

# Internationalizing Academic Research Activities in Japan

Yuan Sun<sup>1</sup> Sumio Kakinuma<sup>1</sup> Masamitsu Negishi<sup>1</sup> Masaki Nisizawa<sup>1</sup>

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## Abstract

Scholarly journals published by Japanese academic societies play important roles in dissemination and sharing of Japanese researchers' research results. To promote their international distribution, internationalization of Japanese academic journals in various aspects is required. In recent years, articles submitted from abroad to Japanese journals seem to be increasing. In this study, we look at the situation surrounding academic journals in Japan through a detailed analysis of journals with high percentages of papers from abroad, based on data from the CJP database produced by the National Institute of Informatics. By looking at these papers in terms of the authors' countries of origin and research field, we try to see what has been happening to national academic journals in Japan in recent years and discuss activities related to internationalizing Japanese academic research.

## 1 Introduction

As shown in many bibliometric studies based on Thomson Reuters' citation index databases (Science Citation Index, Social Science Citation Index, and Art & Humanities Citation Index), the total number of Japanese papers has steadily increased over the past two decades. Our previous study showed that more than 80% of the total publications in Japan are university-participating papers and this share is gradually increasing (Sun, et al., 2007b). Together with the growing number of publications, the proportion of papers co-authored internationally is growing significantly. This suggests that academic research activities in Japan are becoming more and more

internationally oriented. It was even shown that the international co-authorship relations have increasingly become integrated in the national system of publications and synergy is no longer to be found in the national system without taking the international dimension of the publication system into account (Sun, et al., 2007a).

More and more Japanese papers are published in international academic journals; this trend certainly indicates from an international viewpoint the level of Japanese research has risen. Meanwhile, it also shows Japanese researchers tend to and prefer to publish their papers in international journals much more than in national journals. According to Negishi's investigation, 79.3% of Japanese researchers' papers are published in academic journals abroad; only 20.7% of them are published in Japanese national journals (Negishi, 2004).

Under such circumstances, Japanese academic societies face a crisis and need to make their journals more visible internationally. In recent years, internationalization of Japanese journals has become a popular issue across fields. In 2003, an international scholarly communication initiative project (SPARC Japan) was launched with the support of the Ministry of Education, Culture, Sports, Science and Technology. Its mission is to encourage digitization of scholarly journals, especially English language journals published in Japan, with a view to keep in the hands of Japanese researchers the outstanding research results that are currently published abroad and to further promote international dissemination of research results (SCJ, 2005; MEXT, 2006).

On the other hand, it is said that papers submitted from abroad to Japanese academic jour-

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<sup>1</sup>National Institute of Informatics (NII), Japan  
Email: yuan@nii.ac.jp

nals have been increasing in recent years. Fujieda carried out interviews with societies and obtained answers that papers from Asian countries had been increasing (Fujieda, et al., 2006). Because the interviews and questionnaire survey were limited only to three societies, to assess the whole situation, we need to perform a more inclusive investigation.

In this study, we take a look at the situation and trends of research activities of national academic journals published in Japan, focusing in particular on those journals which have increasing portions of publications by authors submitting from abroad. The analysis is based on the Citation Database for Japanese Papers (CJP) produced by the National Institute of Informatics (NII), Japan. By analyzing at these papers by authors' countries of origin and research fields, we attempt to discover what has been happening to national academic journals in Japan in recent years and discuss activities related to internationalizing Japanese academic research.

## 2 Data and Methods

### 2.1 Citation Database for Japanese Papers (CJP) (1995-2007)

The CJP database is a citation index database for Japanese academic papers that has been produced since 1995 by NACSIS, the former name of NII (Negishi et al., 2004). It covers journals published by Japanese academic societies in the four fields of science, engineering, agriculture and medicine. The data we used in this study contained 1,266,662 papers, collected during 1995-2007 from 1,660 journals in the four fields. There are six types of documents overall, but we only took article, letter, review, report and note documentation as research papers for this study, and therefore, only referenced 1,067,561 papers as the subject of our analysis. Table 1 lists the number of journals and publications in each subject field in the CJP database.

### 2.2 Record standardization and country code assignation

The databases note the name of an organization as the one the original paper was written in, so there are many variations of the organization.

After removing the variations, we standardized each affiliation and then assigned a country code to each author according to the address of the author's affiliation (for details see Sun et al., 2008). In this study, we defined those papers which all of their authors were affiliated to foreign countries as papers from abroad, and we call them "foreign papers". It is taken for granted that because the country code was assigned in terms of author's address, the author's country doesn't necessarily mean his (or her) nationality. Since we checked the affiliations carefully in detail, it is obvious that high percentages of Japanese authors were temporarily affiliated with the USA. The same thing seemed to have happened for certain European countries as well. Therefore, it is necessary to be careful when interpreting the results.

## 3 Results

### 3.1 Overall trends of publications in Japanese academic journals

Percentage of foreign papers is low

Table 1 shows the numbers and percentages of journals with foreign papers in each subject in the CJP database. Among the 1,660 total journals across the four fields, 1,060 journals (63.9% of the total) contain at least one foreign paper. To look at it separately by field, the percentage of journals containing foreign papers in the science and medicine fields are the highest at 68.8%, the percentage in engineering is 59.2%, and the percentage in agriculture is 56.6%. However, if we look at the percentage of foreign papers in the total papers, 35,234 papers corresponding to only 3.3% of the total 1,067,561 papers were foreign papers. Even the highest percentage, which was in the science field, was no more than 6%, which indicates that the percentage of papers from abroad is quite low in Japanese academic journals.

Table 1: Number and percentage of journals with foreign papers in each field in the CJP

Fields	Whole		Foreign authors			
	Journals	Papers	Journals	%	Papers	%
Science	282	126,868	194	68.8	7,353	5.8
Engineering	608	459,126	360	59.2	15,113	3.3
Agriculture	196	90,178	111	56.6	1,840	2.0
Medicine	574	391,389	395	68.8	10,928	2.8
Total	1,660	1,067,561	1,060	63.9	35,234	3.3

Most foreign papers are in English

Table 2 shows the ratios of papers in total in CJP in Japanese and English by field and that of foreign papers. In total, 76% of papers published in Japanese academic journals are in Japanese, and the rest (24%) are in English. Except for the science field, in which a high percentage (45%) of papers is in English, the other fields have predominantly high percentages of Japanese language papers. On the other hand, if we look at foreign papers, it is no surprise to see that nearly 95% of them are in English. Maybe we should say it is a surprise to see the remaining 5% of foreign papers are in Japanese.

Table 2: Ratios of papers in Japanese and in English by field

	Whole		Foreign papers	
Science	126,868		7,900	
ENG	56,898	45%	7,602	96%
JPN	69,945	55%	295	4%
Engineering	459,126		15,903	
ENG	90,263	20%	15,238	96%
JPN	368,852	80%	663	4%
Agriculture	90,178		1,986	
ENG	28,583	32%	1,845	93%
JPN	61,587	68%	141	7%
Medicine	391,389		11,494	
ENG	82,325	21%	10,860	94%
JPN	309,048	79%	634	6%
Total	1,067,561		37,283	
ENG	258,069	24%	35,545	95%
JPN	809,432	76%	1,733	5%

### 3.2 Characteristics of publications from abroad

Many are from Asian countries

Looking at the 35,234 (the actual total was 37,183 because of multiple counts for authors'

countries) foreign papers categorized by country or region of affiliated authors, we see that Korea has the highest percentage, at 22.0%. Next come USA (20.5%), China (10.7%), Taiwan (10.0%), India (3.7%) and Turkey (3.6%) (Table 3). As we described earlier in section 2.2, the country code was assigned according to the author's address, not necessarily the author's nationality, and it is especially important to be careful in interpreting the USA data because of the high percentages of Japanese authors with temporary USA affiliations. The results show that except for the special case of the USA, the countries that have large numbers and high percentages of publications are Asian countries.

Table 3: Top 10 countries' number and percentage of publications in total and by field

Country	Fields						Total	%		
	SCI	%	ENG	%	AGR	%			MED	%
KOR	738	9.3	5,370	33.8	516	26.1	1,563	13.7	8,187	22.0
USA	1,493	18.9	2,130	13.4	405	20.5	3,590	31.5	7,618	20.5
CHN	1,677	21.2	1,503	9.5	123	6.2	693	6.1	3,996	10.7
TWN	379	4.8	2,534	15.9	240	12.1	554	4.9	3,707	10.0
IND	589	7.5	402	2.5	53	2.7	339	3.0	1,383	3.7
TUR	140	1.8	59	0.4	39	2.0	1,093	9.6	1,331	3.6
GBR	232	2.9	507	3.2	39	2.0	388	3.4	1,166	3.1
CAN	277	3.5	1,503	9.5	55	2.8	273	2.4	895	2.4
AUS	213	2.7	357	2.2	29	1.5	245	2.1	844	2.3
DEU	134	1.7	191	1.2	25	1.3	406	3.6	756	2.0

The results also show differences among the four fields in terms of author's countries (Table 3). China has the highest percentage in science, while Korea has the highest portions in engineering and agriculture. Korea is also in first place in medicine, if we exclude the USA data. Note that Turkey ranks high in the medicine field; 80% of papers from Turkey and published in Japanese academic journals are in the medicine field. Figure 1 plots the change in number of foreign papers from the top five countries in each field from 1995 to 2005. It shows that Korea and China have had significant growth in all four fields.

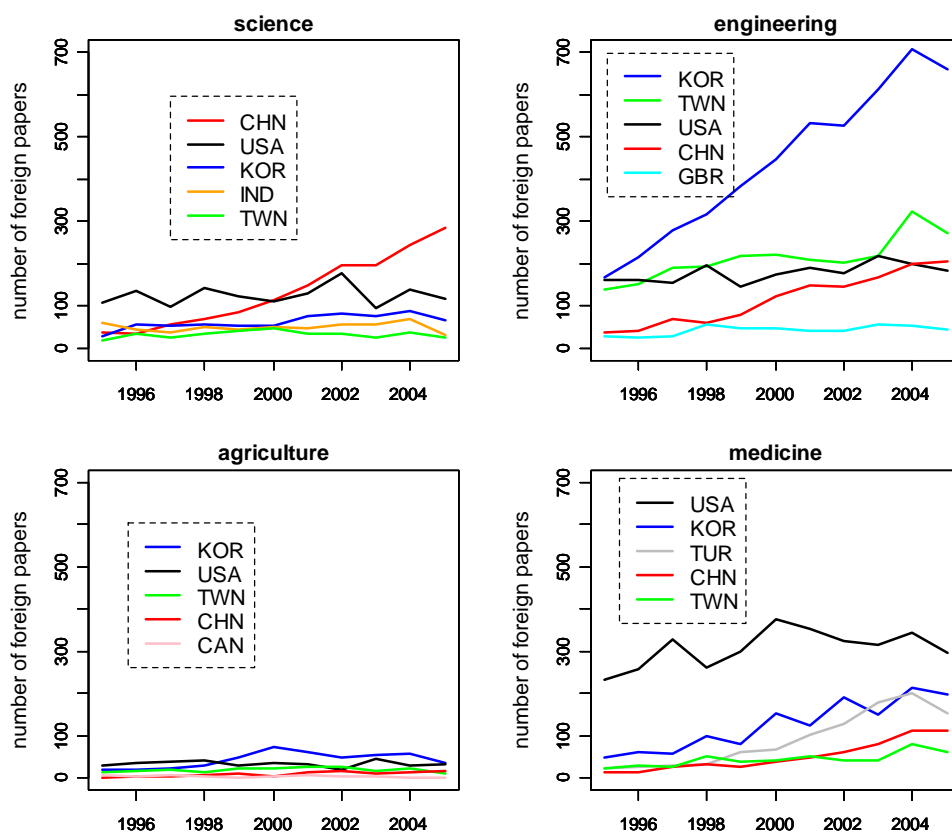


Figure 1: Number of foreign papers of the top five countries in each field from 1995 to 2005

#### Concentration in a few journals

Figure 2 shows the cumulative percentages of publications from abroad for all 1,060 journals with larger numbers of foreign papers published from 1995-2007 in each of the four fields. Most of the publications from abroad were published in a relatively small number of Japanese journals. Overall, 30% of foreign papers were published in the top 10 journals and 50% of them were in the top 30 journals.

During 1995-2007, 50% of foreign papers in the science field were published in the top seven journals, for instance in *Chemistry Letters* (15%) and *Analytical Sciences* (11.2%). In engineering, about 40% were published in three journals: the *Japanese Journal of Applied Physics. Pt. 1, Regular papers & short notes* (22.5%), *Pt. 2, Letters* (5.8%), and *IEICE Transactions on Communications* (8.9%). Five agriculture journals contain more than 40% of the papers, and even in the medicine field in which foreign pa-

pers are distributed in relatively the widest range of journals, 50% of foreign papers are concentrated in 22 journals among the total 395.

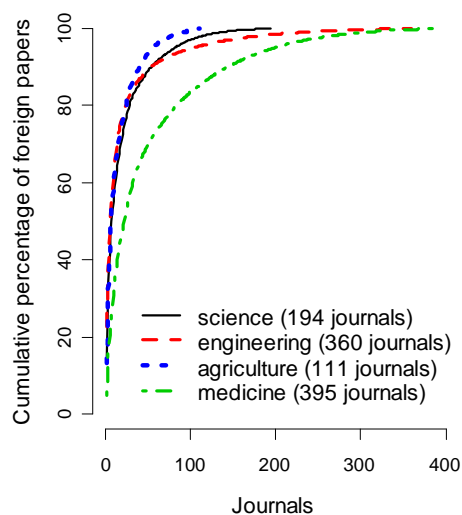


Figure 2: Distribution of foreign papers in 1,060 journals by field

To show how publications from abroad are concentrated in particular journals, we calculated the Gini-coefficient index for the period of 1995 to 2006 for each field (Table 4). The results reveal a high degree of concentration in the fields of agriculture, engineering, science, and medicine.

Table 4. Gini index for the four subjects by year

Year	Science	Engineering	Agriculture	Medicine
1995	0.648	0.771	0.800	0.645
1996	0.635	0.790	0.781	0.637
1997	0.655	0.774	0.807	0.641
1998	0.637	0.791	0.769	0.626
1999	0.650	0.745	0.767	0.561
2000	0.678	0.731	0.711	0.571
2001	0.667	0.756	0.742	0.591
2002	0.671	0.787	0.743	0.577
2003	0.711	0.758	0.712	0.573
2004	0.708	0.784	0.712	0.571
2005	0.678	0.783	0.660	0.587
2006	0.731	0.763	0.766	0.652

If we look at the changes in the percentages of foreign papers during the period, we find several journals with significant increases. IEICE Transactions on Communications has increased its percentage of foreign papers from 13% in 1995 to 44% in 2006, and Analytical Sciences has increased it from 10% in 1995 to 30% in 2006. Although the above results show there are very few publications from abroad in Japanese academic journals as a whole, only about 3% of the

total, if we look at particular journals in each field, we can see the percentages may be considerably high. In 2005, there are three journals with 40% of their papers from abroad, 11 journals with 30% to (less than) 40%, and 40 journals having 20% to (less than) 30%.

### 3.3 SCI journals in the CJP database

#### High concentration of foreign papers in SCI journals

In recent years, the Science Citation Index (SCI) of Thomson Reuters has been frequently used in research evaluations. Whether a journal is indexed by SCI or not, and further, the Impact Factor (IF) of the journal, are now important considerations by which researchers choose academic journals to submit their papers. In 2006, 170 of the total 6,164 SCI journals were from Japan, and 132 of them were included in the CJP database. After dividing the 1,660 titles of the CJP journals into 132 SCI indexed journals and the remaining non-SCI 1,528 journals, we clearly see that the percentage of foreign papers published in SCI journals has greatly increased, as high as 17% in 2006, while that in non-SCI journals has remained almost unchanged (Table 5). In addition, more than half of the foreign papers are published in these 132 SCI journals, and the ratio is getting higher. Since foreign papers tend to concentrate in small numbers of journals, if we look at the top 20 journals with the

Table 5: Number and percentage of publications from abroad in SCI 132 journals (1995-2007)

Year	Total 1,660 journals			132 SCI journals			The rest 1,528 journals			% of foreign papers in SCI journals
	Whole	Foreign	%	Whole	Foreign	%	Whole	Foreign	%	%
1995	82,858	1,797	2.2	15,062	1,021	6.8	67,796	776	1.1	56.8
1996	83,178	2,009	2.4	14,777	1,166	7.9	68,401	843	1.2	58.0
1997	87,168	2,286	2.6	15,130	1,332	8.8	72,038	954	1.3	58.3
1998	87,962	2,474	2.8	15,665	1,448	9.2	72,297	1,026	1.4	58.5
1999	88,800	2,650	3.0	16,383	1,694	10.3	72,417	956	1.3	63.9
2000	93,220	3,060	3.3	17,002	1,910	11.2	76,218	1,150	1.5	62.4
2001	98,957	3,260	3.3	17,416	2,201	12.6	81,541	1,059	1.3	67.5
2002	94,233	3,344	3.5	17,774	2,388	13.4	76,459	956	1.3	71.4
2003	94,718	3,531	3.7	18,225	2,645	14.5	76,493	886	1.2	74.9
2004	95,259	4,055	4.3	18,820	3,087	16.4	76,439	968	1.3	76.1
2005	86,094	3,688	4.3	17,040	2,777	16.3	69,054	911	1.3	75.3
2006	64,749	2,698	4.2	11,679	1,988	17.0	53,070	710	1.3	73.7
2007	10,365	389	3.8	2,056	280	13.6	8,309	109	1.3	72.0
Total	1,067,561	35,241	3.3	197,029	23,937	12.1	870,532	11,304	1.3	67.9



largest numbers of foreign papers in each field, we see that 16 journals are SCI journals in science, 14 in engineering, 13 in agriculture, and 16 are SCI journals in the medicine field.

### Impact Factors of the SCI Journals

Figure 3 shows the yearly change in Impact Factors of Japanese SCI journals from 1995 to 2006 by field. We should mention that we focused on journals in the CJP database, so not all Japanese journals indexed by SCI are included here. From the figure, we can see the differences in IFs among the four fields, their variations by year in each field, and several journals in each field with extremely high IFs (which are plotted as outliers in the figure).

As mentioned above, under the pressure of research evaluation, researchers at universities and research institutes have become conscious about citation counts and Impact Factors as objective measures of their performance. Moreover, to increase a country's or institutional academic

research performance, it is said that in China, which has had a large increase in the number of publications in Japanese academic journals, the government encourages researchers to publish papers in high-level foreign journals, and universities and research institutes even have developed a policy of awarding researchers for each paper published in a foreign SCI-indexed journal (Wang et al., 2006). Is it the case that a journal's Impact Factor affects researchers' submission from abroad?

We took the science field as an example. Figure 4 is a scatter plot of IFs of journals and number of foreign papers in journals in 2005, with a smoothing spline of nonparametric regression. It seems that journals with higher IF tend to have more publications from abroad, although there are some exceptions, such as those with high IFs but a small number of foreign papers, or those with medium IFs but extremely large numbers of foreign papers (for example, Chemistry letters).

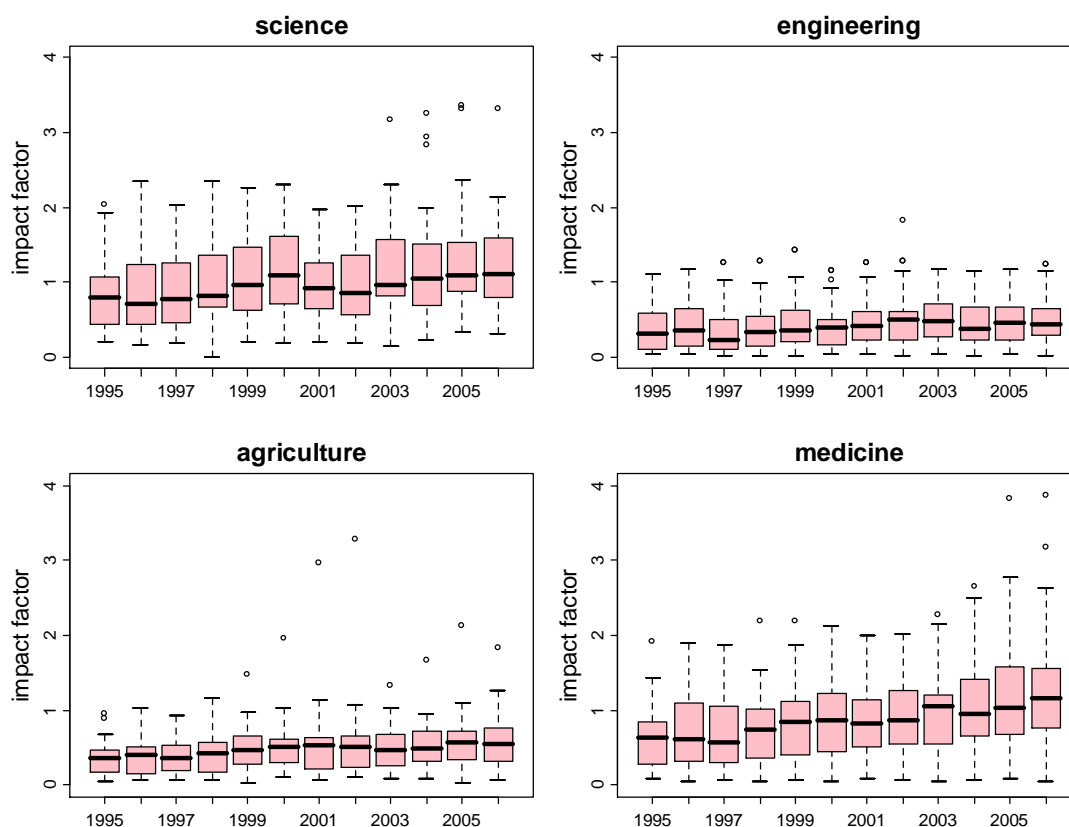


Figure 3: Yearly change in distribution of SCI Journal IFs in each field

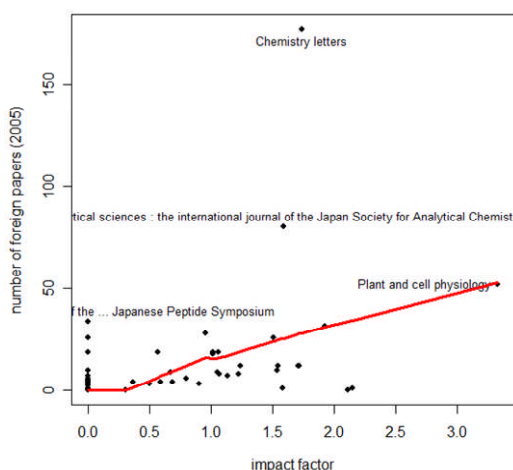


Figure 4: Journal IFs and number of foreign papers in the science field (2005)

Of course, we should take the number of total publications per volume for each journal into account, and also that even for journals with “not-very-high IF but a lot of foreign papers” it is not that they have larger numbers of foreign papers from the beginning. What has encouraged researchers from abroad to submit their papers to these journals?

If we look at the top nine journals with the largest numbers of foreign papers to see the yearly change in their IFs and number of foreign papers (Figure 5), we see that IF and number of foreign papers some journals have very high correlation coefficients, even more than 0.9. Furthermore, we see that some have medium level correlations, while others have very low correlations. It is still too early and too complicated to reach to a conclusion about this situation; a more detailed analysis will be necessary.

## 4 Conclusions and discussion

In this study, we looked at the situation surrounding academic journals in Japan by per-

forming an analysis on journals with publications from abroad as indicated by the CJP database. The main findings are as follows:

(1) Looking at all 1,660 Japanese academic journals in the four nature sciences fields indexed by the CJP in total, the percentage of publications from abroad is low. However, these foreign papers concentrate in a small number of journals. Among them, several journals now have more than 40% of their papers from abroad.

(2) A large part of foreign papers are from Asian countries; papers from Korea and China are especially increasing in number.

(3) The journals indexed by SCI account for only about 8% of the total 1,660 journals, but include more than 50%, even more than 70% recently, of all foreign papers.

(4) Journal Impact Factor seems to be an important factor affecting researchers' submission behaviour. A detailed analysis of individual journals will be necessary to clarify this aspect.

Internationalization or international visibility of academic journals is a common issue and a topic of interest for policy-makers and science editors (Ren et al., 2002; Wang et al., 2006). Although the necessity for internationalization of Japanese academic journals, especially English-language ones, has already been pointed out, the strategy to be adopted is still being discussed in individual academic societies, and there are few bibliometric studies based on objective data to make for a comprehensive discussion. What factors affect a journal's chances of internationalization? Its Impact Factor? Maybe, its editorial system? What else? The role of national academic journals, their internationalization and related issues should be given deeper discussions. We believe that more investigations and bibliometric analyses based on this study should be undertaken.

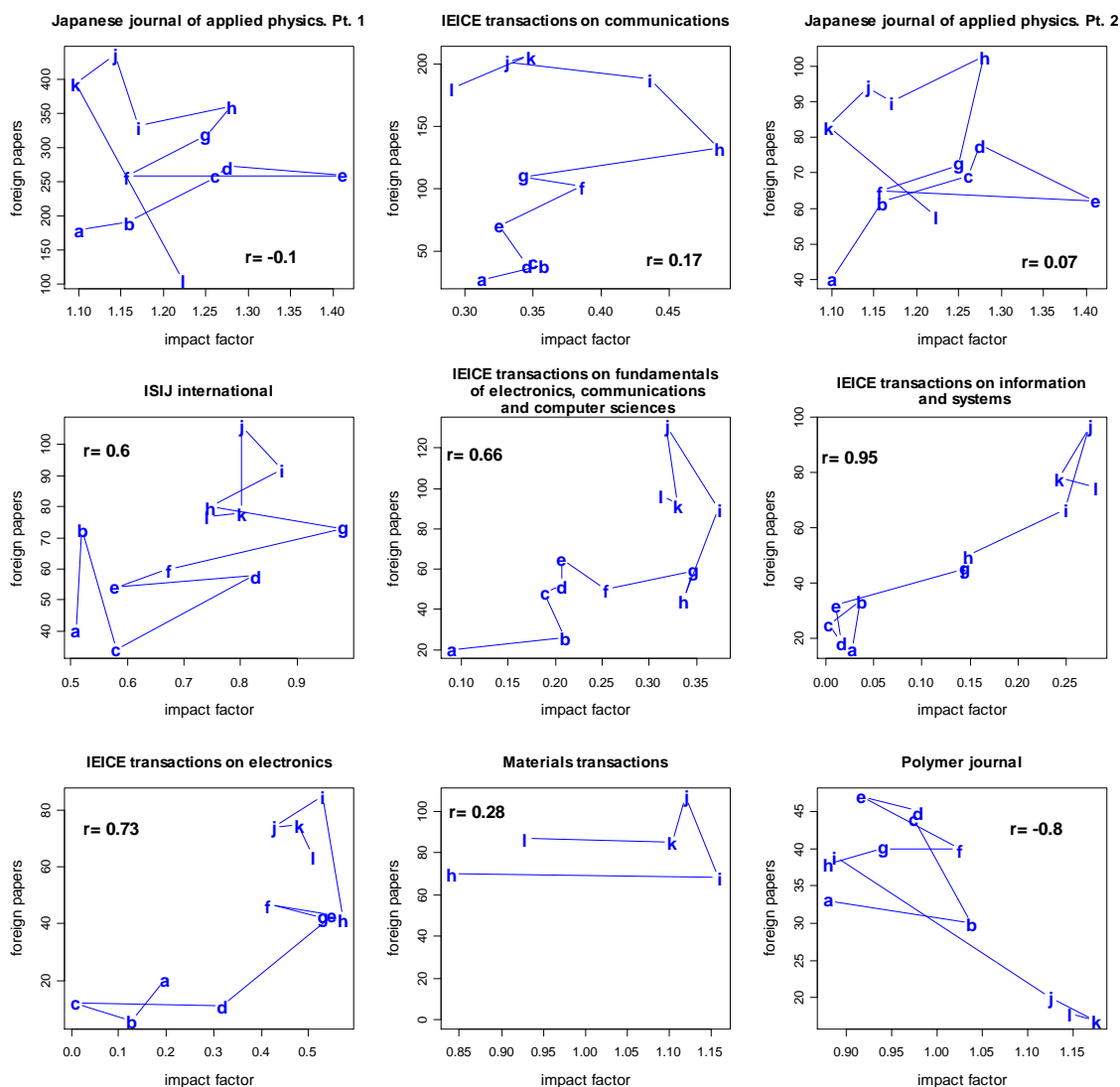


Figure 5: Trajectories of IF and number of foreign papers in nine journals from 1995 to 2006

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