Are multi-authored articles cited more than single-authored ones?
Are collaborations with authors from other countries more cited than collaborations within the country?
A case study.

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Abstract

Based on LUC evaluation data we investigate the citation output of single-authored articles versus the output of articles with two or more collaborators. This is done for 'citable' articles published in journals covered by the JCR (ISI), and for all other articles (published in non-ISI journals, in conference proceedings or in edited books). Citations to books are not included in the study. We further compare citation results for collaborations within the country and with scientists from abroad.

Results: multi-authored articles have usually higher citation frequencies than single-authored ones, but this relation does not hold in all cases. On the other hand, it seems favourable (in the sense of receiving more citations) for a *small* university in a *small* country, to collaborate with scientists from abroad.

Introduction

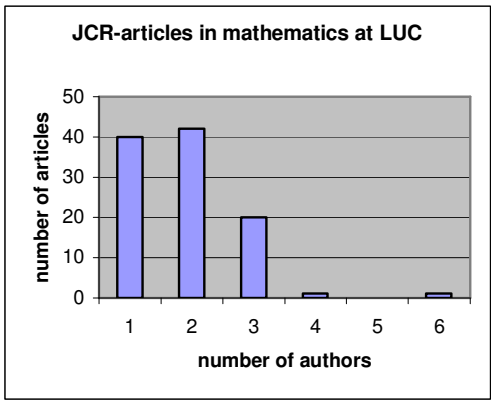
Collaboration is a rich subject as witnessed by Harsanyi's review (Harsanyi, 1993) and the contents of the first and the second Berlin Workshop on Scientometrics and Informetrics. Moreover, collaboration is the key issue to solving complex issues in many areas in science (Cullen et al., 1999). As a research subject in its own right, it can be studied from a practical or from a theoretical point of view (Egghe & Rousseau, 1995). In this note we present

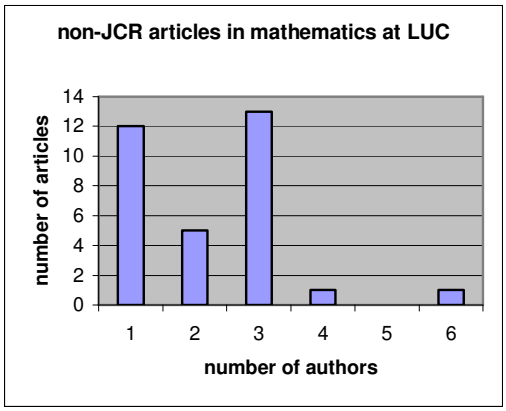
real data (hence taking the 'practical' road) on collaboration and the resulting citation patterns. These data were collected during the evaluation exercise of LUC (Rousseau, 1998). We want to investigate (or at least illustrate) the following problem: are multi-authored articles more cited than other ones? In an earlier article (Rousseau, 1992) we suggested that they were, and that this increased citedness just reflects the conditional probabilities of authors' greater familiarity with the work of their friends and colleagues. The more co-authors a paper has, the more likely it is that another author knows of them, resulting in a citation. It is, however, not clear if it is really true that multi-authored articles are more cited (Smart & Bayer, 1986). One of the factors we will investigate here is the influence of a collaboration with a fellow countryman/woman versus a collaboration with a scientist from abroad. For a small country, such as Belgium, this can make quite a difference.

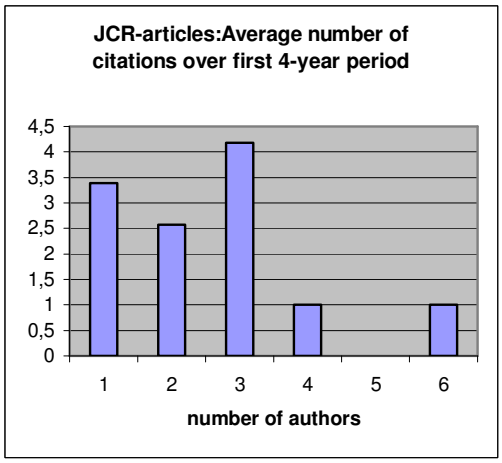
Data are presented in three broad fields: mathematics-statistics-informetrics-theoretical computer science; chemistry, and theoretical physics. As to the publications, we will make a distinction between 'citable' articles in journals covered by the Journal Citation Reports (JCR) and all other articles. Citations were always collected from ISI's databases.

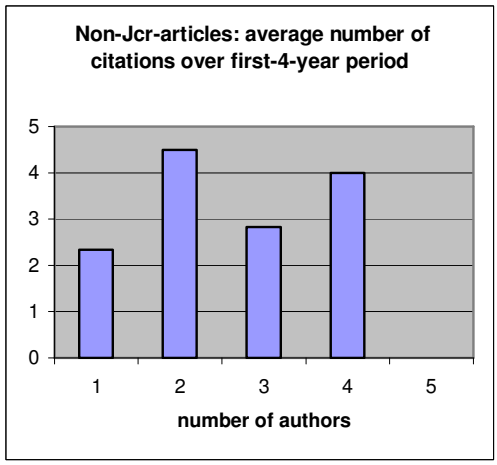
We present graphs showing the number of JCR and non-JCR articles with n, n = 1,2, … authors, the average number of citations these articles received over the first 4-year period and the average number of citations per year. The period covered here lies between 2 and 13 years (depending on the age of the article). We further show the number of collaborations with scientists from Belgium, and with scientists from abroad. Finally, we show the average number of citations per year per category (left: collaborations only with Belgians; right: at least one scientist from abroad collaborates).

Pure mathematics – theoretical computer science – informetrics

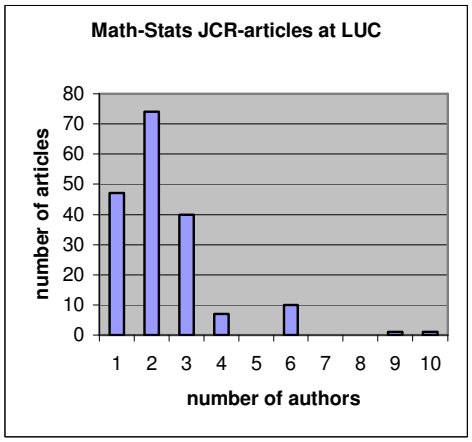


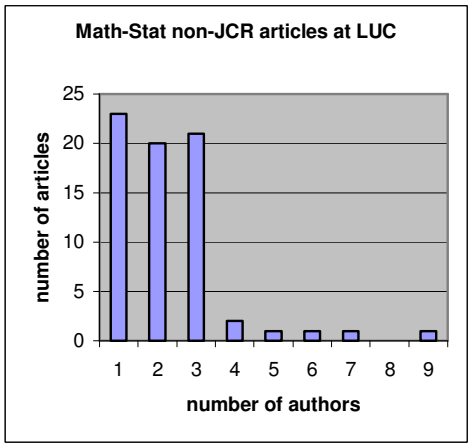


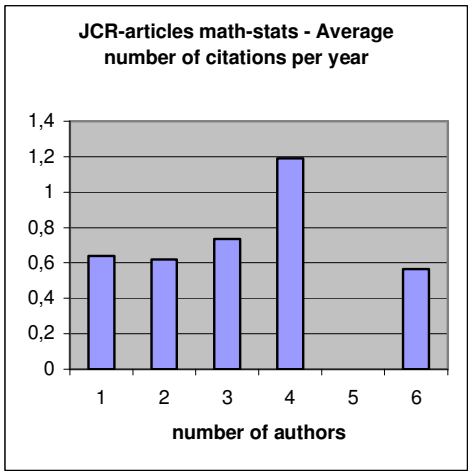


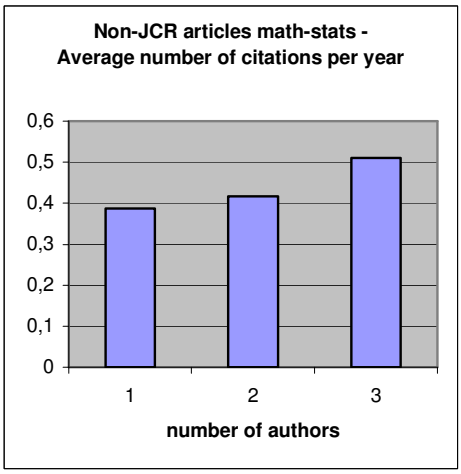


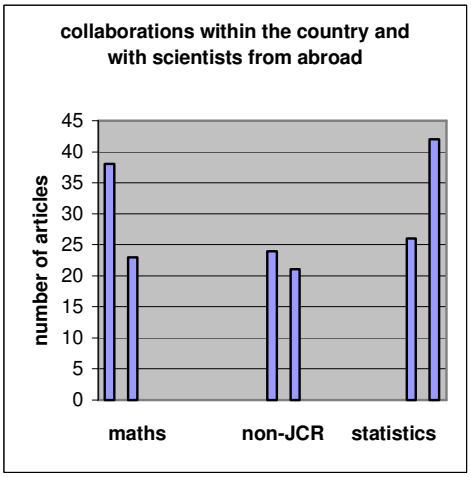
Mathematics and Statistics (including biomedical statistics)

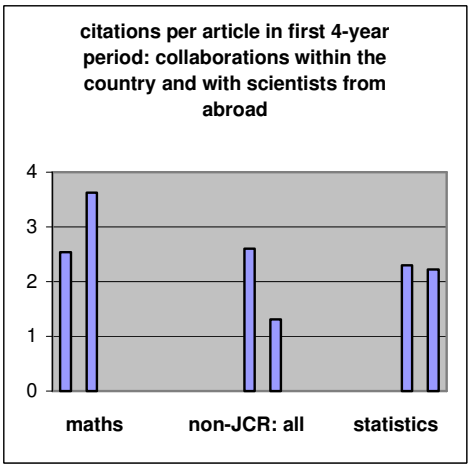


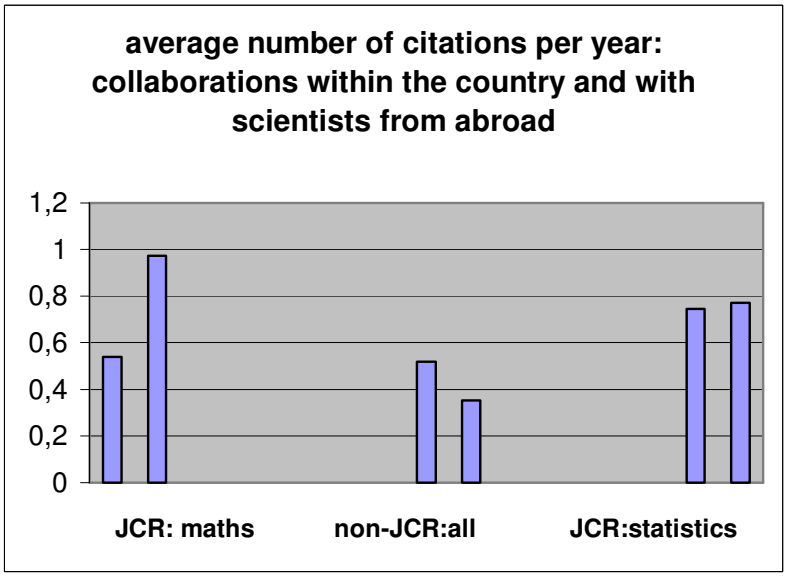



JCR-articles math-stats - Average number of citations per year
1,4
1,2
1
0,8
0,6
0,4
0,2
0
1
2
3
4
5
6
number of authors

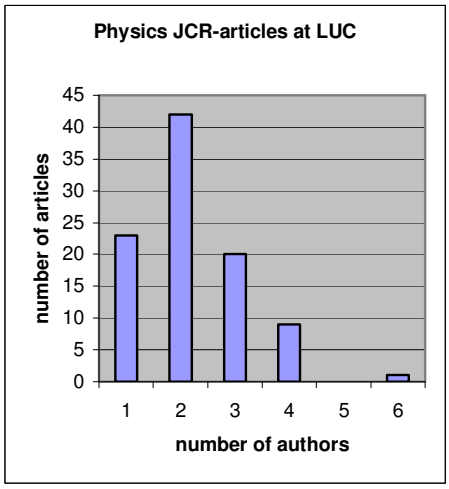

Non-JCR articles math-stats - Average number of citations per year
0,6
0,5
0,4
0,3
0,2
0,1
0
1
2
3
number of authors

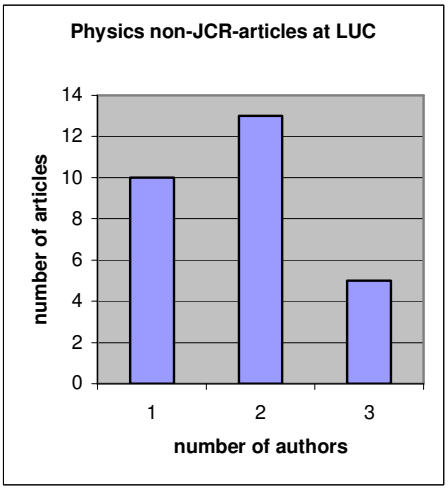

collaborations within the country and with scientists from abroad
number of articles
45
40
35
30
25
20
15
10
5
0
maths
non-JCR
statistics

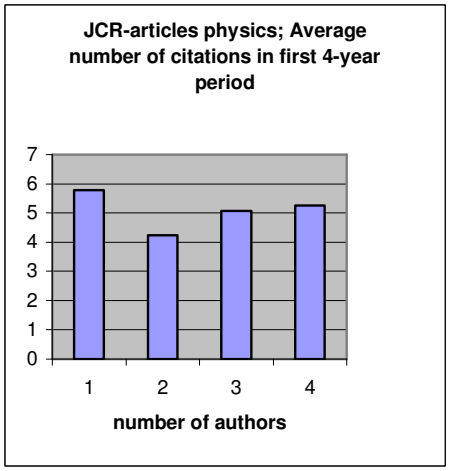

citations per article in first 4-year period: collaborations within the country and with scientists from abroad
4
3
2
1
0
maths
non-JCR: all
statistics

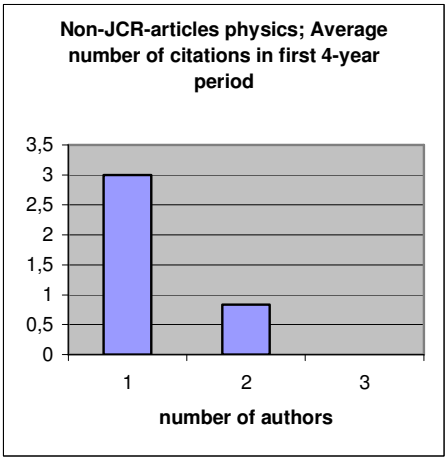

average number of citations per year: collaborations within the country and with scientists from abroad
1,2
1
0,8
0,6
0,4
0,2
0
JCR: maths
non-JCR:all
JCR:statistics

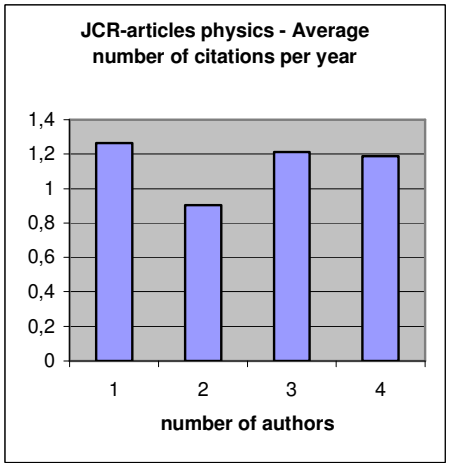
Theoretical Physics

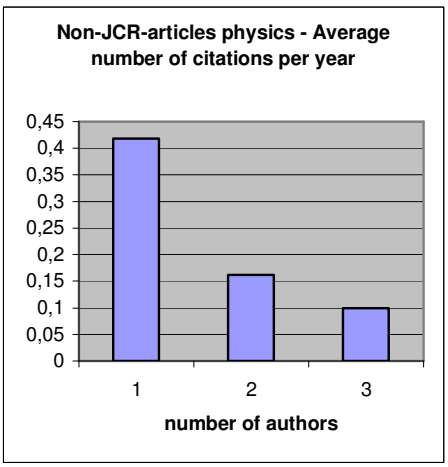


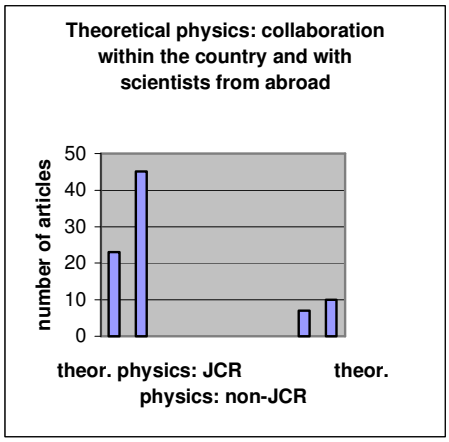


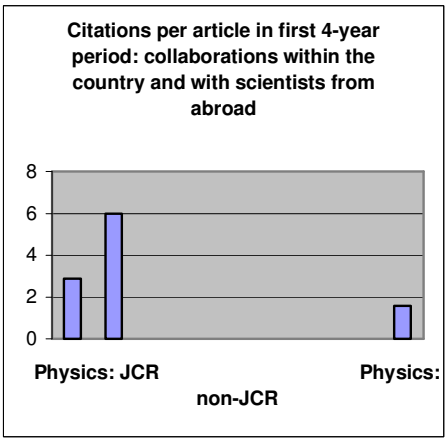


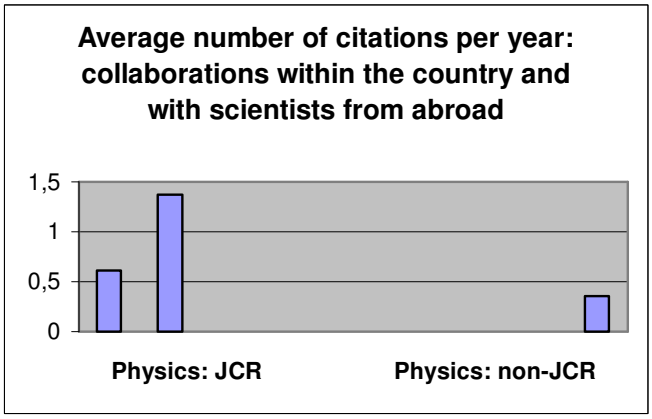




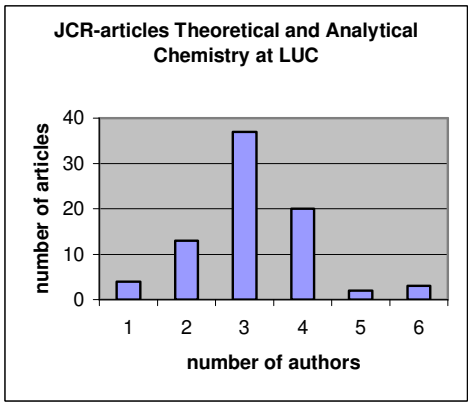


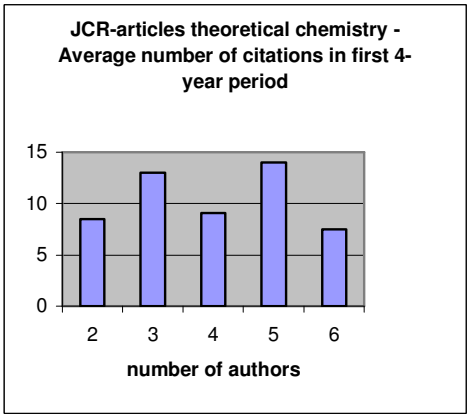


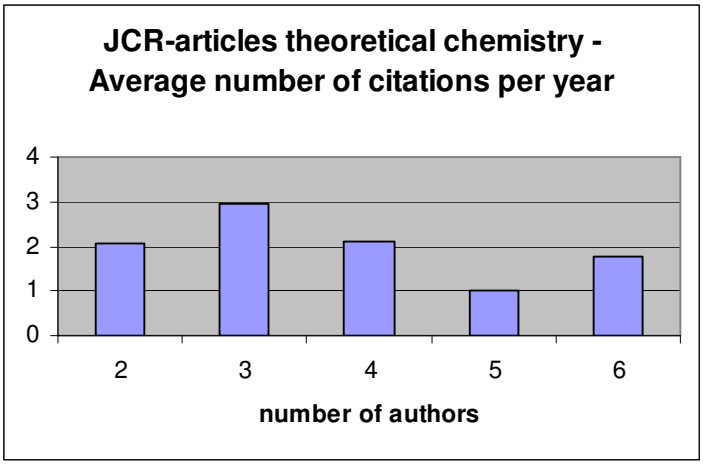




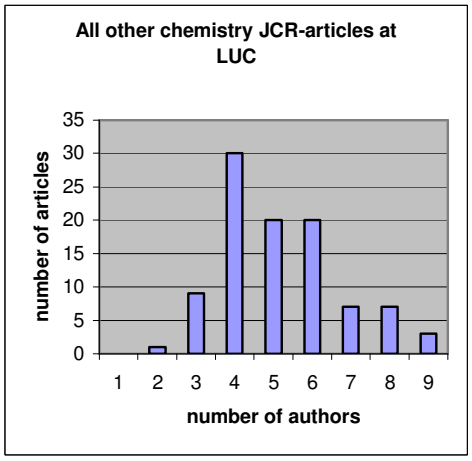
Theoretical and Analytical Chemistry

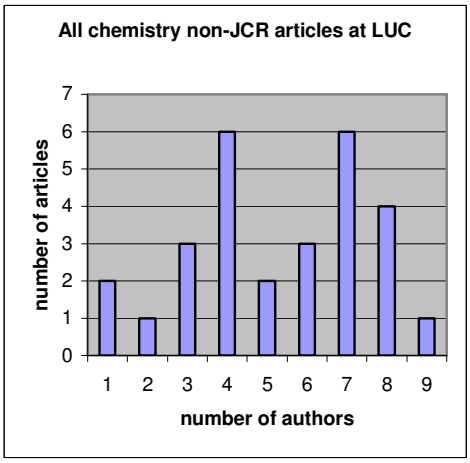


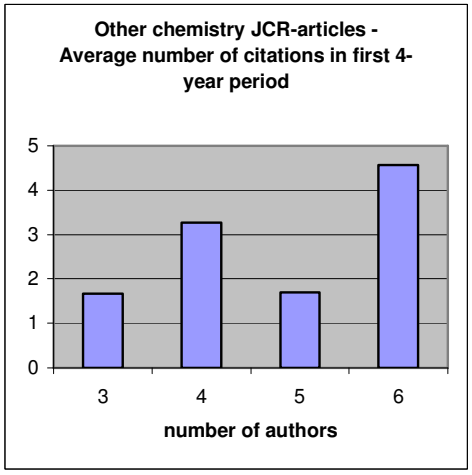


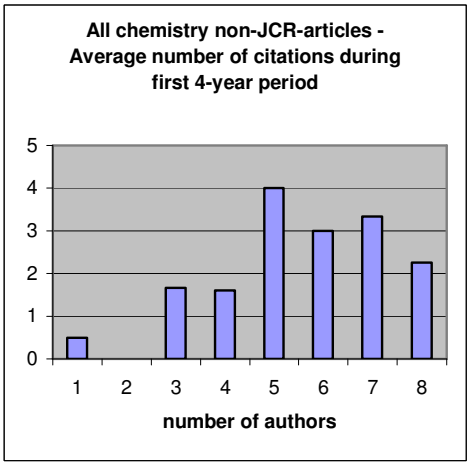


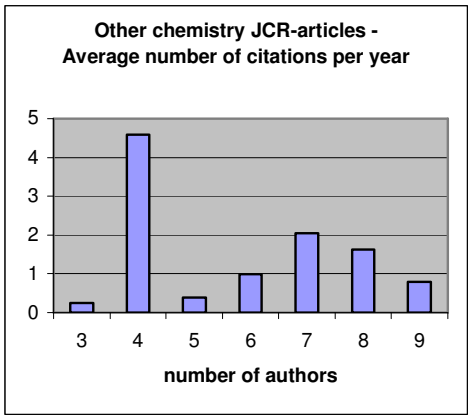
All other chemistry groups
(inorganic, physical, organic, polymer and applied chemistry)

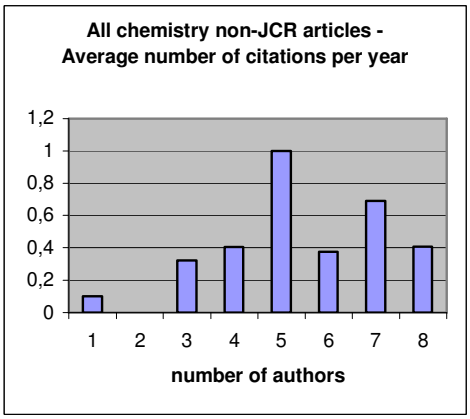


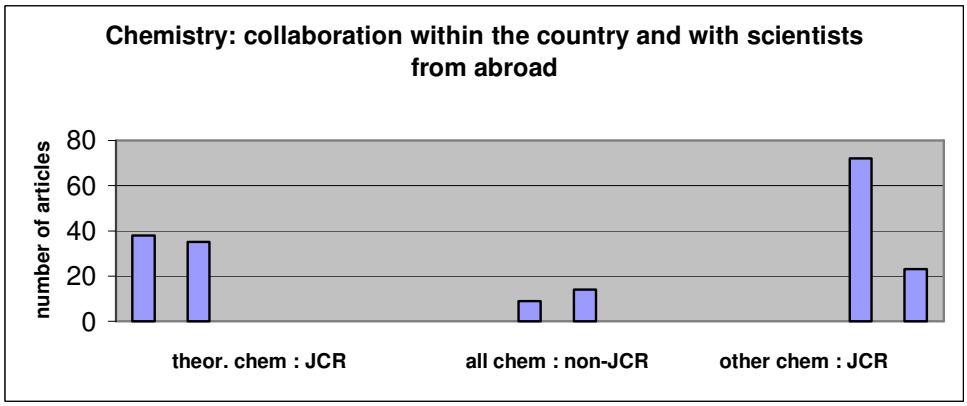


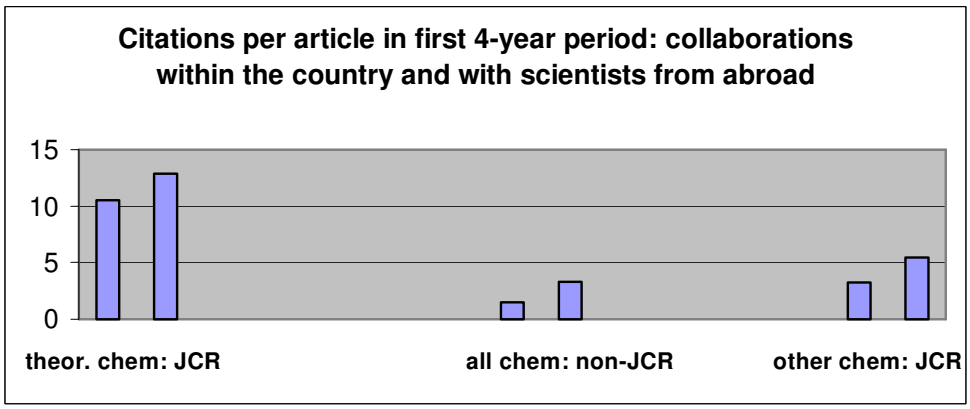


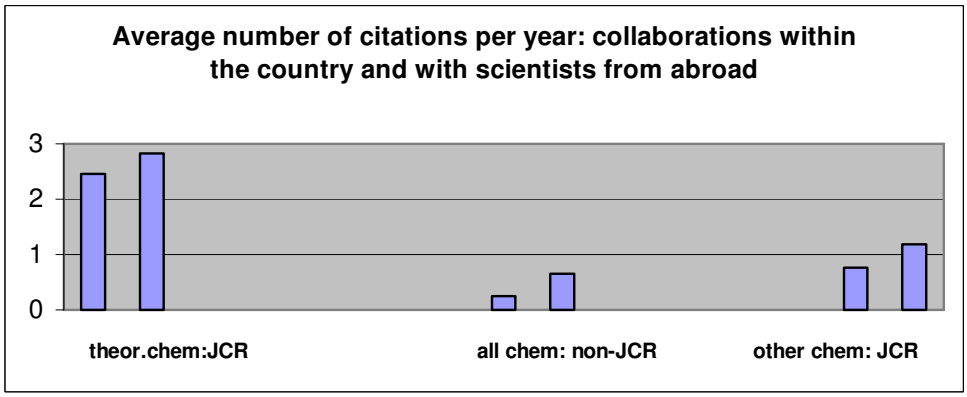



Other chemistry JCR-articles -
Average number of citations per year
5
4
3
2
1
0
3 4 5 6 7 8 9
number of authors


All chemistry non-JCR articles -
Average number of citations per year
1,2
1
0,8
0,6
0,4
0,2
0
1 2 3 4 5 6 7 8
number of authors


Chemistry: collaboration within the country and with scientists from abroad
number of articles
80
60
40
20
0
theor. chem : JCR
all chem : non-JCR
other chem : JCR


Citations per article in first 4-year period: collaborations within the country and with scientists from abroad
15
10
5
0
theor. chem: JCR
all chem: non-JCR
other chem: JCR


Average number of citations per year: collaborations within the country and with scientists from abroad
3
2
1
0
theor.chem:JCR
all chem: non-JCR
other chem: JCR

Comments on the mathematics – statistics group

Adding all publications together (JCR + non-JCR) still yields a mode for the single-author paper in 'mathematics' (i.e. pure mathematics, theoretical computer science and informetrics). Including statistics, however, shifts the mode to articles with two authors. Note also the 9 and 10 author papers in biostatistics. More than 70% of all publications are articles in JCR-journals. It is clear that, for the whole group, multi-authored articles have a higher average number of citations than single-authored ones: 0.71 versus 0.64 per year for JCR publications (or 11% more); 0.44 versus 0.39 for non-JCR publications (or 13% more). This effect does not hold for JCR publications in 'mathematics' during the first 4-year period after publication: 3.24 (single – author articles) versus 2.56 citations for multi-authored ones. In 'mathematics' more collaboration occurs with scientists from within the country, while the opposite is true for statistics. Yet, especially for 'mathematics', collaboration with scientists from abroad yields more citations.

Comments on the theoretical physics group

In theoretical physics the mode is at two authors per article, yet 27% of all publications are single-authored ones. Also here the large majority (77%) of all publications are articles in JCR-journals. Single-authored papers receive more citations than multi-authored ones: 1.26 per year versus 1.04 (or 21% more); 5.79 versus 4.71 during the first 4 years (or 23% more). The effect is even more pronounced for non-JCR publications. This group has a clear preference for collaborations with scientists from abroad. These collaborations also yield more than the double number of citations than collaborations within the country.

Comments on the chemistry groups

In theoretical and analytical chemistry the mode is at 3 authors per paper, while for the other chemistry groups (inorganic, physical, organic, polymer and applied chemistry) it is situated at 4 authors per paper. These other chemistry groups have, moreover, more authors per paper in general. The large majority (86%) of all publications are articles in JCR-journals. It seems that the largest

number of citations per paper occurs in both groups at the mode (3, resp. 4 authors). The 'other' chemistry groups have a clear preference for collaborations within the country (often within the group). Such a preference does not exist in theoretical chemistry. For all groups collaboration with scientists from abroad yields more citations per article than collaboration within the country.

Global comments and conclusion

It is certainly not true that always multi-authored articles receive more citations than single-authored ones, nor is the saying 'the more co-authors, the more citations' always correct. In this sense our findings corroborate those of Smart and Bayer (1986): multi-authored articles have usually higher citation frequencies than single-authored ones, but this relation is not so strong as to hold under all circumstances and for all domains of science. On the other hand, it seems, at least for the cases studied here, that it is favourable (in the sense of receiving more citations) for a *small* university in a *small* country, to collaborate with scientists from abroad. We finally note that in the fields studied here, the large majority of all publications are articles in JCR covered journals.

References

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