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# *Journal interaction*

## ***A bibliometric analysis of economics journals***

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Citation analysis is widely used as an evaluation method within sciences. This paper seeks to qualify citation analyses by adding insight into the sciences under investigation. The paper presents a method of citation analysis using multiple linear regressions on both cited and citing economic journals. The proposed method controls for the different characteristics of the journals as well as for their degree of interaction. The paper shows some of the hidden structures within the economic science that are determinants for the results from citation analysis. The analysis indicates several underlying factors within citation patterns in

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economics that should be accounted for when doing citation analysis for evaluation purposes. A journal is to a large extent self-supplying with citations, but when this is extracted from the data, journals are dependent on similar journals - with respect to sub discipline, geography and JIF - to supply citations.

Keywords: Journal evaluation, journal interaction, citation analysis, Journal Impact Factor, economics, multiple linear regression.

## **Introduction**

Citation analysis in general and the bibliometric indicator Journal Impact Factor (JIF) in particular play a dominant role in sciences for the perception of quality and prestige. Smith (1997) even finds that citation analyses are considered so important that some journals try to manipulate their way to a higher JIF.

One is left to wonder why an evaluation method, that has been so influential in scientific circles, sometimes is used so detached from the very science it is evaluating. Citation analyses only rarely use thorough investigations of the evaluated science as their starting points. Most often only a ranking of journals, institutions etc. is presented without any consideration of the underlying characteristics of the science concerned.

A ranking of all economic journals in a single list is a testimony of a mono-hierarchical perception of the economic sciences. Such a list is useful only if it is assumed that all the journals of the ranking are comparable. This perception builds on a normative line of thinking which states that knowledge that is used by researchers is cited whereas the knowledge, that is not cited, remains unnoticed and unused by others. Then - according to Merton (1979, p. 50) - one should question its value.

In many studies economics has been considered to be a homogeneous international science. For example, Pierce (1992) considers economics to have a higher degree of consensus than other sciences and thus only choose a single American journal for his analysis of bibliometric indicators. In addition there exist a number of examples of evaluations based on citation analysis which treat economics as a single group. A survey of older analyses can be found in Beed and Beed (1996). More recent contributions includes Kalaitzidakis et al (2001) who weights JIF by self citations, article age, journal size and impact using a number of important economic journals. Kocher and Sutter (2001) calculate average JIFs and thus even out year-to-year fluctuations, and Liner (2002) ranks journals according to the number of citations in textbooks. In addition to these studies a number of papers uses the ISI JIFs available from Journal Citation Reports (JCR), see for example Hodgson and Rothman (1999), Sutter and Kocher (2001a) and Sutter and Kocher (2001b).

However, Whitley (2000) points out that economics should only be considered a homogeneous science when the topic of analysis is anglo-saxon economics. This view has been challenged by others, e.g. Portes (1987, p. 1330) who finds differences between American and European economic research with respect to influence and size of scientific production. On the basis of co-citation analysis McCain (1991) constructs a bibliometric map of economics that shows clusters in groups according to subject of which a cluster of journals exists which is termed the Western European point of view. This cluster consists of a number of European, in particular British, journals. Frey and Eichenberger (1993, p. 192) stress that European and American economists have clearly different perceptions of the practise and behaviour within economics as well as of the economic science as a whole. Elliott et al (1998) investigate geographic diversion of authors in 8 economic journals and find clear American dominance - even in the European journals. Hodgson and Rothman (1999) examine the institutional background of editors and authors of 30 economic journals and also find strong American dominance. In addition, Kirman and Dahl (1994) and Kalaitzidakis et al (1999) evaluate European research separately in order to compensate for the otherwise strong focus on American researchers. As the above mentioned studies suggest it thus is difficult to consider economics as a single general science for North America and Europe.

In addition to the geographic dimension it has been pointed out that also other differences cause economics to be anything but a single homogeneous science, cf. Whitley (1991, p. 29). He states that there exists a dominant core within economics which maintains a particular view of economics. This self reinforcing hierarchy does not allow neither alternative perceptions nor journals that are dealing with such perceptions to gain a foothold. It has also been stressed that economics consists of a number of sub-disciplines that are not directly comparable. Barrett, Olin and Von Bailey (2000) thus list 16 sub-disciplines within economics each of which are characterised by different core journals.

Citation analyses are widely used for evaluations even though the fairness of such analyses is debatable. Therefore it is important to attempt to qualify such analyses since their importance for science is huge. The starting point for this paper thus is to use a method of citation analysis to map the structures that exist within a science (in this case economics). Such structures may well be important for the results of citation analyses. Thus the central question addressed in this paper is whether the interaction between journals is determined by underlying factors which depend on the characteristics of the citing and cited journals.

Interaction between journals has been the topic of several papers. Beckmann and Persson (1998) use an investigation of the interaction between 13 economic journals to calculate each journal's impact in the

other journals. Üsdiken and Pasadeos (1995, p. 522) conclude that an author's geographic location (the institutional affiliation) plays an important role in the fragmentation of the sub-discipline area studies. Danell (2000) analyses the degree of dependence between American and European journals and finds clear American dominance. Danell and Engwall (2001) investigate to what extent management journals are americanised such that both North American and European journals to a large extent are dominated by American research. Danell (2001) conducts a dynamic investigation of the networks that are formed between North American and European management journals.

All of the above mentioned studies of interaction between journals analyse the degree of interaction, but none of them focus on possible causes or explanations in the data. In this sense the point of view of Baldi (1997, 1998) on citation processes is useful. He points out that the citation process should be considered a dyadic relationship between the citing and the cited document. A cited document cannot exist without the existence of a citing document, and that is - according to Baldi - an often overlooked aspect in analyses of the citation process, since it enables us to explain citations by characteristics of both sides of the dyadic relationship which can be done using multivariate regression models. Bennion and Karschamroon (1984) is an example of bibliometric regression models including citations included among the variables.

The paper is structured as follows: The next section surveys the research already existing within this field. The following section then presents and discusses the collected data and the chosen methods, followed by a section with the results of the analysis. The last section contains conclusions and a discussion of perspectives of the paper.

## **Methods**

The analysis in the present paper is based on a number of chosen economic journals. It is necessary to collect a rather homogeneous data set in order to keep the number of variables at a reasonable level. One way of limiting the data set is to use journals from only one science. However, a science can be greatly specialised as shown by Barrett, Olin and Von Bailey (2000). They list 16 sub-disciplines within economics that are characterised by large differences in publication practices. In addition, Laband (2002) points out that authors are listed alphabetically within economics in 89 per cent of all articles whereas this is only the case for 44 per cent within agricultural economics. On the other hand 77 per cent of articles within agricultural economics are written by more than one author whereas only 65 per cent within economics are co-authored. A good explanation for this observation could be that the loss for the author who has been main author is greater when the risk is that he or she may not be the first author is greater.



Davis (1998) points out that it can be problematic to use the subject categories of the citation indexes for analytical purposes and Laband and Piette (1994, p. 642) point out that about 15 per cent of the journals in the subject category "economics and business" in 1991 were not economics journals. Therefore a group of economics journals is selected on the basis of two qualitative studies by Elliott et al (1998) and Braüninger and Haucap (2001). The former study identifies 8 journals that in the authors' view are core economic journals. The latter study is a German qualitative investigation of the most influential journals within economics of which we include the 50 highest ranking journals. An additional selection criterion is that the journal must be scientific and should belong primarily to the economic science. The selection on the basis of this criterion is done here by using the criteria set up by Kalaitzidakis et al (2001). Furthermore, the journals have to publish a certain amount of articles and receive a certain amount of citations during the six five-year citation periods in order to obtain valid rankings. The limit has been set to 50 articles although three exemptions have been made with journals that fulfilled all other criteria, but in one or two periods fell just short of the limit of 50 published articles. On the basis of these criteria the 19 journals shown in table I have been selected.

Take in table I

The size of the data set is as always a debatable issue. The analysis here includes 19 journals, but is this journal set representative for the entire population of economic journals? The workload in calculating the data for the analysis is a limiting factor here since the number of journal determines the size of the matrices involved in the analysis. With 19 journals times 19 journals times 16 variables the resulting matrix has 34,656 cells, but if the number of journals doubles the number of cells quadruples to 138,624.

In this paper a 2-year publication period and a 5-year citation period is used. This means that the analysis will include the citations over five years to publications from two years, e.g. citations in 1987-91 to articles published in 1987-88. In order to obtain a sufficiently large amount of data the length of the publication window is set to two years. The length of the citation window must be set in accordance with the degree of obsolescence of articles within the economic literature since we want to include a large percentage of the total number of citations received by the articles under analysis. Only a few investigations of obsolescence within economics have been made. One of the few is Dorban and Vandevenne (1991) who find that 90 per cent of all citations in articles are to publications less than 15 years, but only 24 per cent are to publications aged 0-4 years. Therefore the 5-year citation period used here seems to be in accordance with practice within economics.<sup>i</sup>

Preliminary searches conducted before the start of the actual analysis showed that before the mid-1980s the number of observations in the data material is too small so the initial publication period used in the analysis is 1987-88. The last publication period is 1997-98 since the corresponding citation period is 1997-2001.

The number of citations is used as a dependent variable in three different forms. In order to avoid that journals with a large number of citations and/or a large number of publications bias the results the number of citations in journal x to journal y will be measured as the number of citations to journal y divided by the total number of citations in journal x to all the 19 journals included in the analysis, cf. table II.

Take in table II

The interaction between journals is primarily described by three types of independent variables: geographic variables, sub disciplinary variables and citation variables.

The geographic variables are constructed by determining the geographic location of each journal, i.e. their place of publication. For a large part of the journals we use the location determined by Elliott et al (1998), Hodgson and Rothman (1999) and Portes (1987) while the location in Ulrich´s international periodicals directory was used for the remaining

journals. When using Ulrich's for determining the geographic location it can be problematic for journals published by e.g. Elsevier who are all registered in Ulrich's as being published in The Netherlands while the reality may be different. If no certain geographic location could be determined the journals were discarded from the analysis. The resulting data set consists of nine North American journals and ten European journals.

The citation structure of the journals is described by three variables. Firstly by the share of self-citations and this variable may be important as journals apparently are prone to citing themselves mostly. Secondly, each journal's JIF is calculated for each time period. Finally we include a variable indicating whether the journals have approximately the same JIF.

The Journal Impact Factor is highly disputed, and some critics recommend that JIF should not be used for evaluation at all, see e.g. Seglen (1997). Others accept JIF but prefer that diachronous citation analyses are used for evaluation purposes as recommended by e.g. Ingwersen, Larsen and Wormell (2000). A recent example of diachronous citation analyses is Glänzel et al (2003). Hence, we use diachronous JIFs in this paper. The calculation of the JIF is formulated in Frandsen and Rousseau (2004).

$$IF_S(n_p, n_c, Y_p, Y_c) = \frac{\sum_{i=0}^{n_p-1} \sum_{k=0}^{n_c-1} CIT(Y_c + k, Y_p + i)}{\sum_{i=0}^{n_p-1} PUB(Y_p + i)}$$

$n_p$  denotes the length of the publication period

$n_c$  denotes the length of the citation window

$Y_p$  is the first year of the publication period

$Y_c$  is the first year of the citation period

The sub disciplinary variables describe the subject of each journal. The variables have been constructed on basis of Barrett et al (2000). Nine different sub disciplines are constructed, but some of these groups contain only one journal and are thus excluded from the analysis since. A total list of independent variables is shown in table III.

Take in table III

The searches have been made in all three citation data bases. Only the document types article, note, review and letter are included. This selection has been made in order to exclude documents such as editorials where the scientific content is usually smaller. ISI's calculation of JIF does not include the document type letter, but Hjortgaard Christensen et al (1997) recommend including this type of document.

Before the actual analysis of the data can begin six matrices (one for each time period) of data must be transferred to a spread sheet or another data analysis tool. In a spread sheet usually each combination of citing and cited journal must be written in a single row since most spread sheets do not allow statistical analysis of matrices. This means that the 6 19-by-19 matrices are unfolded to a total of  $6 \times 19 \times 19 \times 16 = 34,656$  cells in a single spread sheet in order to carry out the statistical analysis.

The analysis below consists of different statistical analysis of the data material. Multivariate linear regression analysis of the statistical relations between the dependent and the independent variables gives information on statistically significant relations having controlled for otherwise hidden relations with other variables. Furthermore, we are given the slope coefficients and a p-value for the linear relationship. Pearson's  $r^2$  reveals information about the degree of correlation between the dependent and the independent variables when controlling for the effects of the other variables. The analyses have been made in Microsoft Excel and SPSS.

## **Results**

The results of the analysis can be divided into the three subjects under investigations: geographic relationships, sub disciplinary relationships and JIF-relationships. In addition to these areas there are preliminary analyses of time periods and self-citations that are important for the subsequent

results. The results from the multivariate linear regression analysis are shown in table IV.

The table below shows the results from the multivariate linear regression analysis. The dependent variable is the share of citations from one journal to another journal measured in percentage points. Thus the coefficients may be interpreted as the change in the share of citations given to journal if the characteristic changes by one unit. For example, the coefficient 0.962 to JIF shows that if a journal's JIF increases by one, it will all other things equal receive a share of citations that is 0.9 per cent higher.

Take in table IV

As mentioned above we start out by noting the importance of the six different time periods. It turns out that the time periods do not have a statistically significant influence on the citation pattern when we analyse the entire data set (the p-value is .09). Furthermore, there is no statistically significant relationship to be observed when the journals are analysed separately. Hence in the following we use the entire data set as a pooled set and not divided into the different time periods.

Journals often cite themselves mostly and Van Raan (1998) stresses that it is important to take account of self-citations in any citation analysis. The

present data material also shows a large effect of self-citations. As shown in the results from the multivariate linear regression analysis a journal gives an 8 percentage points larger share of citations to itself than if it had been any other journal having the same characteristics. The p-value for this relationship is  $8.12 * 10^{-70}$ , and .4 per cent of the total variation of citations across journals can be explained by self-citations. In the following we have thus controlled for self-citations in the analysis.

### **Geographical relationships**

Two kinds of geographical relationships can be found in our data material. One is that North America dominates, and the other is that it is important for citations that the citing and cited journals are from the same region.

Tables V and VI illustrate the average shares of references to North American and European journals including and excluding self-citations. The share of citations may also be seen as the degree of dependence between the journals, see e.g. Danell (2000). Table IV shows that while almost 70 per cent of citations in the North American journals are given to articles in North American journals, the corresponding percentage for European journals is only around 50. Furthermore, slightly less than half of the citations given in the European journals are to articles in the European journals.

Take in table V



The inclusion of self-citations in table V may distort the true citation pattern since the degree to which journal cite themselves is not necessarily the same. Table VI therefore shows citations in the North American and European journal excluding self-citations. The result is striking. Having subtracted self-citations it becomes difficult to distinguish the North American journals from the European as journals of both origins give citations in a similar fashion. Thus roughly 60 per cent of citations are given to the North American journals from both groups.

Take in table VI.

It is apparent that both North American and European journals cite North American journals mostly. This pattern is also confirmed by the linear regression analysis where the coefficient to the dummy variable for European origin of the cited journal is negative and strongly statistically significant. This analysis thus confirms that - having controlled for other journal characteristics - European journals are cited significantly less than North American journals. A European journal receives a share of citations that is half a percentage point smaller than a North American journal.

As it was stressed in Section 2 above strong North American dominance have also been found by other researchers in this area. Portes (1987, p. 1329) provokingly announces that a part of the research strategy in

European economics is “Let’s be more like America”. American economic research is more prestigious, and in Europe researchers try to apply the same methods, use the same ideals etc. to gain the same prestige. As noted by Van Dalen (1999) another indicator is that 44 per cent of the Nobel Prize winners in economics are born outside the US, but all of these have begun their award winning work in America. There is a large export of economic researchers from the rest of the world to the United States (and Canada).

Even though strong American dominance has been widely recognised this does not make the phenomenon any less interesting. Almost all economic journals describe themselves as being “international” and accept manuscripts from all over the world. As manuscripts allegedly are judged purely on their academic quality such a strong American dominance should not necessarily prevail. While North American and European journals in principle publish the same types of articles, the analysis clearly shows that there is a difference in the degree of which these articles are cited, even when controlling for a number of factors such as JIF. Such a result need to be taken into account when rankings of journals are constructed for evaluation purposes since publication in European journals will affect citation numbers downwards.

Another interesting geographical relationship that can be observed from the data is that journals tend to cite journals from their own region more

- having controlled for self-citations and geographic origin of the cited journal. Thus journals from the same region as the citing journal receive on average a 0.65 percentage point higher share of citations than journals from the other region. (Pearson's  $r^2$  is 0.006 and a total of 0.6 per cent of the total variations in citations can be explained by the same-region variable). An interpretation of this result could be that economics is not such an integrated science after all. At least there seems to some indications of a partial geographic division of economics.

This result is not necessarily expected as the analysis only deals with international economic journals. Even though we have divided the world into just two regions it is still possible to observe some degree of separation between European and North American journals. Most likely this relates to the fact that the research networks primarily exist separately in North America and Europe, and the knowledge of the research going on within your own network will always be larger. But if economics should be viewed as one large single science such tendencies should not be observed.

### **Subdisciplinary relationships**

As already pointed out there are large differences with respect to the publication practise within economics. This pattern is confirmed by the results herein. Table VII thus show the percentage of citations that are given to journals within the same sub discipline and the percentage given

to journal outside the sub discipline with and without accounting for self-citations. It is clear from the table that sub disciplines are to a large extent self-contained since almost 60 per cent of citations are given to journals within the same sub discipline when citations to the publishing journal (which of course belongs to the sub discipline) are excluded.

Take in table VII.

The strong degree to which journals tend to cite journals within the same sub discipline is confirmed by the regression analysis. Journals within the same sub discipline on average receive a share of references that is 2.7 percentage points higher than an otherwise similar journal from another sub discipline. The relationship is strongly statistically significant, and it explains a total of 1.4 per cent of the variation in citations. McCain (1991) finds a similar pattern when drawing bibliometric maps for economics. She finds that economic journals tend to cluster in different areas in the map indicating a segregated science. It is interesting that while the method of analysis is very different from the one in the present paper the results nevertheless are similar.

The existence of such a strong statistical sub disciplinary relationship emphasizes the importance of subdividing rankings of economic journals into groups according to sub discipline. A single overall ranking may thus

be dominated by journals within a single sub discipline whereas other sub disciplines are too small to be even represented in the list. Researches working within smaller sub disciplines may risk that their work is perceived as having a low quality even though this entirely is due to the ranking method which fails to take properly account of the domain organisation.

### **JIF-relationships**

Two distinct relationships between the JIFs of the citing and cited journals can be found in the data material. One relates to the JIF of the cited journal, and the other relates to the difference between the JIFs of the citing and cited journal. These two relationships will be discussed in turn.

First, there is a strong statistical relationship between the JIF of the cited journal and the share of the citations it receives, cf. table IV. Empirically the relationship is such that if a journal has a JIF that is 1 higher than an otherwise identical journal, then the former journal receives a roughly 1 percentage point higher share of citations than the latter journal. Since the share of citations to a journal is highly linked to the absolute number of citations to the journal, this relationship was to be expected. Similarly it should come as no surprise that this statistical pattern can explain a rather large part of the total variation in citations, namely 22 per cent. The interesting part of the analysis is not this relationship, but rather the

patterns found even when controlling for the fact that journals with higher JIFs tend to have larger shares of citations.

In addition to the simple relationship between the size of a journal's JIF and the share of citations it receives, another more interesting pattern relates to the difference in JIF between the citing and the cited journals. In figure 1 the journals in the study have been divided into 6 groups according to JIF. Thus group 1 is the group of journals with the highest JIFs, group 2 is the group with the second highest etc. The figure shows the share of citations given to and from the different groups. The citing journals are shown along the horizontal axis while the cited journals are shown along the vertical axis. However, self-citations have been "extracted" from the numbers in the figure. This has been done for the following reason: Since a journal always belongs to the same groups as itself, and since self-citations are widely used, cf. above, the share of citations to the journals own group would be overstated if self-citations were included. The extraction has taken place by replacing the actual share of citations given by a journal to itself by the estimated share of citations to a journal with the same characteristics using the estimation equation in table IV. The figure shows that JIF-group 1 gives around half of its citations to JIF-groups 1 and 2 whereas JIF-group 6 only gives around 30 per cent of citations to these two groups. When looking the other way around a similar pattern emerges. Thus JIF-group 1 only gives around 20 per cent of its citations to JIF-groups 5 and 6 while the similar

number for JIF-group 6 is 35 per cent. Once again it should be made clear that self-citations have been extracted from these numbers. It thus appears that journal cite journals with a similar JIF more than others such that high JIF journals cite high JIF journals and low JIF journals cite low JIF journals.

Take in figure 1.

This pattern is confirmed by the multivariate linear regression analysis by including the absolute difference between the JIF of the citing and cited journals. It could have been argued that the pattern with journals citing journal with similar JIFs more was due to the fact that journals within the same sub discipline tend to have similar JIFs. However, in the linear regression analysis the effect is still present even though sub disciplinary status has been controlled for. This number is large when the journals have very different JIFs and small when they have little difference in JIFs. The regression analysis thus shows that if the difference between the JIFs of the citing and the cited journal increases by one then the share of citations given decreases by .2 per cent. Even though this effect is not large numerically it is strongly statistically significant, and it furthermore should be remembered that this is the marginal effect, such that all other variables are held constant. It should be noted that if citation patterns only depended on the quality of publications then this effect should not be observed, since in that case all journals would depend on a core of high-quality journals for the bulk of citations.

However, this is not the case. A journal is to a large extent self-supplying with citations, but when this is extracted from the data, journals are dependent on similar journals - with respect to sub discipline, geography and JIF - to supply citations. These findings renders support to Whitley (1991) who claims that there exists a dominating core within economics, since core journals seem to cite other core journals. But there also exists a large periphery that - although they cite each other - finds it difficult to gain foothold. The journals within this periphery must publish research that has a different scope or use since it is relatively more interesting to other periphery-journals than to core journals. Thus for evaluation purposes it could be relevant to consider including journals with low JIFs but with a specific scope relevant to the evaluation.

## **Conclusion**

Both evaluations of scientific journals and the quantitative methods for evaluations are here to stay. Researchers, politicians and publishers often use citation analyses as the basis for statements on research quality or impact. Thus the present paper has not tried to argue against the strong position taken by citation analyses. Rather it has discussed the possibilities for strengthening these analyses by ensuring a large degree of reliability and validity. This has been done by pointing out some apparent weaknesses of the simple citation analyses.



Weaknesses of citation analyses can be partly dealt with by finding the hidden structures of the science under evaluation. The present paper has investigated whether an analysis of the interaction of economic journals, where the different characteristics of the journals are taken into account, can contribute to a larger insight into the economic science and thus be used to qualify citation analyses.

Once again it must be pointed out that the analysis in this paper only has included a subset of the economic journals and of the economic science. Bearing this reservation in mind we can conclude the following on the basis of our investigation: There are several underlying factors influencing the citation patterns within economics. These factors should be taken into account when conducting citation analyses for evaluation purposes. The results in the paper show that economics are clearly dominated by North America, and that researchers in Europe and North America to some extent are separated into two different patterns of citations and publications. Furthermore, economics can be subdivided into a number of different sub disciplines which mostly use literature from their own sub discipline. Finally, the results indicate that economics consists of a dominating core of journals that to a large degree cite each other and therefore self reinforces this core. A large group of journals in contrast are in the periphery of economic research.

The factors which have been found to influence citation patterns within economics may be important only for patterns within this science. Other sciences may exhibit other patterns and thus other underlying factors. E.g. one could imagine that citation patterns in law sciences are more tightly connected to geographic locations than economics since law and judicial sciences is closely related to legislation in the individual countries as pointed out by Wallerstein (1996). This aspect only makes this type of analysis more useful because it enables us to analyse some of the characteristics that separate the sciences. In an evaluation that takes place across a wide board of sciences an analysis of both cited and citing journals may help to determine which factors should be taken into account in the evaluation. If for examples the judicial science and economics were to be analysed in the same evaluation one factor that should be taken into account is that law journals to a much larger degree are in other languages than English and therefore are not quite as well represented in the citation databases as their counterparts within economics.

This paper has looked into the possibility of analysing citing and cited journals to map some of the hidden structures within economics. It has been shown that this method is highly useable for this purpose. As the present paper has only included 19 journals from a single science obvious extensions for further research are to look at a larger set of the economic

journals (for example by including journals from more regions) and to make comparisons across sciences.

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## Appendix 1. Detailed description of searches

A detailed description is given for the benefit of reproducing the searches. The number of references in a journal to another journal is determined by the following searches which also yield the numerator in the expression for JIF.

```
S jn=econometrics/1997:1998
```

With the following search we limit the document types in order to focus on documents with a scientific content:

```
S s2 and (dt=article or dt=review or dt=note or  
dt=letter)
```

Subsequently the reference lists are ranked alphabetically:

```
Rank cw cont alpha
```

For this search continuous output is chosen since all cited work and their shares are needed for the subsequent calculations. Since these fields are uncontrolled attention must be paid to the different forms of names as well as changing names of journals. The Scandinavian Journal of Economics was thus earlier called The Swedish Journal of Economics.

For the calculation of the JIF we need to find also the denominator in the formula above:

```
S s1(s)cy=1997:1998/1997:2001 not ud=2002?
```

where s1 is the different name forms the journal has in the CW-field. The "not ud=2002?"-command is added to exclude records added to the data base the year after the publication year as Hjortgaard Christensen et al (1997) point out this makes the searches reproducible.

We also limit this search according to document types:

```
S s2 and (dt=article or dt=review or dt=note or dt=letter)
```

All three citation bases are used for this search since the journal may well have been cited within other sciences. Ingwersen and Hjortgaard Christensen (1997) point out that when using different data bases duplicates may be found. These are eliminated using the Remove Duplicates-command. Since this command is not always working as intended it is also recommended to use the Identify Duplicates Only-command.

By using the Set Postings On-command we are shown both items and postings as results of the search. "Items" counts the number of documents that cites the journal whereas "postings" counts the total number of citations to the journal. However, the number of postings includes duplicates and must be normalised by using the procedure by Hjortgaard Christensen et al (1997). This means subtracting the number of items from the number of postings in order to correct the fact that publication years are duplicates and dividing the result by two since both "cited year" and "cited work" are counted.

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<sup>i</sup> Some authors point out that there seems to be a rather slow publication process in economics, see e.g. Franes (2002) or Trivedi (1993). In addition, Ellison's (2002) findings indicate that the publication process have slowed down over time. From 1940 to 1960 3 to 4 months passed from an article was sent to a journal until it was accepted. In the 1990s this period was 12-22 months. Since the analysis in the present paper does not focus on evaluation of articles, but rather stresses the development of journal interactions over time, we believe that the 5- year citation period used herein is appropriate.