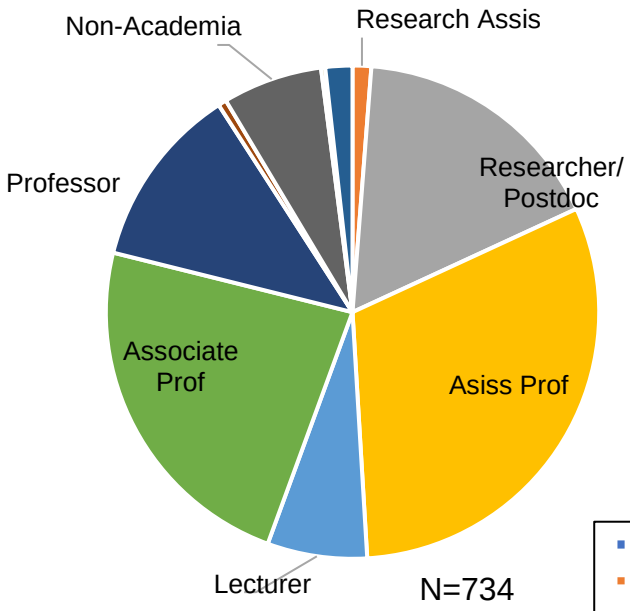
Job Posts in the First and the Final Year of the Analyzed Period

- "The 1st year" means the first job-assigned year between 2008 and 2011, and "the final year" means the final job-assigned year between 2017 and 2020.
- The following charts show the post advancement from the 1st year to the final year.
- Approximately, more than a half of the researchers was university students in the 1st year, and in the final year, the ratio of assistant professors and associate professors increased.

Job Posts in the First Year



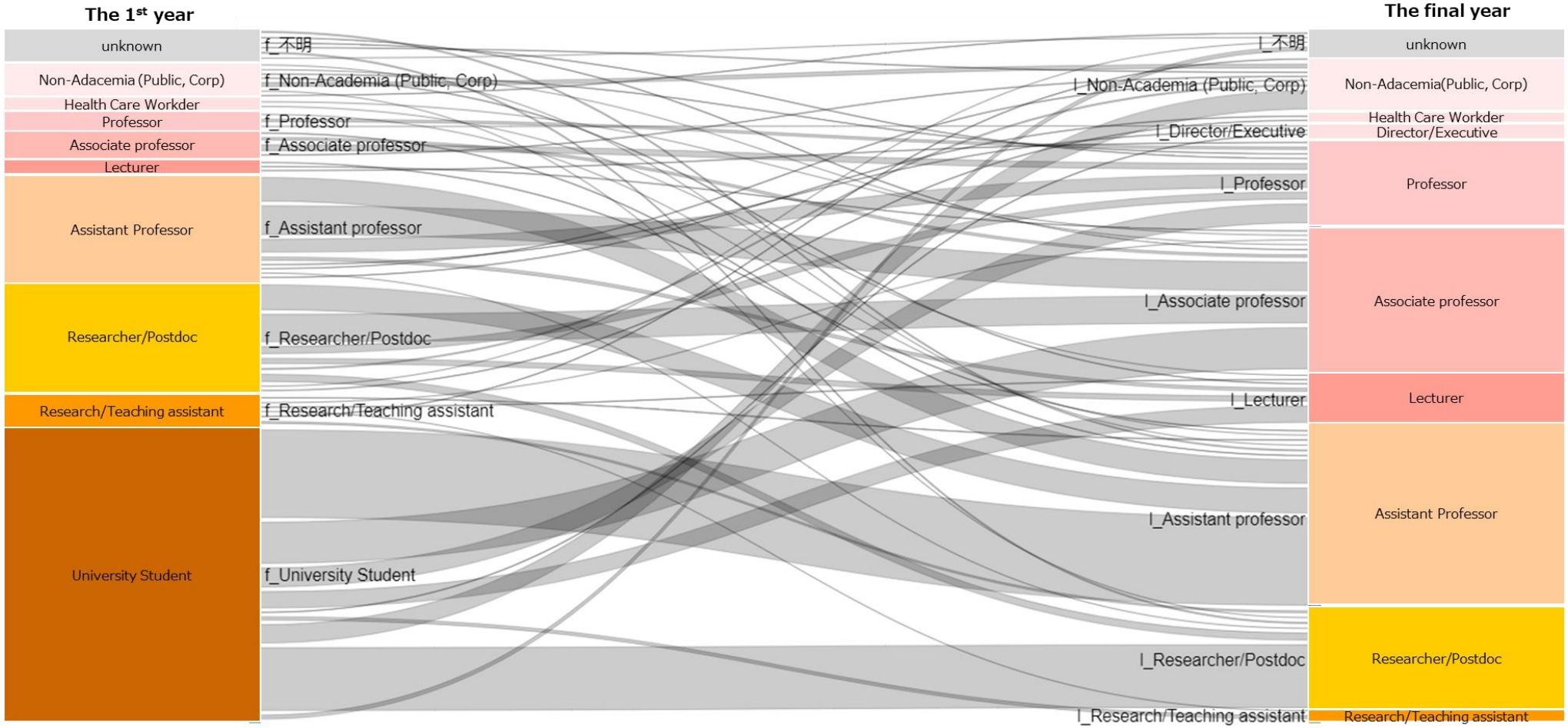
Job Posts in the Final Year



Job posts	the 1st year	%	the final year	%
University Student	403	55%	0	0%
Research/Teaching assistant	16	2%	9	1%
Researcher/Postdoc	127	17%	124	17%
Assistant professor	118	16%	227	31%
Lecturer	3	0%	48	7%
Associate professor	19	3%	171	23%
Professor	10	1%	88	12%
Director/Executive	0	0%	4	1%
Non-Academia (Public, Corp)	17	2%	48	7%
Health Care Worker	4	1%	2	0%
unknown	17	2%	13	2%

Job Post Advancement from the First Year to the Final Year of the Analyzed Period

- The following chart shows the advancement of job posts from the 1st year to the final year of the analyzed period. Many university students in the 1st year were advanced to be assistant professors or postdocs in the final year.
- Postdocs in the 1st year were advanced to be assistant professors or associate professors. Posts of researchers were advanced with the passing of years, and the ratio of assistant professors in the final year was the highest.



N=734

Career Pattern and Career Grouping to Analyze the WPI impact

- Researchers' careers were classified into sixteen (16) career patterns based on institutions they were affiliated with before/after WPI.
- Further, those sixteen (16) career patterns were re-classified into four (4) career groups.

Sixteen (16) of Career Patterns

career patterns	Pre WPI	WPI	Post WPI
A	None(WPI in the 1st year)	WPI	None (WPI until the final year)
B	None(WPI in the 1st year)	WPI	WPI host inst (excl. WPI)
C	None(WPI in the 1st year)	WPI	Non-WPI Inst
D	None(WPI in the 1st year)	WPI	Non-Academia
E	WPI host inst (excl. WPI)	WPI	None (WPI until the final year)
F	WPI host inst (excl. WPI)	WPI	WPI host inst (excl. WPI)
G	WPI host inst (excl. WPI)	WPI	Non-WPI Inst
H	WPI host inst (excl. WPI)	WPI	Non-Academia
I	Non-WPI Inst	WPI	None (WPI until the final year)
J	Non-WPI Inst	WPI	WPI host inst (excl. WPI)
K	Non-WPI Inst	WPI	Non-WPI inst
L	Non-WPI Inst	WPI	Non-Academia
M	Non-Academia	WPI	None (WPI until the final year)
N	Non-Academia	WPI	WPI host Inst (excl. WPI)
O	Non-Academia	WPI	Non-WPI Inst
P	Non-Academia	WPI	Non-Academia

Four (4) Career Groups

Grouping	patterns (A-P)	Pre/WPI/Post	main features
Group I	A	WPI	They were affiliated with WPI for more than ten years
Group II	E/I/M	Pre WPI	They held pre-WPI job posts.
Group III	B/C/D	WPI Post	They held post-WPI job posts.
Group IV	F/G/H/ J / K / L / N / O / P	Pre WPI Post	They held both pre-WPI and post-WPI job posts.

Career Grouping to Analyze the WPI impact to Researcher's Career Development

- Sixteen (16) of career patterns were re-classified into four (4) career groups, and the number of researchers per career group were as follows.
- Researchers in Group IV that joined WPI from non-WPI institutions and pursued the next career at non-WPI institutions were 511. This group was the largest. The second largest group was Group II, where 138 researchers joined WPI from non-WPI institutions and were affiliated with WPI until the final year.

of Researchers in Sixteen (16) Career Patterns

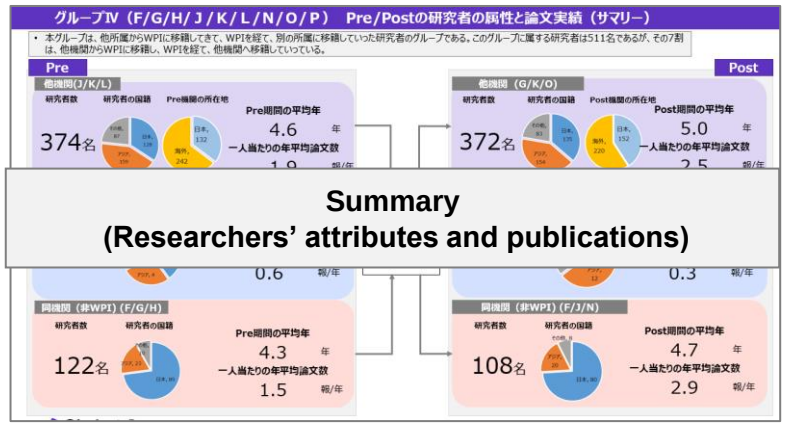
career pattern	Pre	WPI	Post	Total	Japan	APAC	EU&NA	Other
A	None (WPI in the 1st year)	WPI	None (WPI until the final year)	32	25	3	3	1
B	None (WPI in the 1st year)	WPI	WPI host inst (excl. WPI)	15	14	1	0	0
C	None (WPI in the 1st year)	WPI	Non-WPI Inst	36	23	7	4	2
D	None (WPI in the 1st year)	WPI	Non-Academia	2	2	0	0	0
E	WPI host inst (excl. WPI)	WPI	None (WPI until the final year)	53	43	6	3	1
F	WPI host inst (excl. WPI)	WPI	WPI host inst (excl. WPI)	55	44	7	3	1
G	WPI host inst (excl. WPI)	WPI	Non-WPI Inst	63	41	16	5	1
H	WPI host inst (excl. WPI)	WPI	Non-Academia	4	4	0	0	0
I	Non-WPI Inst	WPI	None (WPI until the final year)	82	34	23	18	7
J	Non-WPI Inst	WPI	WPI host inst (excl. WPI)	52	35	13	4	0
K	Non-WPI Inst	WPI	Non-WPI inst	301	90	137	59	15
L	Non-WPI Inst	WPI	Non-Academia	21	3	9	8	1
M	Non-Academia	WPI	None (WPI until the final year)	3	2	0	1	0
N	Non-Academia	WPI	WPI host Inst (excl. WPI)	1	1	0	0	0
O	Non-Academia	WPI	Non-WPI Inst	8	4	1	2	1
P	Non-Academia	WPI	Non-Academia	6	1	3	2	0
			Total	734	366	226	112	30
			%	100%	50%	31%	15%	4%

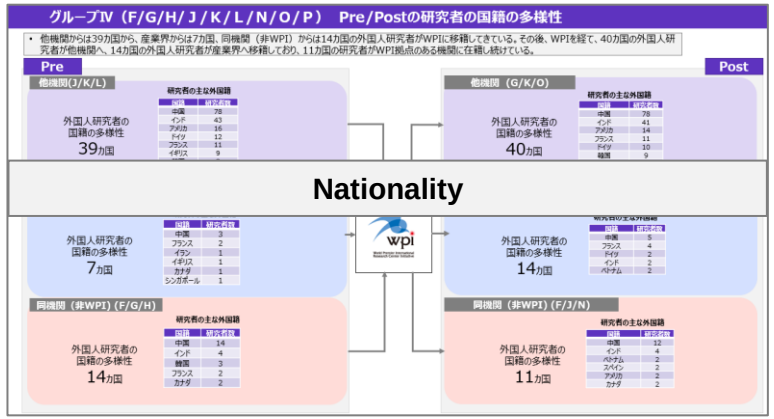
of Researchers in Four (4) Career Groups

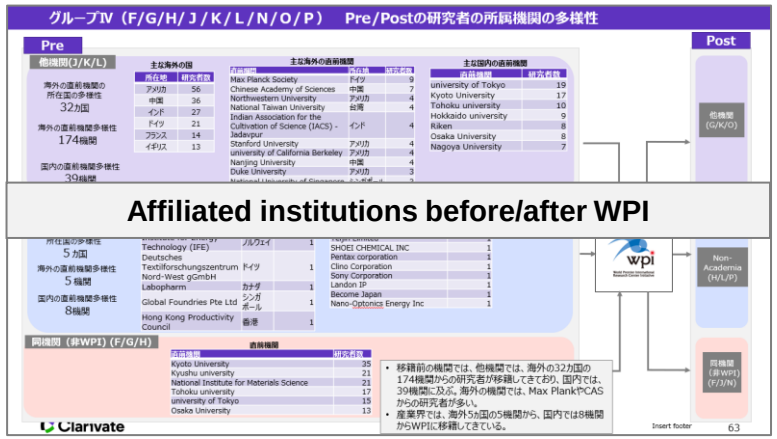
group	career pattern	main features		Total	Japan	APAC	EU&NA	Others
Ⅰ	A	They were affiliated with WPI for more than ten years	# of researchers	32	25	3	3	1
			%	100%	78%	9%	9%	3%
Ⅱ	E/I/M	They held pre-WPI job posts.	# of researchers	138	79	29	22	8
			%	100%	57%	21%	16%	6%
Ⅲ	B/C/D	They held post-WPI job posts.	# of researchers	53	39	8	4	2
			%	100%	74%	15%	8%	4%
Ⅳ	F/G/H/ J / K / L / N / O / P	They held both pre-WPI and post-WPI job posts.	# of researchers	511	223	186	83	19
			%	100%	44%	36%	16%	4%
		Total	# of researchers	734	366	226	112	30
			%	100%	50%	31%	15%	4%

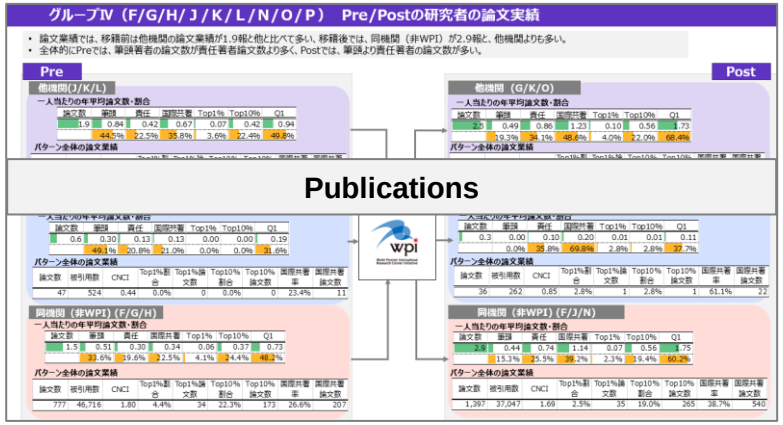
Attributes of the Four Career Groups

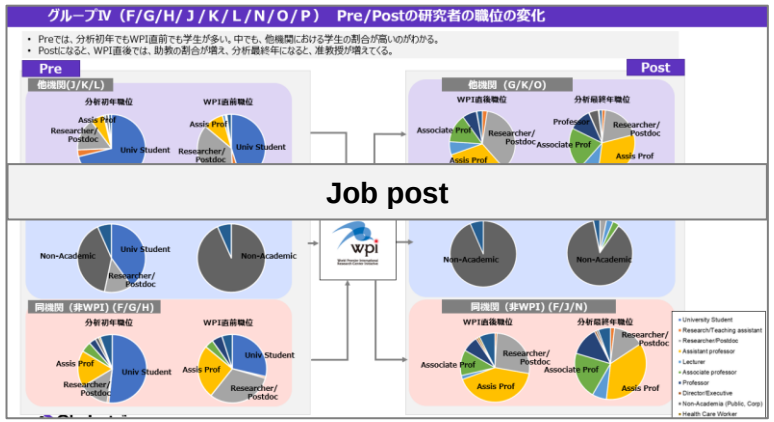
- Based on four career groups, further analysis was conducted to clarify the following attributes.
  - Who joined WPI? - nationalities, locations of affiliated institutions before WPI
  - Who pursued the next career at non-WPI institutions? - nationalities
  - Which institutions did the researchers join after WPI? - locations of the institutions, in the academia or private sectors
  - Who were affiliated with WPI for more than ten years? - nationalities











Group IV (F/G/H/J/K/L/N/O/P)
Summary of Attributes and # of Publications of Researchers with both Pre-WPI and Post-WPI Experiences

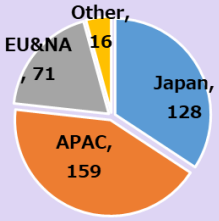
- Researchers with both pre-WPI and post-WPI experiences in Group IV were 511.
- 70% of the researchers in this group were affiliated with non-WPI institutions before/after WPI.

Pre

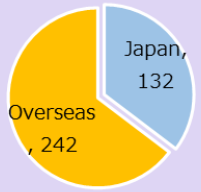
Non-WPI Inst (J/K/L)

of researchers: 374

Nationality



Location of institutions before WPI



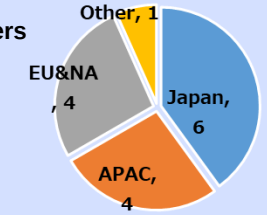
Years in pre-WPI on average: 4.6 Year

# of publications per researcher on average: 1.9 per year

Non-Academia (N/O/P)

of researchers: 15

Nationality



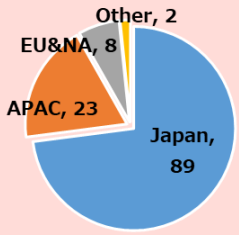
Years in pre-WPI on average: 4.5 Year

# of publications per researcher on average: 0.6 per year

WPI host inst (excl. WPI) (F/G/H)

of researchers: 122

Nationality



Years in pre-WPI on average: 4.3 Year

# of publications per researcher on average: 1.5 per year

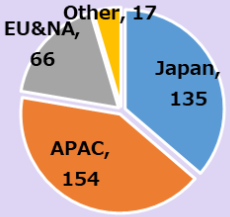
# of researchers: 511

Post

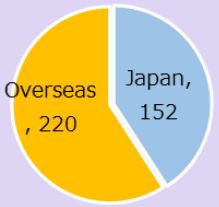
Non-WPI Inst (G/K/O)

of researchers: 372

Nationality



Location in institutions after WPI



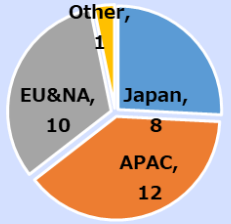
Years in post-WPI on average: 5.0 Year

# of publications per researcher on average: 2.5 per year

Non-Academia (H/L/P)

of researchers: 31

Nationality



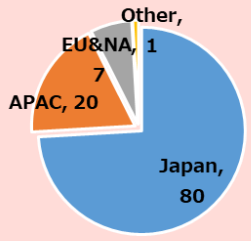
Years in post-WPI on average: 4.7 Year

# of publications per researcher on average: 0.3 per year

WPI host inst (excl. WPI) (F/J/N)

of researchers: 108

Nationality



Years in post-WPI on average: 4.7 Year

# of publications per researcher on average: 2.9 per year

- The researchers of 39 nationalities joined WPI from non-WPI institutions, the researchers of 7 nationalities joined WPI from industries, the researchers of 14 nationalities joined WPI from WPI-host institutions (excl. WPI).
- After leaving WPI, the researchers of 40 nationalities pursued their next career at non-WPI institutions, the researchers of 14 nationalities pursued their next career in industries and the researchers of 11 nationalities were affiliated with WPI host institutions (excl. WPI).

Pre

Non-WPI Inst (J/K/L)

of researchers:374
(Japan:128, APAC:159, EU&NA:71, Other:16)

Nationalities of non-Japanese researchers
39

Major Nationalities

Nationality	# of researchers
China	78
India	43
US	16
Germany	12
France	11
UK	9
South Korea	8
Australia	7
Iran	6

Non-Academia (N/O/P)

of researchers:15
(Japan:6, APAC:4, EU&NA:4, Other1)

Nationalities of non-Japanese researchers
7

Major Nationalities

Nationality	# of researchers
China	3
France	2
Iran	1
UK	1
Canada	1
Singapore	1

WPI Host Inst (excl. WPI) (F/G/H)

of researchers:122
(Japan:89, APAC:23, EU&NA:8, Other:2)

Nationalities of non-Japanese researchers
14

Major Nationalities

Nationality	# of researchers
China	14
India	4
South Korea	3
France	2
Canada	2

wpi
World Premier International Research Center Initiative

# of Researchers
511

Post

Non-WPI Inst (G/K/O)

of researchers:372
(Japan:135, APAC:154, EU&NA:66, Other:17)

Nationalities of non-Japanese researchers
40

Major Nationalities

Nationality	# of researchers
China	78
India	41
US	14
France	11
Germany	10
South Korea	9
UK	9

Non-Academia (H/L/P)

of researchers:31
(Japan:8, APAC:12, EU&NA:10,Other:1)

Nationalities of non-Japanese researchers
14

Major Nationalities

Nationality	# of researchers
China	5
France	4
Germany	2
India	2
Vietnam	2

WPI Host Inst (excl. WPI) (F/J/N)

of researchers:108
(Japan:80, APAC:20, EU&NA :7,Other:1)

Nationalities of non-Japanese researchers
11

Major Nationalities

Nationality	# of researchers
China	12
India	4
Vietnam	2
Spain	2
US	2
Canada	2

Pre

Non-WPI Inst (J/K/L)

of researchers:374 (Japan:128, APAC:159, EU&NA:71, Other:16)

Location of overseas institutions before WPI
32 countries

Overseas institutions before WPI
174 institutions

institutions in Japan before WPI
39 institutions

Major locations

Location	# of researchers
US	56
China	36
India	27
Germany	21
France	14
UK	13

Major international institutions before WPI

institutions before WPI	Location	# of researchers
Max Planck Society	Germany	9
Chinese Academy of Sciences	China	7
Northwestern University	US	4
National Taiwan University	Taiwan	4
Indian Association for the Cultivation of Science (IACS) – Jadavpur	India	4
Stanford University	US	4
University of California Berkeley	US	4
Nanjing University	China	4
Duke University	US	3
National University of Singapore	Singapore	3
University of Edinburgh	UK	3

Major Japanese institutions before WPI

institutions before WPI	# of researchers
University of Tokyo	19
Kyoto University	17
Tohoku University	10
Hokkaido University	9
Riken	8
Osaka University	8
Nagoya University	7

Non-Academia (N/O/P)

of researchers:15 (Japan:6, APAC:4, EU&NA:4, Other:1)

Location of overseas institutions before WPI
5 countries

Overseas institutions before WPI
5 institutions

institutions in Japan before WPI
8 institutions

Major international institutions before WPI

institutions before WPI	Location	# of researchers
Institute for Energy Technology (IFE)	Norway	1
Deutsches Textilforschungszentrum Nord-West gGmbH	Germany	1
Labopharm	Canada	1
Global Foundries Pte Ltd	Singapore	1
Hong Kong Productivity Council	香港	1

Major Japanese institutions before WPI

institutions before WPI	# of researchers
Teijin Limited	1
SHOEI CHEMICAL INC	1
Pentax corporation	1
Clino Corporation	1
Sony Corporation	1
Landon IP	1
Become Japan	1
Nano-Optonics Energy Inc	1

WPI Host Inst (excl. WPI) (F/G/H)

of researchers:122
(Japan:89, APAC:23, EU&NA:8, Other:2)

WPI host institutions (excl. WPI)

institutions before WPI	# of researchers
Kyoto University	35
Kyushu University	21
National Institute for Materials Science	21
Tohoku University	17
University of Tokyo	15
Osaka University	13

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# of researchers

511

Post

- Non-WPI Inst(G/K/O)
- Non-Academia (H/L/P)
- WPI Host Inst (excl. WPI) (F/J/N)

- Researchers joined WPI from 174 international institutions in 32 countries and from 39 institutions located in Japan.
- More researchers from Max Plank and CAS joined WPI than those of any other institution.
- In the non-academia sectors, researchers joined WPI from 5 companies from 5 countries and 8 companies from Japan.

Pre

- Non-WPI Inst (J/K/L)
- Non-Academia (N/O/P)
- WPI Host Inst (Excl. WPI) (F/G/H)

# of researchers

511

Post

Non-WPI Inst (G/K/O)

of researchers:372
(Japan:135, APAC:154, EU&NA:66, Other:17)

Location of international institutions after WPI
37 countries

International institutions after WPI
177 institutions

Japanese institutions after WPI
59 institutions

Major locations

Location	# of researchers
US	47
China	42
India	14
UK	14
Germany	13
Australia	10
South Korea	9
Taiwan	8
France	8

Major international institutions after WPI

institutions after WPI	Location	# of researchers
Max Planck Society	Germany	4
Nanyang Technological University	Singapore	3
Sun Yat Sen University	China	3
Soochow University	Taiwan	3
Huazhong University of Science & Technology	China	3
China University of Petroleum	China	3
University of California Santa Cruz	US	3
Aalto University	フィンランド	3

Major Japanese institutions after WPI

institutions after WPI	# of researchers
University of Tokyo	17
Kyoto University	12
Riken	9
Osaka University	8
Nagoya University	7
University of Tsukuba	6
Kanazawa University	5
Tokyo Institute of Technology	5
Hokkaido University	5
National Astronomical Observatory of Japan	5

Non-Academia (H/L/P)

of researchers:31
(Japan:8, APAC:12, EU&NA:10,Other:1)

Location of International institutions after WPI
8 countries

International institutions after WPI
16 institutions

Japanese institutions after WPI
15 institutions

Major locations

Location	# of researchers
US	4
Germany	3
South Korea	3
Canada	2
Switzerland	1
India	1
Hong Kong	1
Singapore	1

Major international institutions after WPI

institutions after WPI	Location	# of researchers
USV PRIVATE LIMITED	India	1
Samsung	South Korea	1
RaiseMe	US	1
BIOASTRA TECHNOLOGIES INC.	Canada	1
Samsung SDI	South Korea	1
Covance	US	1
Nano and Advanced Materials Institute Ltd.	Hong Kong	1
EPCOS AG	Germany	1
Robert Bosch GmbH	Germany	1
Geomega Resources Inc (GMA.V)	Canada	1
Samsung Electronics	South Korea	1
Intellectual Property Office of Singapore (IPOS)	Singapore	1
Thermo Fisher Scientific	US	1
Micron Technology	US	1
BASF	Germany	1
MSD	Switzerland	1

Major Japanese institutions after WPI

institutions after WPI	# of researchers
Amplified ai inc	1
MEMS CORE Co., Ltd	1
Kyowa Chemical industry Co., Ltd	1
APB	1
Raymei Inc	1
British Consulate	1
KOTAI Biotechnologies, Inc.	1
CMIC Holdings Co Ltd	1
Maeda Patent Office	1
CORNES Technologies	1
Preferred Networks Inc	1
FactSet	1
Tokyo Electron Ltd	1
Harima Chemicals Group Inc	1
Hitachi Limited	1

WPI Host Inst (excl. WPI) (F/J/N)

of researchers:108
(Japan:80, APAC:20, EU&NA :7,Other:1)

WPI host institutions (excl. WPI)

institutions after WPI	# of researchers
National Institute for Materials Science	28
Kyoto University	26
Tohoku University	20
Kyushu University	18
Osaka University	9
University of Tokyo	7

- Researchers pursued the next career at 177 institutions located in 37 countries and 59 institutions located in Japan. More researchers pursed the next career at Max Plank than any other institution.
- In the non-academia sector, researchers pursued the next career at 16 companies in 8 countries and 15 companies in Japan.

- Researchers affiliated with non-WPI institutions before WPI (patterns J/K/L) had 1.9 publications on average, and this number was higher than the number of publications of those affiliated with non-academia (N/O/P) and WPI host institutions (excl. WPI centers) (F/G/H). Researchers affiliated with WPI host institutions (excl. WPI centers) after WPI (F/J/N) had 2.9 publications on average. This number was higher than the number of publications of those affiliated with non-WPI institutions (G/K/O).
- As a whole, in pre-WPI, the number of publications produced as the 1st author was higher than that as the corresponding author. In post-WPI, the number of publications produced as the corresponding author was higher than that as the 1st author.
- The number of publications of the researchers of all career patterns other than non-academia increased from pre-WPI to post-WPI. The proportion of Top1% and Top10% most-cited papers of the patterns nearly doubled from the global average. International collaborations and the proportion of publications on high-impact factor journals (JIF Q1) increased from pre-WPI to post-WPI.

Pre

Non-WPI Inst(J/K/L)

of researchers:374 (Japan:128, APAC:159, EU&NA:71, Other:16)

# of publications per researcher per year on average

#of pub	first-auth	corresponding-auth	internatonal collaboration	Top1% pub	Top10% pub	JIF Q1 pub
1.9	0.84	0.42	0.67	0.07	0.42	0.94
	44.5%	22.5%	35.8%	3.6%	22.4%	49.8%

# of publications of patterns J/K/L

#of pub	Times Cited	CNCI	% Top1%	Top1% pub	% Top10%	Top10% pub	% international collabo	# of international collabo
2,697	148,372	1.94	3.9%	105	22.0%	592	35.3%	951

Non-Academia (N/O/P)

of researchers:15 (Japan:6, APAC:4, EU&NA:4, Other:1)

# of publications per researcher per year on average

#of pub	first-auth	corresponding-auth	internatonal collaboration	Top1% pub	Top10% pub	JIF Q1 pub
0.6	0.30	0.13	0.13	0.00	0.00	0.19
	49.1%	20.8%	21.0%	0.0%	0.0%	31.6%

# of publications of patterns N/O/P

#of pub	Times Cited	CNCI	% Top1%	Top1% pub	% Top10%	Top10% pub	% international collabo	# of international collabo
47	524	0.44	0.0%	0	0.0%	0	23.4%	11

WPI Host inst (excl. WPI) (F/G/H)

of researchers:122
(Japan:89, APAC:23, EU&NA:8, Other:2)

# of publications per researcher per year on average

#of pub	first-auth	corresponding-auth	internatonal collaboration	Top1% pub	Top10% pub	JIF Q1 pub
1.5	0.51	0.30	0.34	0.06	0.37	0.73
	33.6%	19.6%	22.5%	4.1%	24.4%	48.2%

# of publications of patterns F/G/H

#of pub	Times Cited	CNCI	% Top1%	Top1% pub	% Top10%	Top10% pub	% international collabo	# of international collabo
777	46,716	1.80	4.4%	34	22.3%	173	26.6%	207

# of researchers

511

Post

Non-WPI Inst(G/K/O)

of researchers:372 (Japan:135, APAC:154, EU&NA:66, Other:17)

# of publications per researcher per year on average

#of pub	first-auth	corresponding-auth	internatonal collaboration	Top1% pub	Top10% pub	JIF Q1 pub
2.5	0.49	0.86	1.23	0.10	0.56	1.73
	19.3%	34.1%	48.6%	4.0%	22.0%	68.4%

# of publications of patterns G/K/O

#of pub	Times Cited	CNCI	% Top1%	Top1% pub	% Top10%	Top10% pub	% international collabo	# of international collabo
4,649	109,437	1.79	3.6%	166	21.6%	1,002	44.1%	2,052

Non-Academia (H/L/P)

of researchers:31 (Japan:8, APAC:12, EU&NA:10,Other:1)

# of publications per researcher per year on average

#of pub	first-auth	corresponding-auth	internatonal collaboration	Top1% pub	Top10% pub	JIF Q1 pub
0.3	0.00	0.10	0.20	0.01	0.01	0.11
	0.0%	35.8%	69.8%	2.8%	2.8%	37.7%

# of publications of patterns H/L/P

#of pub	Times Cited	CNCI	% Top1%	Top1% pub	% Top10%	Top10% pub	% international collabo	# of international collabo
36	262	0.85	2.8%	1	2.8%	1	61.1%	22

WPI Host inst (excl. WPI)(F/J/N)

of researchers:108 (Japan:80, APAC:20, EU&NA :7,Other:1)

# of publications per researcher per year on average

#of pub	first-auth	corresponding-auth	internatonal collaboration	Top1% pub	Top10% pub	JIF Q1 pub
2.9	0.44	0.74	1.14	0.07	0.56	1.75
	15.3%	25.5%	39.2%	2.3%	19.4%	60.2%

# of publications of patterns F/J/N

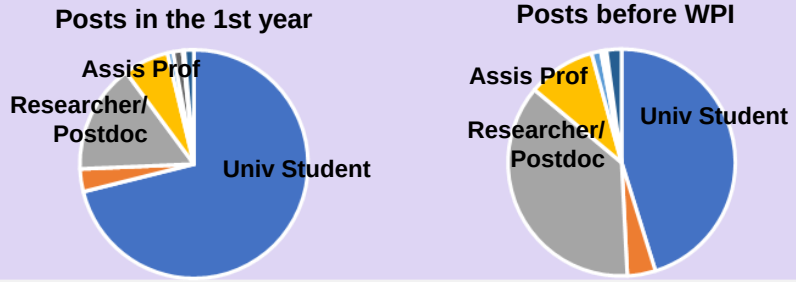
#of pub	Times Cited	CNCI	% Top1%	Top1% pub	% Top10%	Top10% pub	% international collabo	# of international collabo
1,397	37,047	1.69	2.5%	35	19.0%	265	38.7%	540

- The largest portion of posts in the 1st year and of posts before WPI were university students. The ratio of university students was high among the researchers who joined WPI from non-WPI institutions. In post-WPI experiences, the ratio of assistant professors increased in the posts after WPI, and the ratio of associate professors increased in the posts in the final year.

Pre

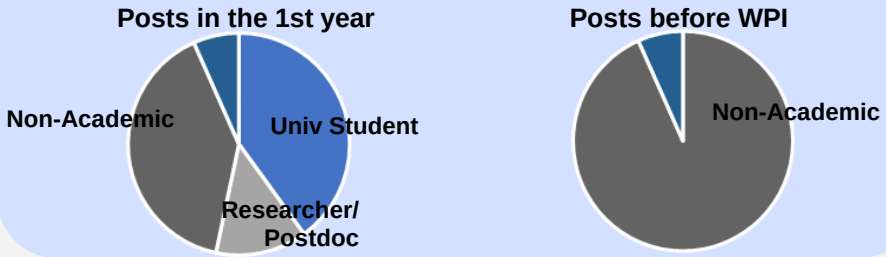
Non-WPI Inst(J/K/L)

of researchers:374
(Japan:128, APAC:159, EU&NA:71, Other:16)



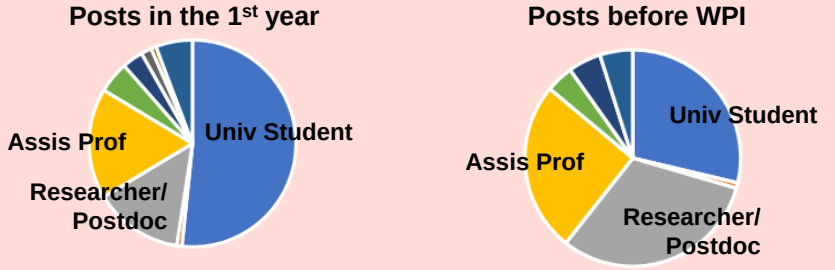
Non-Academia (N/O/P)

of researchers:15
(Japan:6, APAC:4, EU&NA:4, Other1)



WPI Host inst (excl. WPI) (F/G/H)

of researchers:122 (Japan:89, APAC:23, EU&NA:8, Other:2)



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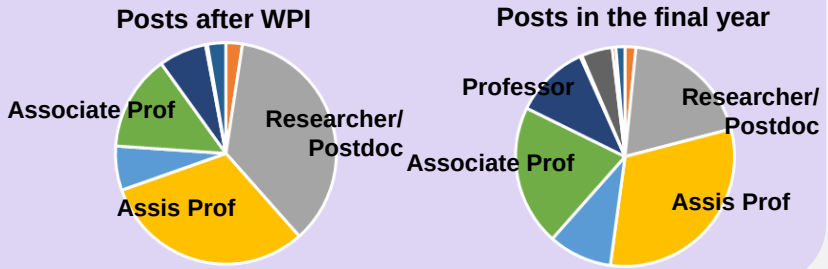
# of researchers
511

Post

Non-WPI Inst(G/K/O)

of researchers:372
(Japan:135, APAC:154, EU&NA:66, Other:17)

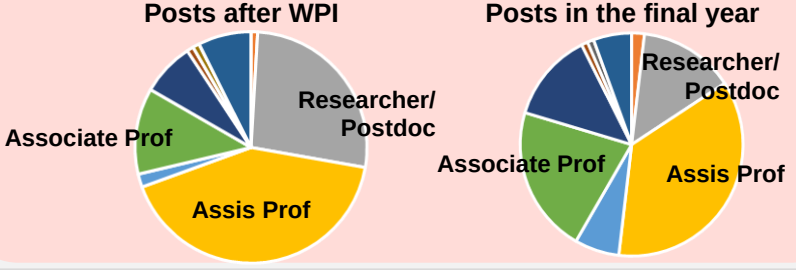


Non-Academia (H/L/P)

of researchers:31
(Japan:8, APAC:12, EU&NA:10,Other:1)

WPI Host inst (excl. WPI) (F/J/N)

of researchers:108 (Japan:80, APAC:20, EU&NA :7,Other:1)



- University Student
- Research/Teaching assistant
- Researcher/Postdoc
- Assistant professor
- Lecturer
- Associate professor
- Professor
- Director/Executive
- Non-Academia (Public, Corp)
- Health Care Worker
- unknown

Career Grouping to Analyze the WPI Impact to Researcher's Career Development

- Sixteen (16) of career patterns were re-classified into four (4) career groups, and the number of researchers per career group were as follows.
- Researchers in Group IV that joined WPI from non-WPI institutions and pursued the next career at non-WPI institutions were 511. This group was the largest. The second largest group was Group II, where 138 researchers joined WPI from non-WPI institutions and were affiliated with WPI until the final year.

of Researchers in Sixteen (16) Career Patterns

career pattern	Pre	WPI	Post	Total	Japan	APAC	EU&NA	Other
A	None (WPI in the 1st year)	WPI	None (WPI until the final year)	32	25	3	3	1
B	None (WPI in the 1st year)	WPI	WPI host inst (excl. WPI)	15	14	1	0	0
C	None (WPI in the 1st year)	WPI	Non-WPI Inst	36	23	7	4	2
D	None (WPI in the 1st year)	WPI	Non-Academia	2	2	0	0	0
E	WPI host inst (excl. WPI)	WPI	None (WPI until the final year)	53	43	6	3	1
F	WPI host inst (excl. WPI)	WPI	WPI host inst (excl. WPI)	55	44	7	3	1
G	WPI host inst (excl. WPI)	WPI	Non-WPI Inst	63	41	16	5	1
H	WPI host inst (excl. WPI)	WPI	Non-Academia	4	4	0	0	0
I	Non-WPI Inst	WPI	None (WPI until the final year)	82	34	23	18	7
J	Non-WPI Inst	WPI	WPI host inst (excl. WPI)	52	35	13	4	0
K	Non-WPI Inst	WPI	Non-WPI inst	301	90	137	59	15
L	Non-WPI Inst	WPI	Non-Academia	21	3	9	8	1
M	Non-Academia	WPI	None (WPI until the final year)	3	2	0	1	0
N	Non-Academia	WPI	WPI host Inst (excl. WPI)	1	1	0	0	0
O	Non-Academia	WPI	Non-WPI Inst	8	4	1	2	1
P	Non-Academia	WPI	Non-Academia	6	1	3	2	0
			Total	734	366	226	112	30
			%	100%	50%	31%	15%	4%

of Researchers in Four (4) Career Groups

group	career pattern	main features		Total	Japan	APAC	EU&NA	Others
Ⅰ	A	They were affiliated with WPI for more than ten years	# of researchers	32	25	3	3	1
			%	100%	78%	9%	9%	3%
Ⅱ	E/I/M	They held pre-WPI job posts.	# of researchers	138	79	29	22	8
			%	100%	57%	21%	16%	6%
Ⅲ	B/C/D	They held post-WPI job posts.	# of researchers	53	39	8	4	2
			%	100%	74%	15%	8%	4%
Ⅳ	F/G/H/ J / K / L / N / O / P	They held both pre-WPI and post-WPI job posts.	# of researchers	511	223	186	83	19
			%	100%	44%	36%	16%	4%
		Total	# of researchers	734	366	226	112	30
			%	100%	50%	31%	15%	4%

Discussion｜Analysis of Effect of WPI on Promoting International Mobility of Talented Researchers

- **1: Hosting talented researchers**
  - The following findings were summarized in the researchers with pre-WPI experiences.

Career Patterns	Main Features
career pattern (I) (joined non-WPI institutions before WPI)	• Among the 82 researchers that joined WPI from non-WPI institutions, the 17 researchers joined WPI from top 50 universities of Times Higher Education World University Ranking (THE top 50 universities) and Max Plank, and the 22 researchers joined WPI from RU11. • Among the 40 overseas institutions that researches joined before WPI, the 10 institutions were THE top 50 universities and Max Plank. • Among the 16 institutions located in Japan that researchers joined before WPI, the 6 institutions were RU11.
career patterns(J/K/L) (joined non-WPI institutions before WPI and pursued next carrier at non-WPI institutions or WPI host institutions (excl. WPI))	• Among the 374 researchers that joined WPI from other institutions, the 69 researchers joined WPI from THE top 50 universities, Max Plank and CNRS, and the 102 researchers joined WPI from RU11, RIKEN, AIST and NIMS. • Among the 174 overseas institutions that researchers joined before WPI, the 34 institutions were THE top 50 universities, Max Plank and CNRS. • Among the 39 institutions located in Japan that researchers joined before WPI, the 14 institutions were RU11, RIKEN, AIST and NIMS.

  - Among the researchers of career patterns (I/J/K/L) that joined WPI from non-WPI institutions, 20% of them joined WPI from THE top 50 universities, Max Plank and CNRS, and 27% of them joined WPI from RU11, RIKEN, AIST and NIMS.
  - Also, which institutions the researchers in career pattern (I) joined before WPI, the proportion of Top 1% most-cited publications was 4% and the proportion of Top 10% most-cited publications was 25.7%.
  - Which institutions the researchers in career pattern (J/K/L) joined before WPI, the proportion of Top 1% most-cited publications was 3.9% and the proportion of Top 10% most-cited publications was 22%. The researchers had publications with high citation index before joining WPI.
  - As a result, the researchers joined WPI from world-renowned research institutions, and which institutions researchers joined before WPI, they had publications with high citation index before joining WPI. Thus, WPI attracted talented researchers from all over the world.

Discussion｜Analysis of Effect of WPI on Promoting International Mobility of Talented Researchers

- **2: Developing talented researchers**
  - The following findings were summarized in the researchers with post-WPI experience.

Career Patterns	Main Features
career pattern(C) (joined non-WPI institutions after WPI)	• Among the 36 researchers that pursued the next career at non-WPI institutions after WPI, the 3 researchers joined THE top 50 universities and the 15 researchers joined RU11 and RIKEN. • Among the 13 overseas institutions that the researchers joined after WPI, the 3 institutions were ranked as THE top 50 universities . • Among the 16 institutions in Japan that the researchers joined after WPI, the 9 institutions were RU11, RIKEN or AIST.
career pattern(G/K/O) (joined WPI from non-WPI institutions, WPI host institutions (excl. WPI) or non-academia sector and pursued the next career at non-WPI institutions after WPI)	• Among the 372 researchers that pursued the next career at non-WPI institutions after WPI, the 44 researchers joined THE top 50 universities, Max Plank and CNRS, and the 86 researchers joined RU11, RIKEN, AIST and NIMS. • Among the 177 overseas institutions that researchers joined after WPI, the 29 institutions were THE top 50 universities, Max Plank and CNRS. • Among the 59 institutions in Japan that researchers joined after WPI, the 14 institutions were RU11, RIKEN, AIST and NIMS.

  - The sum of the researchers of career patterns (C/G/K/O) was 408. 12% of them joined THE top 50 universities, Max Plank and CNRS, and 25% of them joined RU11, RIKEN, AIST and NIMS.
  - Also, which institutions the researchers in career pattern (C) joined after WPI, the proportion of Top1% most-cited publications was 1.9% and the proportion of Top10% most-cited publications was 11.7%.
  - Which institutions the researchers in career patterns (G/K/O) joined WPI, the proportion of Top1% most-cited publications was 3.6 % and the proportion of Top10% most-cited publications was 21.6%. The researchers had publications with high citation index in post-WPI experiences in general.
  - The researchers with pre-WPI experiences pursued the next career at renowned institutions after leaving WPI.
  - Which institutions the researchers joined after WPI, those researchers had publications with high citation index in post-WPI experience. Thus, WPI developed talented researchers.

Discussion｜Analysis of Effect of WPI on Promoting International Mobility of Talented Researchers

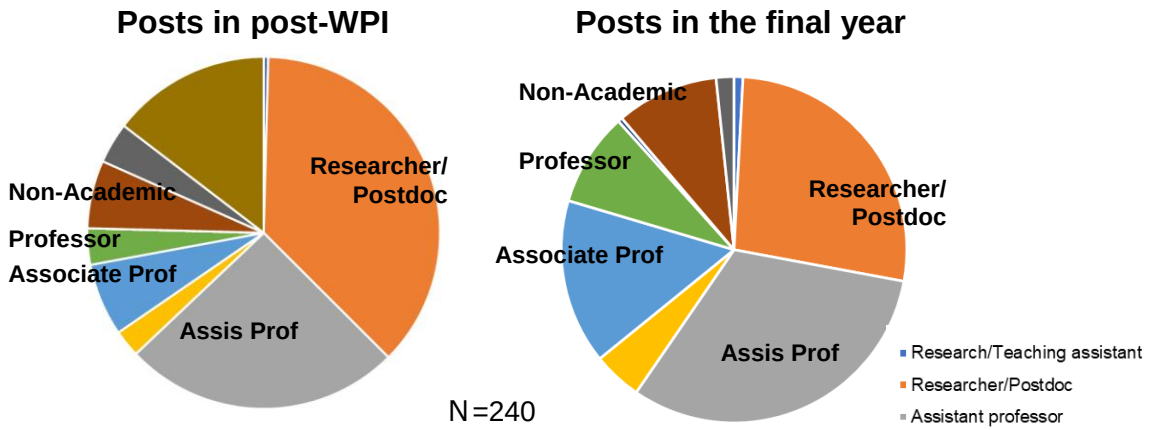
- **3: Hosting young researchers and creating positive impact on their research careers**
  - Among the 649 researchers with pre-WPI experiences, university students at pre-WPI were 240 (37%), and postdocs were 215 (33%). The sum of the university students and postdocs at pre-WPI were 455 (70%).
  - The 240 university students started their career at WPI.
  - Among the 240 university students who started their career at WPI, the number of researchers promoted to postdocs in post-WPI was larger than that of researchers promoted to assistant researchers. In the final year, the number of researchers promoted to assistant researchers was larger than that of researchers promoted to postdocs.
  - In comparison with the number of publications per researcher per year on average, the number of publications increased as the job post advanced.

# of publications per researcher per year in pre-WPI and post-WPI of the 240 researchers started their career at WPI

career pattern	Pre	WPI	Post	# of researcher	Pre	Post
E	WPI host Inst (non-WPI)	WPI	None (WPI unitil the final year)	9	1.6	* –
F	WPI host Inst (non-WPI)	WPI	WPI host Inst (non-WPI)	8	0.9	3.6
G	WPI host Inst (non-WPI)	WPI	Non-WPI Inst	26	0.9	2.3
H	WPI host Inst (non-WPI)	WPI	Non-Academia	1	0.3	1.5
I	Non-WPI Inst	WPI	None (WPI unitil the final year)	27	1.8	* –
J	Non-WPI Inst	WPI	WPI host Inst (non-WPI)	20	1.1	3.3
K	Non-WPI Inst	WPI	Non-WPI Inst	135	1.8	2.7
L	Non-WPI Inst	WPI	Non-Academia	14	0.9	0.2

* Researchers in Patterns E and I had no publications in post-WPI because they were affiliated with WPI until the final year

Posts in post-WPI and posts in the final year of the 240 researchers started their career at WPI



Discussion｜Analysis of Effect of WPI on Promoting International Mobility of Talented Researchers

- **4: Establishing an international research environment**
  - The 368 researchers of 49 nationalities joined WPI. This number was approximately a half of the total 734 researchers.
  - The researchers in career pattern (I) joined WPI from 40 overseas institutions located in 19 countries, and the researchers in career pattern (J/K/L) joined WPI from 172 overseas institutions located in 32 countries, and thus, WPI attracted researchers from various institutions from all over the world. Then, WPI established an international research environment.
  - Further, among the 32 researchers in pattern (A) who were affiliated with WPI from the 1st year for more than ten years, the 7 non-Japanese researchers were affiliated with WPI for 12 years on average.
  - Among the 138 researchers in patterns (E/I/M), the 59 non-Japanese researchers were affiliated with WPI for 7.7 years on average. WPI enabled the non-Japanese researchers to stay in Japan for a long term. In this way, WPI attracted many non-Japanese researchers and they established international research environment in WPI.
- **5:Effecting positive changes in the academia in Japan**
  - Among the researchers that pursued the next career at non-WPI institutions located in Japan after leaving WPI, the researchers in career pattern (C) became affiliated with 16 institutions located in Japan after WPI, and the researchers in career patterns (G/K/O) became affiliated with 59 institutions located in Japan. Thus, the researchers with WPI experiences became affiliated with various institutions in Japan, and thus, WPI enhanced the mobility of researchers within the academia in Japan.
  - 27% of the researchers of career patterns (I/J/K/L) joined WPI from RU11, RIKEN, NIMS and AIST. 25% of the researchers in career patterns (C/G/K/O) joined RU11, RIKEN, NIMS and AIST after WPI.
  - Mobility of the researchers between WPI and renowned institutions in Japan was enhanced.

Discussion｜Analysis of Effect of WPI on Promoting International Mobility of Talented Researchers

- **6: Effecting positive changes in the academia overseas**
  - Among the researchers that pursued their next career abroad, the researchers in career pattern (C) joined13 institutions located in 9 countries after WPI, and the researchers in career pattern (G/K/O) joined 177 overseas institutions located in 37 countries after WPI. Thus, the researchers with WPI experiences pursued their next career at various institutions all over the world. Mobility of researchers between WPI and research institutions all over the world was enhanced.

- **7:Improving mobility of talents with industries**
  - The researchers with industry experiences in pre-WPI and/or post-WPI were 45, which amounts to 6% of the total 734 researchers. Mobility of talents with industries was enhanced.
  - More specifically, the 12 researchers joined WPI from industries, and the 27 researchers pursued the next career in industries. The 6 researchers had both pre-WPI and post-WPI experiences in industries.

Discussion｜Analysis of Effect of WPI on Promoting International Mobility of Talented Researchers

- **8: Improving research activities after WPI experiences**
  - Among the researchers in Group IV of career patterns (F/G/H/J/K/L/N/O/P) with both pre-WPI and post-WPI experiences, in all career patterns except from the researchers with industry experiences, the number of publications per person per year in post-WPI was higher than that in pre-WPI. More specifically, 1.9 papers in patterns (J/K/L) and 1.5 papers in patterns (F/G/H) were published per person per year in pre-WPI, and 2.5 papers in patterns (G/K/O) and 2.9 papers in patterns (F/J/N) were published per person per year in post-WPI.
  - In pre-WPI, the number of the first-author publications per person per year was higher than that of the corresponding-author publications, and in post-WPI, the number of the corresponding-author publications was higher than that of the first-author publications. More specifically, in pre-WPI, in patterns (J/K/L), 0.84 first-author papers and 0.42 corresponding-author papers were published per person per year , and in patterns (F/G/H), 0.51 first-author papers and 0.30 corresponding-author papers were published per person per year . In post-WPI, in patterns (G/K/O), 0.49 first-author papers and 0.86 corresponding-author papers were published per person per year , and in patterns (F/J/N), 0.44 first-author papers and 0.74 corresponding-author papers were published per person per year . Therefore, as the job post advanced, the ownership in the research activities advanced.
  - The number of international collaborative publications and the number of publications published on high Impact Factor Journals (JIF Q1 Journals) in post-WPI were larger than those in pre-WPI. As the job post advanced, the number of international collaborative publications and the number of publications on top journals increased.
  - However, the proportion of Top1% and Top10% most-cited papers increased in some career patterns or decreased in some career patterns. Citation index was kept very high in both pre-WPI and post-WPI. The researchers that joined WPI had publications with high citation index before joining WPI, and such researchers consistently produced publications with high citation index after leaving WPI.
  - Consequently, WPI centers attracted talented researchers having publications with high citation index in pre-WPI, and such researchers pursued their next career at various institutions all over the world after leaving WPI and consistently produced publications with high citation index. International mobility of talented researchers through WPI experiences was achieved, and WPI experiences enhanced research activities in the institutions all over the world.