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EDITORIAL GATEKEEPING PATTERNS IN INTERNATIONAL SCIENCE JOURNALS. A NEW SCIENCE INDICATOR

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Significant correlations were found between the number of science journal editors from different countries, on the one hand, and the number of scientists, the number of science journals and the number of science papers produced by these countries on the other. We argue for using the extent of participation in the editorial board of international science journals as a new science indicator. The deviations from the regression lines between the new indicator and other publication indicators allow one to assess the "open" or "closed" character of the scientific life of a given country.

Introduction

Several attempts have been made to evaluate and rank countries regarding to their participation in the international scientific enterprise.[1–3] The conceptual basis of these attempts has been best formulated by *Nalimov*.[4] Phenomenologically, as said by him, science is a process of searching new pieces of information. Being a self-organizing system, science and its development is governed by its information flows.[4] Consequently, the amount of information flowing through scientific information channels may serve as the basis of quantitative investigations.[5,6]

It has been proved that among the indicators used for characterizing the research activities within a country those related to publication data (number of papers, journals, authors, citations) are more unobtrusive and reliable than many other indicators.[7]

Since the continuance of science as an intellectual and social process is secured by papers published in science journals, indicators related to journal publication ac-

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tivity are of utmost importance. For the satisfactory operation of the stratified system of science, the information screening activity of journal editorial boards – which designate the professional profile of those journals – is of paramount significance.[9,10] It is considered that the critical mentality and decisions of the editors have so far protected and will also warrant in the future the social and intellectual integrity of science.[1,11] *Crane* rightfully considers the members of such boards the publication "gatekeepers" of a given field.[12]

Searching for new quality output indicators which characterize the research effort in a given country our attention turned to the international science journals. The members of the editorial boards of these journals belong usually to many countries. We consider that an invitation to participate in such a board represents in general a distinctive recognition of the scientific work of the invitee. Through an invitation to join the board of an international journal both the researcher and his or her country share the recognition. Moreover the number of gatekeeping editors of international journals may reflect the process that precedes the publication of science papers; thus this number may qualify the research activity of a country as well.[1] In controlling systems of manuscript evaluation and selection, journal editors occupy powerful strategic positions in the social hierarchy of their field. They have a strong influence on the nature and quality of work published in the sciences.

In our investigations we wished to know the proportions in which scientists of individual countries participate in the editorial boards of international journals of various fields, as well as in all sciences together. The applicability of this new indicator has been tested by comparing these proportions to other publication indicators.

The data base

Science journals were considered "international" if their editorial board included scientists from five countries at least, irrespective of the title of the jorunal in question. (The "International" label in the title of some journals may hide a truly national journal. On the contrary, in the editorial board of, e.g. the *American Heart Journal* there are, in addition to North Americans, scientist from ten, mostly European countries.)

Issues from the first quarter of 1980 of international (in the above sense) journals were selected mostly from the listing given in the Appendix of the *Narin* study.[2] We have also incorporated into our data base a number of other journals, in particular newer ones from the data base of the Institute for Scientific Information (ISI). The classification of journals by fields followed that used by *Narin*[2] (psychology journals were discarded from our study). The distribution of journals among 8 science fields was the following:

Clinical Medicine	45 journals
Biomedical Research	28 journals
Biology	22 journals
Chemistry	49 journals
Physics	25 journals
Earth and Space Sciences	10 journals
Engineering	59 journals
Mathematics	14 journals
Total:	252 journals

The necessary data were obtained by counting and countrywise pooling the editors. In so doing we considered editors the editor-in-chief, the editor(s), the deputy editor(s) (-in-chief), the managing editor, the members of the editorial board and advisory board, excepting only the technical editor(s).

Data processing

Table 1 shows the field and country distribution of editors in our 252 journal sample. The grouping into geopolitical regions follows that of *Narin.*[2] Our data were correlated with the number of science papers published by authors of the respective geopolitical regions[2] and with the number of science journals.[13] The correlations were investigated within each field. A correlation study among the number of first authors (taken from the 1978 issue of WIPIS[14]) and the number of editors, for each country, supplemented those enumerated.

The correlation coefficients and the slopes of the regression lines (calculated by the method of unweighted least squares) were in each case determined from double logarithmic plots.

Results and discussion

Table 2 shows the correlation coefficient (r) and the slope (m) of the regression line between the logarithm of the number of editors and the logarithm of the number of papers or the logarithm of the number of journals published in each field. Correlation parameters of the sum of editors in all fields, with the number of WIPIS[14] authors of the given regions were determined as well, again on double logarithmic scales. The results including the regression lines are shown in Figures 1–9.

Table 1
Country-by-country distribution of the editors of international science journals

Number of journals examined	45	28	22	49	25	10	59	14	252
Country or region / Field	Clinical Med.	Biomed. Res.	Biology	Chem-istry	Physics	Earth and Space Sci.	Eng. and Tech.	Mathe-matics	All fields
US	523	283	132	415	182	76	655	105	2371
UK	245	152	69	238	152	33	289	22	1200
Fed. Rep. Germany (D)	158	124	73	190	73	31	171	21	841
France (F)	74	47	24	128	51	26	75	13	438
Soviet Union (SU)	26	24	13	58	18	9	63	8	219
Japan (JAP)	42	25	18	78	17	9	56	6	251
German Dem. Rep. (DDR)	12	31	33	23	7	12	6	7	131
Canada (CDN)	50	15	28	47	18	24	45	7	234
India (IND)	10	7	9	16	6	1	21	3	73
New-Zealand (NZL)	3	3	4	4	1	3	7	1	26
South-Africa (SAF)	7	1	6	6	1	3	13	–	37
Australia (AUST)	23	14	16	25	9	20	43	8	158
Israel (IL)	13	11	7	24	9	4	29	5	102
Italy (I)	42	14	33	52	14	5	36	42	238
Sweden (S)	75	24	6	23	12	12	24	7	183
Latin-America (LAM)	16	7	9	14	1	3	31	3	84
Rest of East Europe (EEU)	75	23	29	116	40	8	77	18	386
Rest of Near East and North Africa (NREA)	3	1	1	4	–	–	21	–	30
Black Africa (BAF)	3	–	–	1	–	–	3	–	7
Rest of Asia and Pacific (ASP)	4	1	7	1	1	–	12	2	28
Rest of West Europe (WEU)	318	127	93	207	91	62	181	42	1121
Unknown	20	3	5	18	6	8	–	4	64
Total	1742	937	615	1688	709	349	1858	324	8222

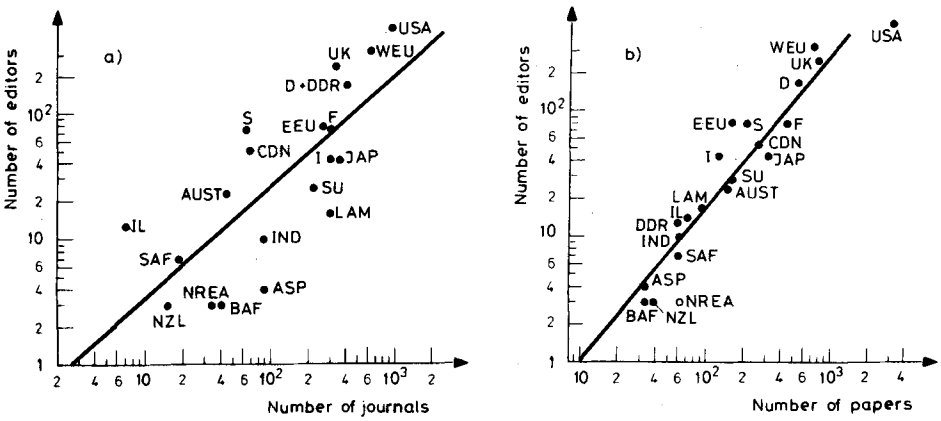

Fig. 1a. Correlation between the number of editors and the number of journals published in the field of clinical medicine*

Fig. 1b. Correlation between the number of editors and the number of papers published in the field of clinical medicine

*For the key to the country abbreviations, see Table 1.

Table 2
Correlation parameters for the relationship between the number of editors and the number of science journals, or the number of authors, or the number of papers for each field and for all fields combined

Field	E–P		E–J		E–A	
	r	m	r	m	r	m
Clinical medicine	0.948	1.258	0.757	0.883	–	–
Biomedical Research	0.901	1.135	0.803	0.828	–	–
Biology	0.629	0.651	0.811	0.939	–	–
Chemistry	0.910	1.082	0.851	0.965	–	–
Physics	0.872	0.973	0.839	0.988	–	–
Earth and Space Sciences	0.659	0.697	0.713	0.823	–	–
Engineering and Technology	0.880	0.754	0.839	0.749	–	–
Mathematics	0.750	0.691	0.716	0.794	–	–
Total	0.913	1.079	0.808	0.997	0.899	0.924

E–P = log number of editors – log number of papers
E–J = log number of editors – log number of journals
E–A = log number of editors – log number of authors

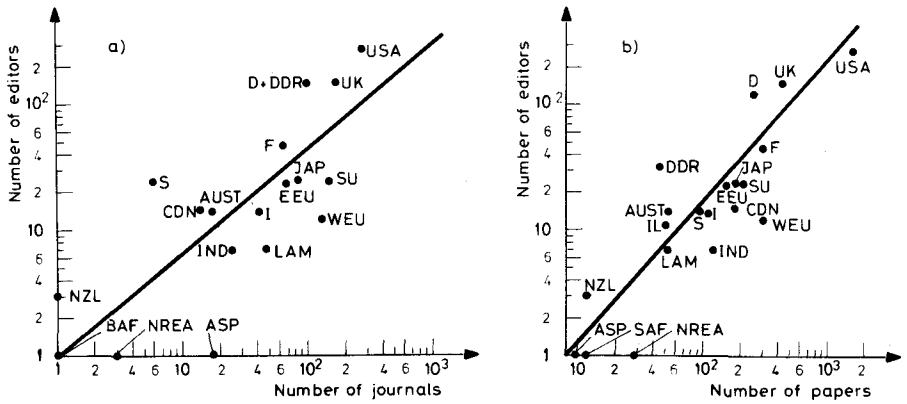

Fig. 2a. Correlation between the number of editors and the number of journals published in the field of biomedical research

Fig. 2b. Correlation between the number of editors and the number of papers published in the field of biomedical research

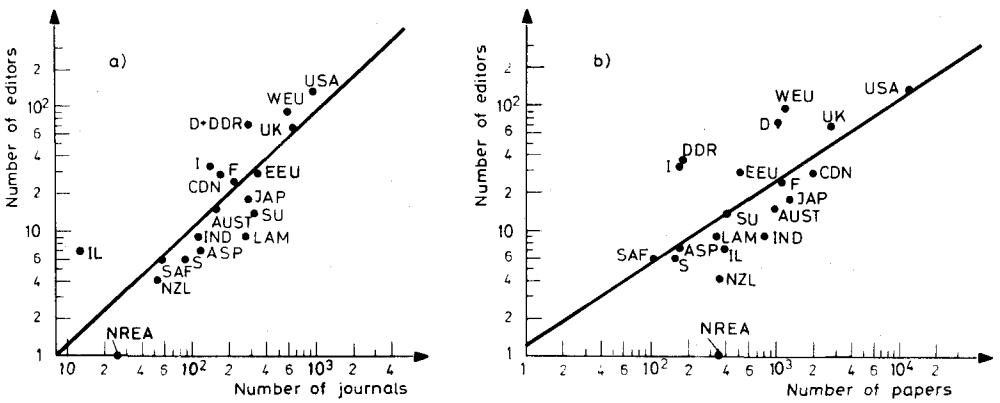

Fig. 3a. Correlation between the number of editors and the number of journals published in the field of biology

Fog. 3b. Correlation between the number of editors and the number of papers published in the field of biology

A strong correlation is observed between the number of editors and the number of papers for each scientific field (Table 2). The correlation coefficients for the particular fields are above, 0.650, and for all fields combined, above 0.800.

The slopes of the regression lines on Figures 1–9 are between 0.651 and 1.258. Using the number of editors of all science journals the regression coefficients are

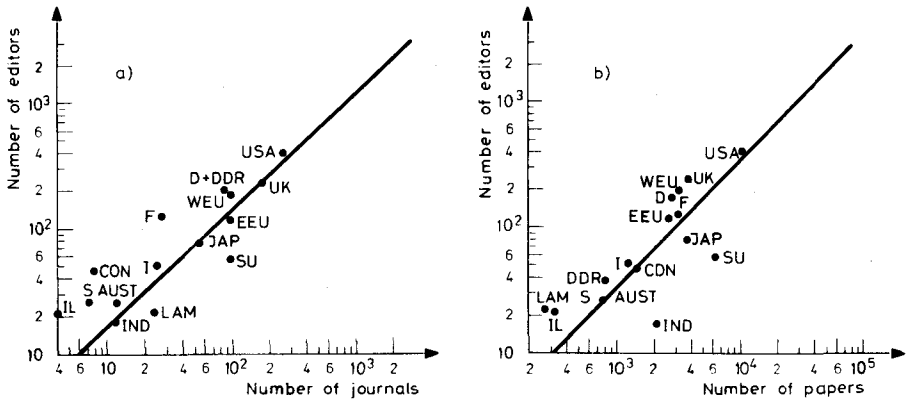

Fig. 4a. Correlation between the number of editors and the number of journals published in the field of chemistry

Fig. 4b. Correlation between the number of editors and the number of papers published in the field of chemistry

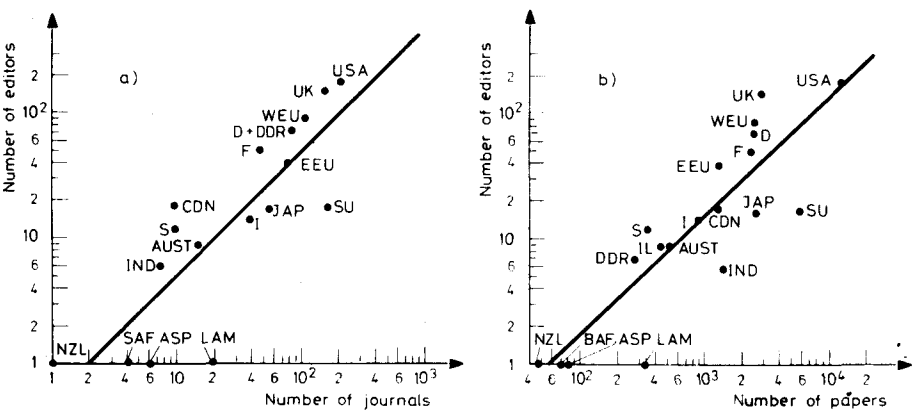

Fig. 5a. Correlation between the number of editors and the number of journals published in the field of physics

Fig. 5b. Correlation between the number of editors and the number of papers published in the field of physics

close to unity (1.079 and 0.997, resp.). This suggests a direct linear relationship between the number of editors and papers, and the number of editors and journals. In some fields a deviation from linearity, mainly in the negative direction, can be noticed. This could be attributed to an equalizing tendency in the composition of

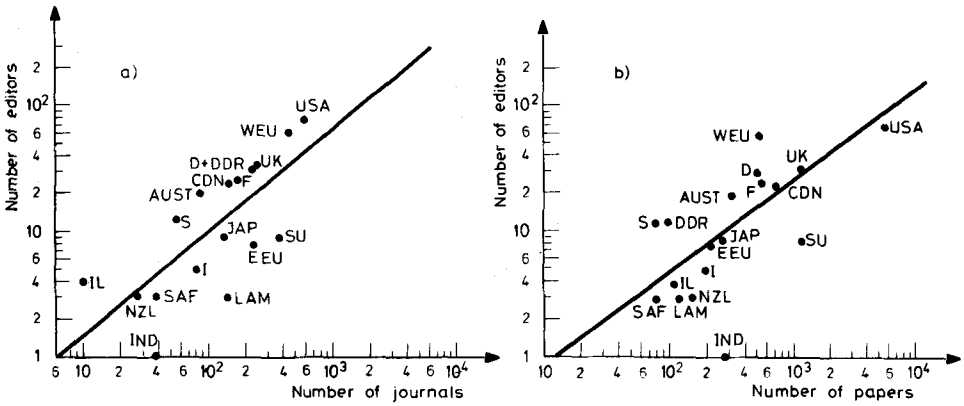

Fig. 6a. Correlation between the number of editors and the number of journals published in the field of earth and space sciences

Fig. 6b. Correlation between tne number of editors and the number of papers published in the field of earth and space sciences

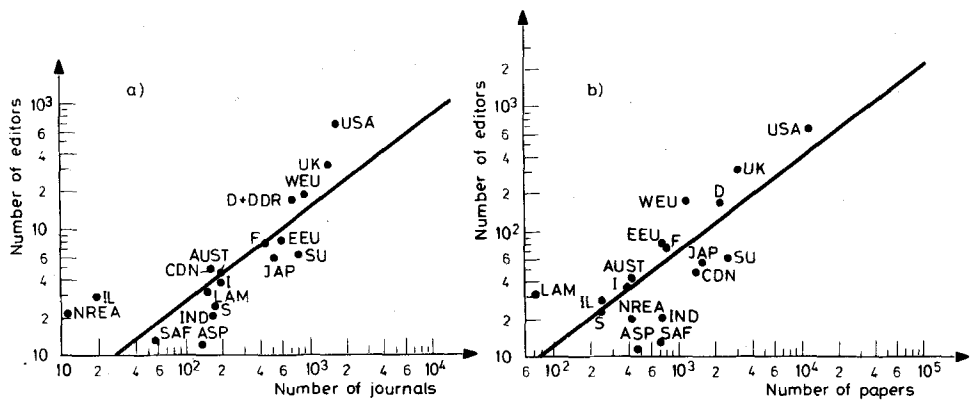

Fig. 7a. Correlation between the number of editors and the number of journals published in the field of engineering and technology

Fig. 7b. Correlation between the number of editors and the number of papers published in the field of engineering and technology

the editorial boards. For the regression among the total number of editors and the number of authors the slope is again close to unity (Figure 9c.).

The position of the individual points (corresponding to the single geopolitical regions) relative to the regression line between the number of editors and the number

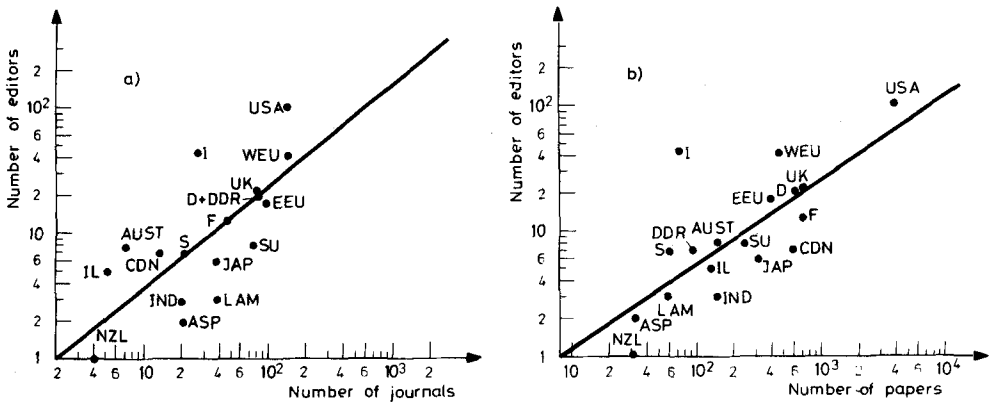

Fig. 8a. Correlation between the number of editors and the number of journals published in the field of mathematics

Fig. 8b. Correlation between the number of editors and the number of papers published in the field of mathematics

of journals suggests the following. Countries or geopolitical regions situated *above* the regression line have more editors in the editorial boards of international journals than it may be expected from the number of science journals published in the country or geopolitical region in question. For the countries *below* the regression line the situation is the opposite.

The country-by-country distribution of the number of editors and journals in the various fields shows that the US, Canada, Israel, Sweden, both Germanies, the United Kingdom and France are situated above the regression line, whereas Japan and the Soviet Union are almost always situated below it.

In most of the science fields the distribution of the number of editors and papers shows that the points corresponding to Sweden, the Federal Republic of Germany and Western Europe are above, while those for India, Japan and the Soviet Union are below the regression line.

Upon analyzing the totality of editors in the whole sample relative to the number of journals one finds more international journal editors than expected in the case of Israel, Sweden, Canada, France, both Germanies, the rest of West Europe leaving out the United Kingdom and the United States, while less than expected are found for the Soviet Union, Japan and India. Related to the number of papers the number of editors is higher than expected in the German Democratic Republic, Sweden, Italy, East and West Europe, the Federal Republic of Germany, whereas the number of editors from Soviet Union, Canada and Japan is lower than expected

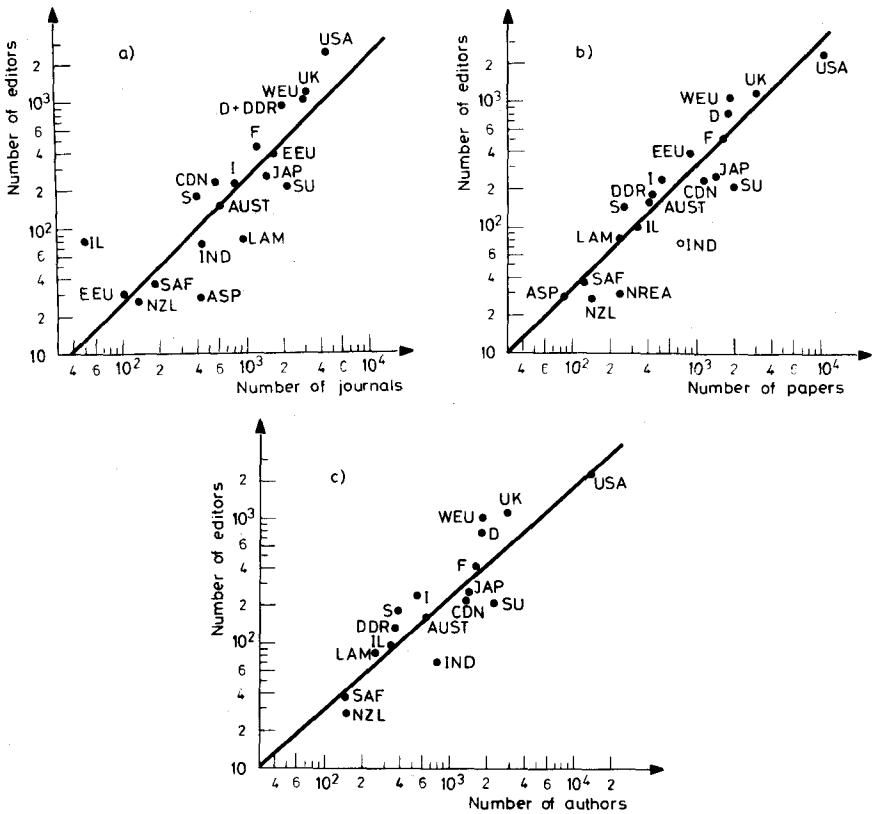

Fig. 9a. Correlation between the number of editors and the number of journals published in all fields combined

Fig. 9b. Correlation between the number of editors and the number of papers published in all fields combined

Fig. 9c. Correlation between the number of editors and the number of authors in all fields combined

(Figure 9). An essentially identical statement can be made in relating the number of editors of all science journals covered to the number of WIPIS[14] authors.

Along with the scientific development level of each country one should also take into account, the "open" or "closed" nature of scientific life in the country in issue. In other words one should also consider how actively scientists of a country take part in the international scientific life, or to which extent are they isolated (by language or other barriers).

There have earlier been some efforts to answer the above question. *Frame* and *Carpenter,*[15] studied the international coauthorship pattern in scientific papers. They

found that scientists from the US, United Kingdom, Canada, Italy, Sweden and Israel are engaged to a larger extent in international coauthorship than those from an average country, while in between the authors of paper coming from the Soviet Union, Japan and India, the previously not mentioned East European countries and the German Democratic Republic there are less foreign coauthors.

Investigating international publication practices *Inhaber*[16] has pointed out that only 12% of the Israeli researchers publish their results in domestic journals, and also scientists from The Netherlands, Japan and Switzerland publish preferentially in foreign, and in particular in US journals. On the other hand, eighty percent of Soviet scientists publish exclusively in domestic journals.[4] Our results on the international gatekeeping patterns are in accord with the above findings.

In the case of some countries the geographic distance could result in the fact that their scientists figure less frequently among the members of the editorial boards of international journals.

The countries whose scientific life is more open are in a better position. Among them Israel, Sweden, Canada, the United Kingdom and the US belong to this category both according to our results and those of *Frame* and *Carpenter.*[15] Due to their efficient international relationships (e.g. coauthorship with foreign researchers) and to their more successful communication strategy, etc. the scientists of these countries are more "visible" and so they receive relatively more invitations to participate in the editorial board of international journals.

Conclusions

We have shown that country-by-country distribution of the editors of international science journals may characterize the scientific research activity of the countries, or perhaps assess their research efficiency in various science fields as well. The number of editors is in correlation with other scientometric indicators so far used[2] in all the science fields studied.

On the basis of deviations from values expected from the regression lines the gatekeeping indicator provides also a possibility for drawing inferences about the "open" or "closed" nature of the scientific life of a given country.

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