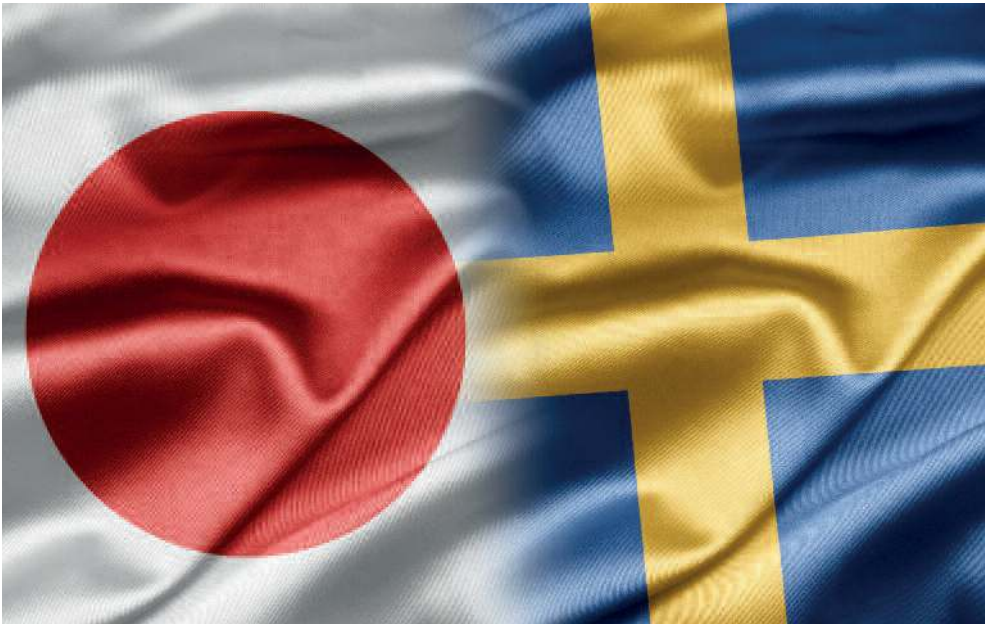

Academic collaboration: Sweden–Japan

STINT
The Swedish Foundation for International Cooperation in Research and Higher Education

CR 2018:01

Introduction

This report aims to provide an overview of academic collaboration between Japan and Sweden. The focus is on research collaboration, but student mobility is also touched upon. The issues studied include:

- How does the volume of co-publications involving Japan and Sweden develop?
- What topics and disciplines dominate in the research collaboration?
- How intensive is the collaboration in comparison to collabora tions with other countries in the region?
- Which are the higher education institutions (HEIs) with the largest numbers of co-publications with Japan and Sweden, respectively?
- Which Swedish HEIs receive most students from Japan?

The publication data are from Elsevier's Scopus database and the analysis was done using SciVal and Excel. Data were extracted in July 2018. The author of this report is Hans Pohl, Programme Director at STINT.

Longer-term development

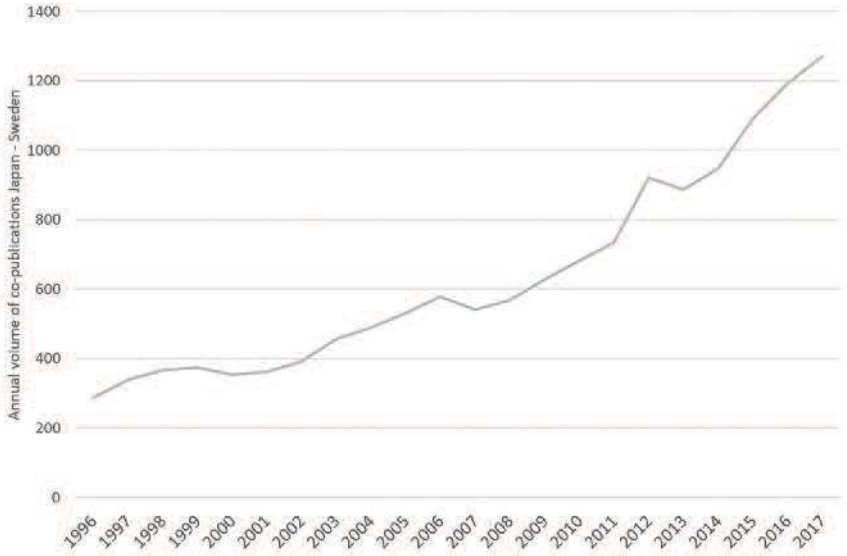

Figure 1: **Annual volume of Japan–Sweden co-publications**

In Figure 1, the annual volume of co-publications is shown over a period of 20 years. The volume has increased from fewer than 300 co-publications in 1996 up to almost 1,300 co-publications in 2017. Even though research collaboration often is the result of longer-term efforts, the focus of the remainder of the report is on the last five years, as current collaboration is the most important to study.

Relative growth

When comparing the growth in co-publications with the growth of all publications including Sweden or Japan, it is clear that co-publication volumes increase more rapidly (Figure 2).

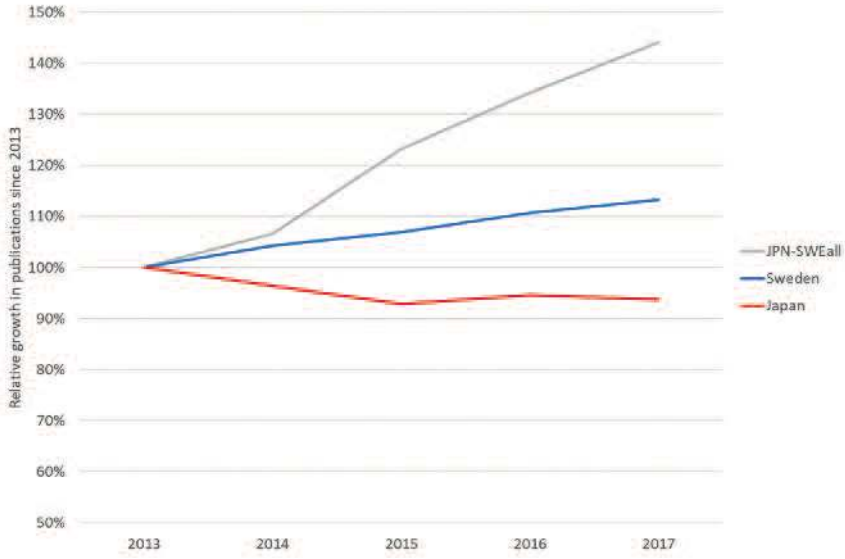

Figure 2: **Relative growth compared to the volume 2013**

Hyper-authored co-publications

Some researchers in Sweden and Japan participate in large networks. These networks often produce high numbers of publications and each publication can have thousands of co-authors from all over the academic world. Because such publications represent bilateral collaboration between Japan and Sweden only to a limited extent, it is often relevant to study them separately. In Figure 3, the annual number of all co-publications as well as the number of co-publications with fewer than 100 co-authors are indicated with solid lines. The dotted line shows the share of co-publications with 100 or more co-authors, which represents approximately 20% of all Japan – Sweden co-publications.

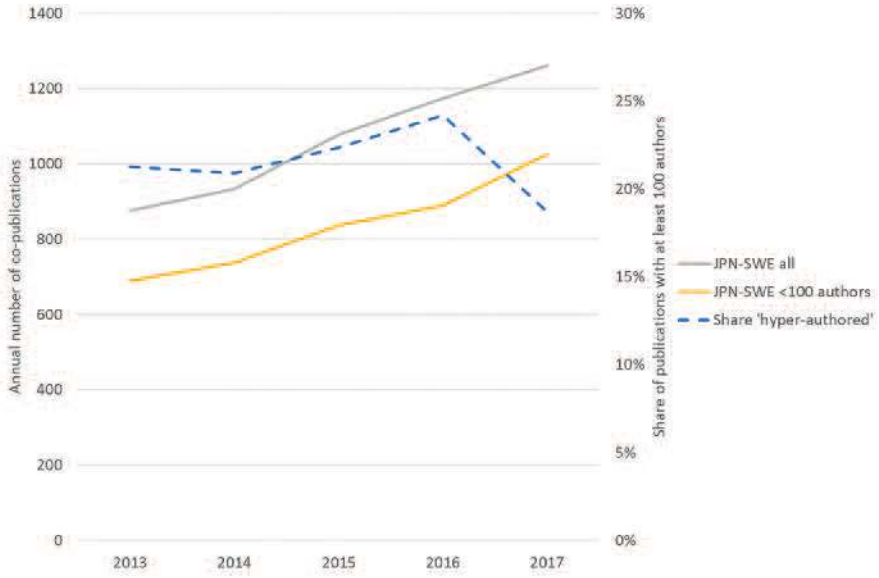

Figure 3: **Publications with different numbers of co-authors**

Citation impact

One indicator related to the quality of publications is the field-weighted citation impact (FWCI). It compares the number of citations a publication receives with the number of citations for other publications in the same scientific area, published in the same year and in the same type of publication. If the FWCI equals one, the citation impact is at the world average; if it is higher, it is better than the world average.

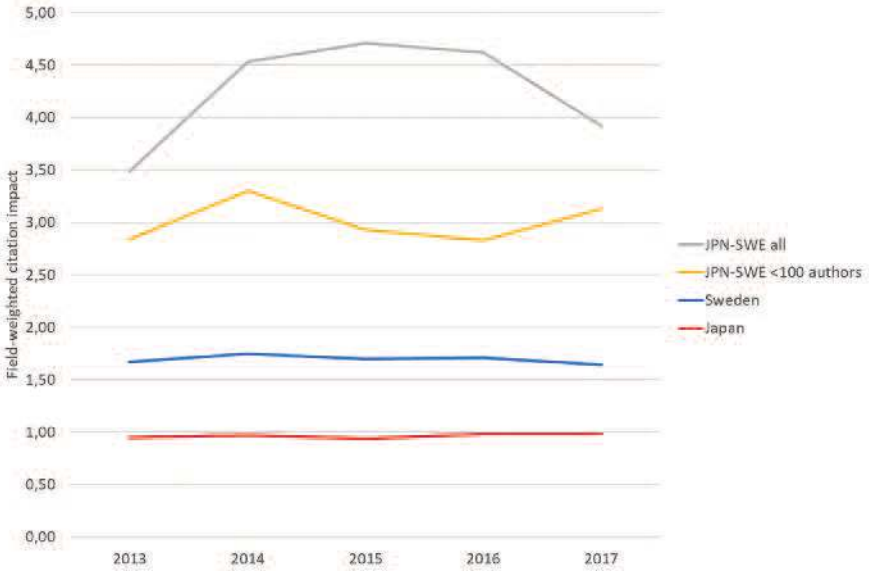

Figure 4: **Field-weighted citation impact for co-publications, as well as Sweden and Japan**

In Figure 4, the FWCI is indicated for four partly overlapping groups of publications. The impact of hyper-authored publications on the FWCI is clearly visible but it is also very clear that co-publications receive much higher FWCI than all publications involving either Sweden or Japan.

Key phrases

Using Elsevier's Fingerprint Engine to analyse the metadata and abstracts of the publications, the key phrases in the publication set comprising all co-publications are depicted in Figure 5. The size and position of the key phrases indicate relevance, while colour indicates if it is growing or declining. Some of the most prominent key phrases appear to be related to the hyper-authored publications, which often deal with particle physics in laboratories such as CERN.

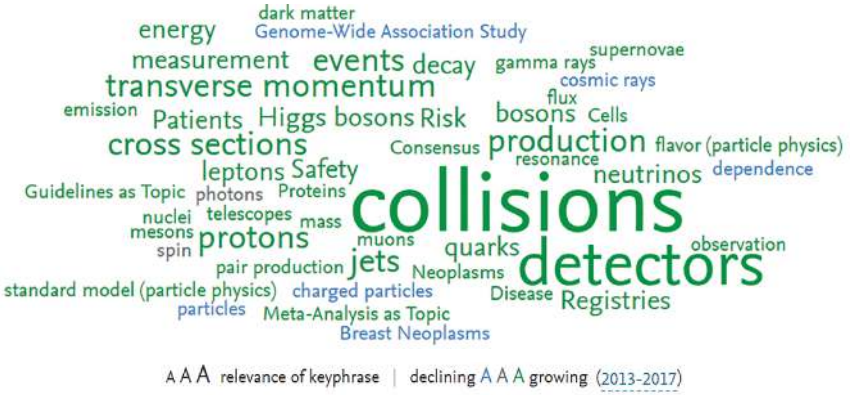

Figure 5: **Key phrases for all Japan–Sweden co-publications**

In the key phrase map for publications with fewer than 100 co-authors, several aspects related to medicine appear to be prominent (Figure 6).

Figure 6: **Key phrases for Japan–Sweden co-publications with fewer than 100 co-authors**

Scientific profiles

Another way of studying research collaboration is to differentiate between scientific disciplines. Here the top six categories in the classification by OECD are used: Agricultural Sciences (Agri), Engineering & Technology (Eng), Humanities (Hum), Medical Sciences (Med), Natural Sciences (Nat), and Social Sciences (Soc).

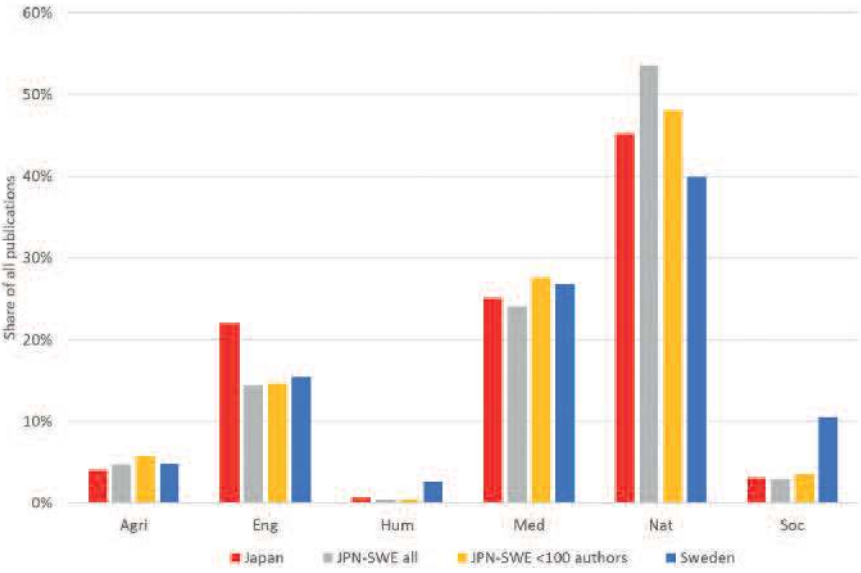

Figure 7: **Scientific profiles of different publication sets**

In Figure 7, the four colours represent different publication sets. For each publication set, the share of publications in each category is calculated. For example, of all publications including Japan, approximately 45% are within the natural sciences. Publications during the period 2013–2017 were included.

The shares for the co-publications could be expected to be somewhere between the national shares of each category. However, natural sciences feature more prominently in the co-publications than in the national publication sets, while the opposite is true for the humanities.

Collaboration intensity

STINT has developed the Normalized Collaboration Intensity Index (NCII) to illustrate how much countries collaborate in research. Based on co-publication data, the NCII shows if two countries are collaborating more or less than 'expected'. Expected collaboration is calculated on the assumption that a country collaborates exactly in proportion to each partner country's share of the global volume of international co-publications. More collaboration than expected equals percentages above 100%, or closer to red in the colour scale used in the maps in Figure 8 - Figure 11. Globally, the 94 countries with more than 1,000 Scopus publications in 2017 were selected.

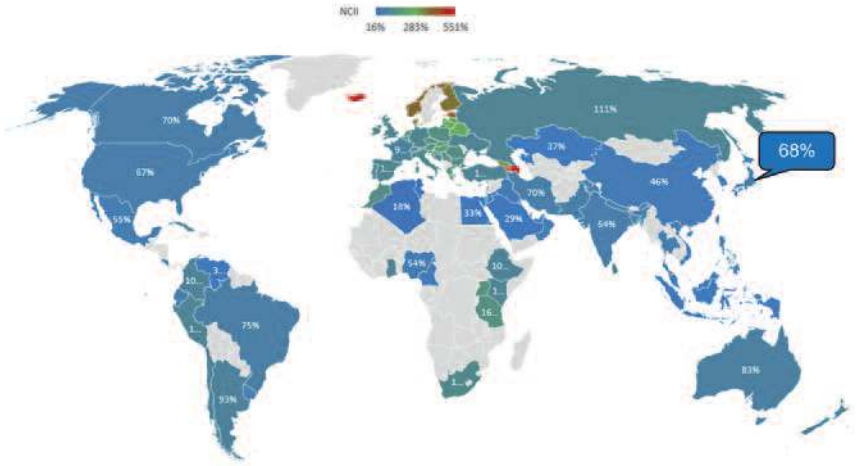

Figure 8: **Normalised Collaboration Intensity Index for Sweden**

In Figure 8, the NCII for Sweden is illustrated, using publications for 2013 - 2017. Neighbouring Nordic countries show the highest collaboration intensity and the figure 68% indicates that co-publications with Japan represent 68% of Japan's international co-publications' share of the global volume of international co-publications.

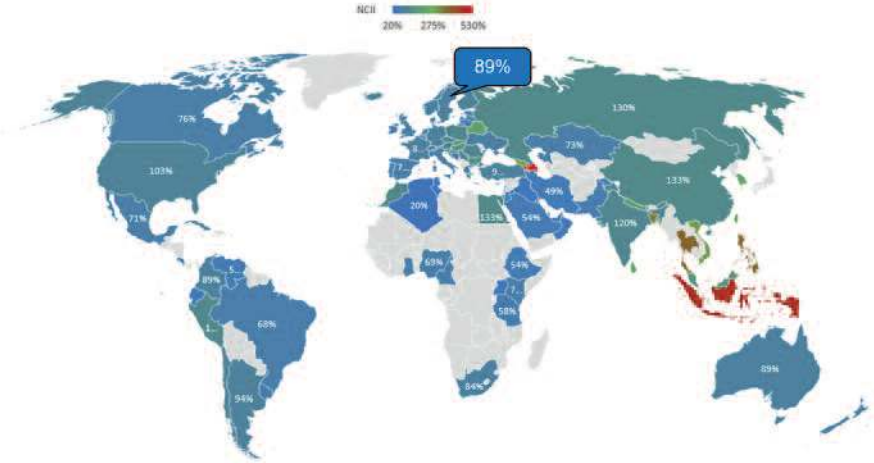

Figure 9: **Normalised Collaboration Intensity Index for Japan**

In Figure 9, the same collaboration intensity index is shown for Japan. Several countries in South-East Asia show high collaboration intensity with Japan. At 89%, Sweden is slightly below average.

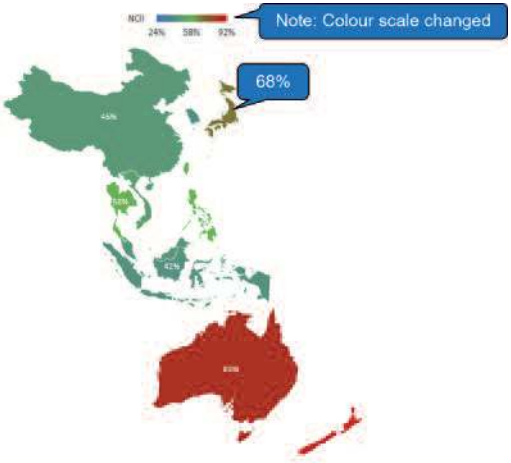

Figure 10: **Normalised Collaboration Intensity Index for Sweden – focused on East Asia and the Pacific**

When looking closer at Sweden's collaborations in East Asia and the Pacific, Japan shows a relatively high NCII for countries in the region, even though Australia and New Zealand have higher figures (Figure 10).

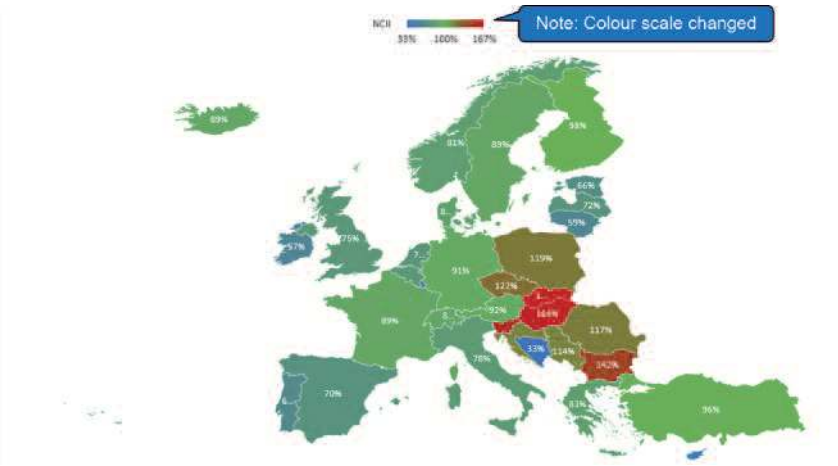

Figure 11: **Normalised Collaboration Intensity Index for Japan – focused on Europe**

Japan's collaboration with countries in Europe tends to be a bit more intensive with the eastern parts (Figure 11). This is probably partly due to hyper-authored publications, which constitute a large share of all international co-publications in some of these countries. Collaboration with Sweden shows approximately the same intensity as with Germany and France and is a bit higher than Japan's collaboration intensity with the UK.

Institutional participation

Almost all HEIs in Sweden have some co-publications with Japanese HEIs. Based on the numbers of co-publications with fewer than 100 co-authors, the top ten were selected for closer study. All co-publications as well as the co-publications with fewer than 100 co-authors by these ten Swedish HEIs are indicated in Figure 12.

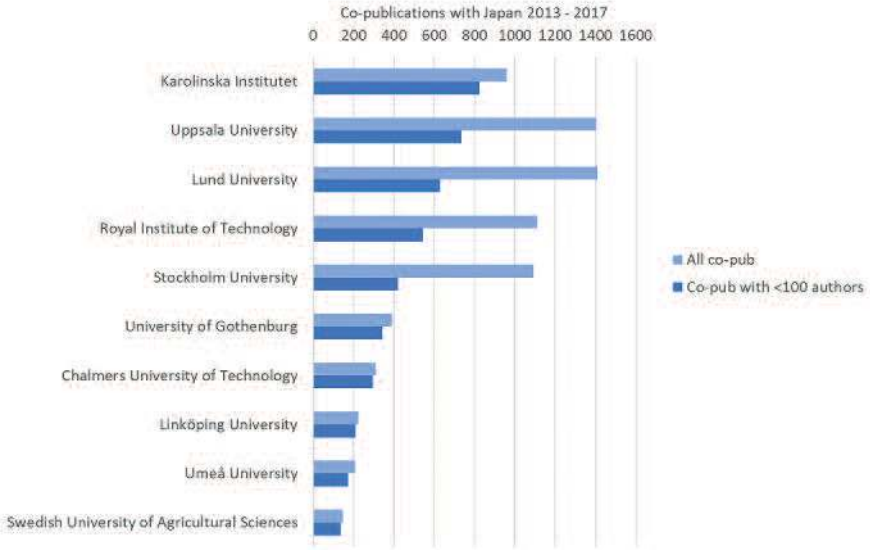

Figure 12: **Co-publications with Japan – top ten HEIs in Sweden**

Karolinska Institutet has the highest number of co-publications with fewer than 100 co-authors. Karolinska Institutet focuses on medical sciences and it also has the highest number of publications of all HEIs in Sweden. Two large comprehensive universities follow. It could also be noted that four Swedish HEIs participate in networks with large numbers of researchers.

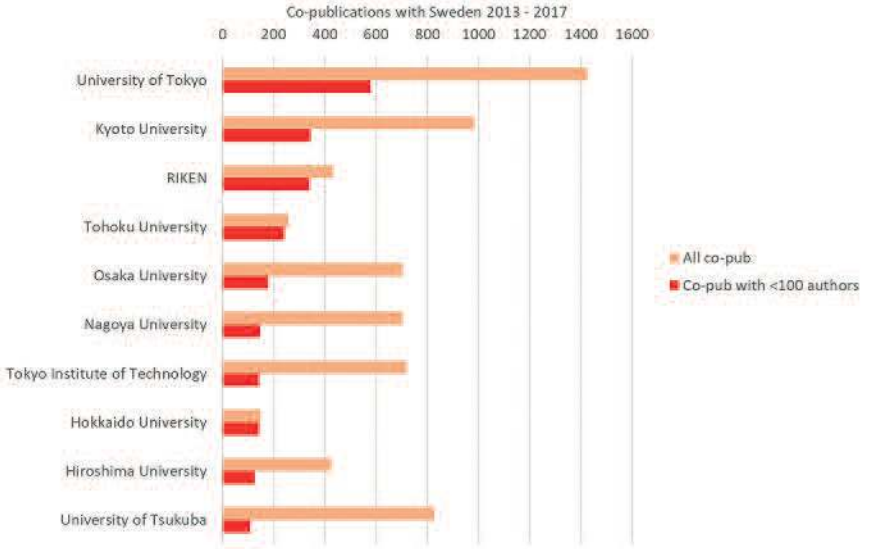

Figure 13: **Co-publications with Sweden – top ten HEIs in Japan**

The equivalent list of the top ten HEIs in Japan has the University of Tokyo at the top, which is also the largest producer of publications in Japan (Figure 13). The following HEIs clearly have lower numbers of co-publications with Sweden than the University of Tokyo and the larger HEIs in Sweden. One reason for this is probably that Japan has many more HEIs than Sweden. Seven of the Japanese HEIs participate in large research networks.

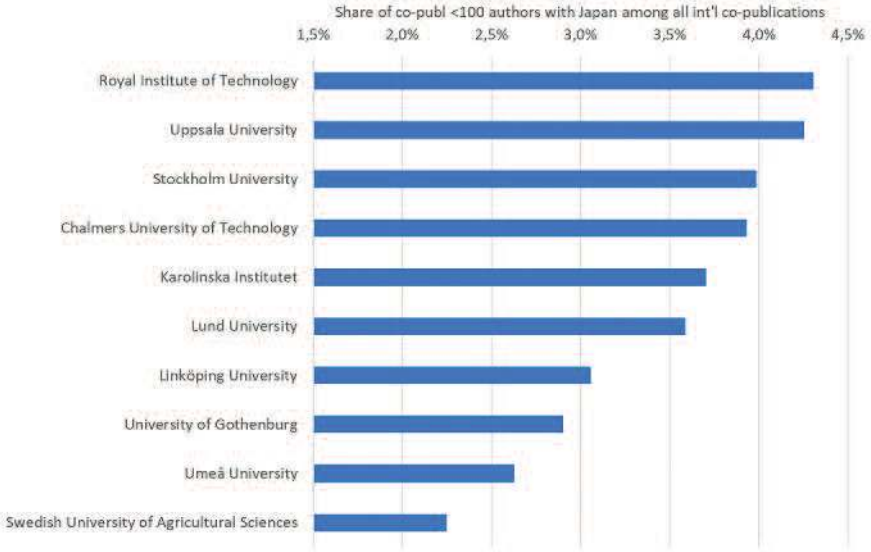

Figure 14: **Share of co-publications with Japan of all international co-publications**

In relative terms, KTH Royal Institute of Technology has the largest number of co-publications with Japan with fewer than 100 co-authors in relation to all international co-publications (Figure 14). Six HEIs have more than 3.5% of Japanese participation in their international co-publications.

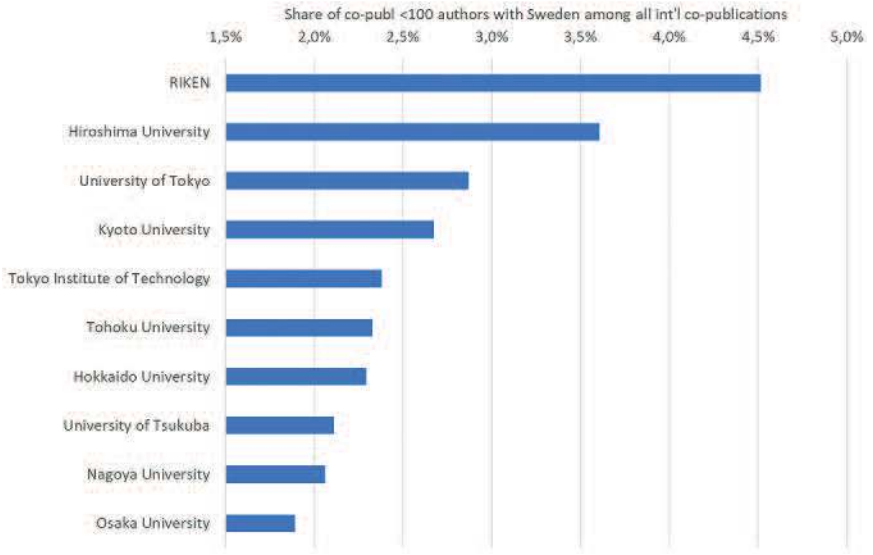

Figure 15: **Share of co-publications with Sweden of all international co-publications**

In Japan, RIKEN has the highest share of co-publications with Sweden with fewer than 100 co-authors (Figure 15). Hiroshima University also has more than 3.5% of all international co-publications with Sweden.

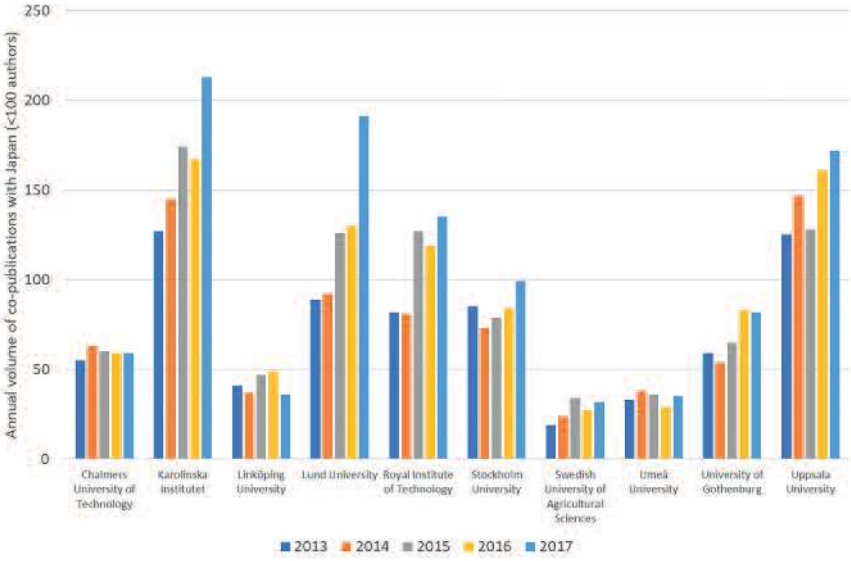

Figure 16: **Annual co-publications with Japan for Swedish HEIs**

Swedish HEIs show growing numbers of co-publications with Japan (Figure 16). Of these, Karolinska Institutet, Lund University and KTH Royal Institute of Technology show large growth when comparing the volumes of 2013 and 2017.

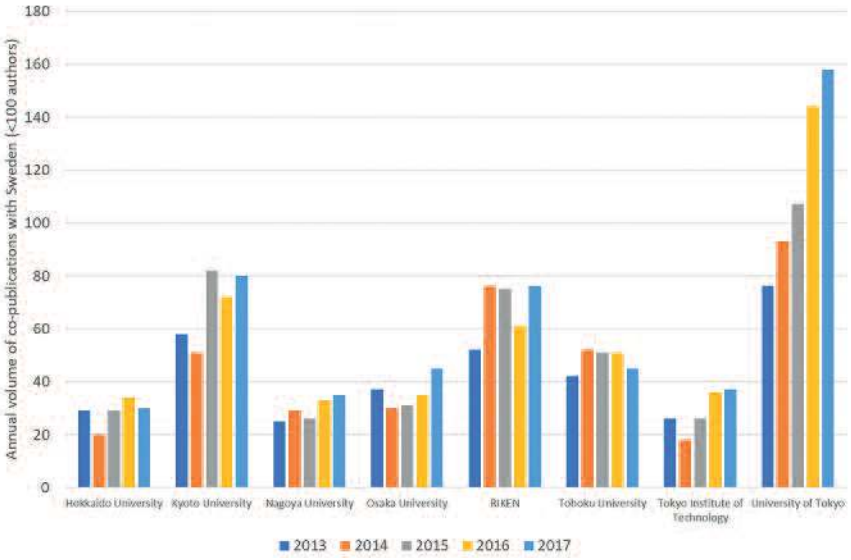

Figure 17: **Annual co-publications with Sweden for Japanese HEIs**

Also in Japan, the top ten predominantly show some growth in co-publications with Sweden, although more modest. University of Tokyo is the exception with a doubled volume (Figure 17).

Co-publications <100 authors	University of Tokyo	Kyoto University	RIKEN	Tohoku University	Osaka University	Nagoya University	Tokyo Institute of Technology	Hokkaido University	Hiroshima University	University of Tsukuba	All co-publ <100 authors w. JPN
Karolinska Institutet	70	41	87	41	44	32	4	29	13	23	826
Uppsala University	95	57	74	75	41	30	22	21	30	28	733
Lund University	69	97	51	37	31	15	10	9	15	10	628
Royal Institute of Technology	127	48	93	55	29	23	38	27	43	5	544
Stockholm University	148	52	18	41	20	27	29	48	44	13	420
University of Gothenburg	43	24	23	6	14	13	36	3	2	10	343
Chalmers University of Technology	22	24	29	27	9	10	6	13	19	5	296
Linköping University	33	11	1	9	6	6	1	4	5	5	210
Umeå University	12	14	7	6	9	4	3	6	2	5	171
Swedish University of Agricultural Sciences	11	20	6	7	2	6	7	10	1	2	136
All co-publ <100 authors w. SWE	578	343	340	241	178	148	143	142	125	110	4179

Figure 18: **Co-publication matrix**

In the co-publication matrix for the top ten HEIs, the dominance of the University of Tokyo on the Japanese side is clearly visible (Figure 18). Lund University and Kyoto University have several co-publications.

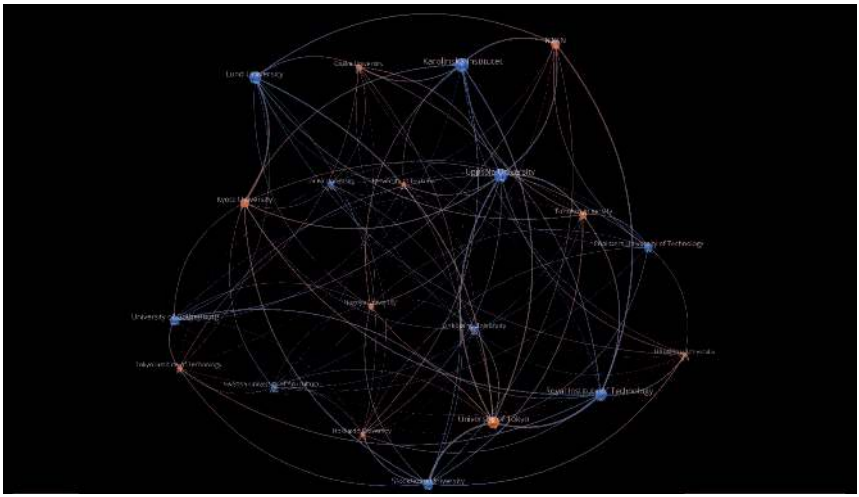

Figure 19: **Cluster map of top ten HEIs in Japan and Sweden**

The co-publication matrix can also be visualised as a cluster map. Here the Vosviewer tool was used. The size of the balls corresponds to the total volume of Japan – Sweden co-publications, the thickness of the lines relates to the co-publications in each pair and the colours show the country (Figure 19). The strong network between University of Tokyo, KTH Royal Institute of Technology and Stockholm University is for example reflected by their positions on the map.

Students from Japan to Sweden

Data from the Swedish Higher Education Authority (UKÄ) were used to list the HEIs in Sweden who receive students from Japan on a more regular basis (Figure 20).

	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017	Average
Jönköping University	6	6	7	11	6	6		7,0
Karolinska institutet					11	9	12	10,7
Linköping University	17	24	18	23	23	30	21	22,3
Linneaus University	43	37	45	34	32	31	37	37,0
Lund University	34	35	35	42	54	47	62	44,1
Royal Institute of Technology	25	25	27	23	32	27	26	26,4
Stockholm University	21	30	19	21	28	23	29	24,4
Umeå University	6	7	8	8	12	6	10	8,1
University of Gothenburg	50	49	42	46	34	37	39	42,4
Uppsala University	27	27	27	28	27	27	28	27,3
SUM	**229**	**240**	**228**	**236**	**259**	**243**	**264**	

Figure 20: **Japanese students registered at Swedish HEIs**

On average, Lund University, which is closely followed by the University of Gothenburg and Linneaus University, appears to have the highest numbers of registered students from Japan. Corresponding data for students travelling from Sweden to Japan are not available.

[2] UKÄ 2018 http://statistik.uka.se/statistiksidor/utbildning-pa-grundniva-och-avancerad-niva.html

Concluding summary

The research collaboration between Japan and Sweden is growing and it generates high-impact publications. The natural sciences dominate and co-publications in the humanities are at a low level.

In relative terms, Sweden's research collaboration with Japan is lower than Japan's volume of international co-publications would motivate. The same is also true from a Japanese perspective, even though the volume is closer to average.

The largest collaborators are Karolinska Institutet, Uppsala University and Lund University in Sweden, and the University of Tokyo, Kyoto University and RIKEN in Japan, respectively. In relative terms, KTH Royal Institute of Technology and RIKEN have the highest shares of Japan-Sweden co-publications.

Lund University and the University of Gothenburg receive the highest numbers of students from Japan.

The Swedish Foundation for International Cooperation in Research and Higher Education, STINT, was set up by the Swedish Government in 1994 with the mission to internationalise Swedish higher education and research.

STINT promotes knowledge and competence development within internationalisation and invests in internationalisation projects proposed by researchers, educators and leaderships at Swedish universities.

STINT promotes internationalisation as an instrument to:

- Enhance the quality of research and higher education
- Increase the competitiveness of universities
- Strengthen the attractiveness of Swedish universities

STINT's mission is to encourage renewal within internationalisation through new collaboration forms and new partners. For example, STINT invests in young researchers' and teachers' international collaborations. Moreover, STINT's ambition is to be a pioneer in establishing strategic cooperation with emerging countries in research and higher education.

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