Obtaining Macro-Information on References from WoS online Data: Investigating a Problem in Cross-Disciplinary Transfer

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Introduction

The Web of Science (WoS) online interface provides bibliographic details of both the citations and the reference of articles. However, WoS provides considerable macro-level information on citations that it does not provide on references. For example, the task of obtaining from WoS information on the number of documents published between 2000 and 2007 that cite Economics articles published in 2000 can be accomplished using the 'Refine' and 'Analyse' facilities, whereas the task of obtaining data on the number of Economics documents published between 2000 and 2007 that refer to articles published in 2000 is less straightforward. This paper introduces a technique for obtaining macro-level information on references and applies it to investigate the effect of disciplinary overlap on the evaluation of cross-disciplinary transfer. For the WoS subject category of Economics, disciplinary overlap consists of all articles that are both in Economics and another WoS subject category and 'cross-disciplinary transfer' refers to both the citation of Economics articles by articles in other subjects and references in Economics pointing to articles in other subjects.

When investigating cross-disciplinary transfer, disciplinary overlap can be either included or excluded. When disciplinary overlap is included, cross-disciplinary citation of subject A by subject B is evaluated on all articles in subject A (also including those in subject B); when disciplinary overlap is excluded cross-disciplinary citation of subject A by subject B is evaluated only on the articles in subject A and not in subject B. Research on cross-disciplinary citation (e.g., Borgman & Rice, 1992; Meyer & Spencer, 1996; Rinia, Van Leeuwen, Bruins, Van Vuren & Van Raan, 2002; Tang 2004; Rafols & Meyer, 2007; Cronin & Meho, 2008; Sugimoto, Pratt & Hauser, 2008) has typically included disciplinary overlap, but would the exclusion of disciplinary overlap have affected the findings? This presentation describes our findings on this problem and the Conclusions indicate how the technique used can be applied more widely.

Methods

The problem was investigated for two WoS subject categories (Economics and Psychology, Multidisciplinary) and for both citation cross-disciplinary transfer and reference cross-disciplinary transfer.

The data for citation cross-disciplinary transfer was collected from WoS online using the 'Refine', 'Analyse' and 'Create Citation Report' facilities. The citation window was set to 7 years by using the 'Analyse' facility to exclude articles published in 2008 or 2009, and when using the 'Create Citation Report' facility author self-citation was excluded.

As WoS does not provide macro-level information on reference cross-disciplinary transfer this needed to be obtained from the data collected on citation cross-disciplinary transfer. The new technique introduced here is to obtain the data on citation cross-disciplinary transfer for all SSCI subjects and then collate the relevant findings; for example, the data on the reference cross-disciplinary transfer between Economics and Multidisciplinary Psychology was obtained from the data on Economics documents that cited Multidisciplinary Psychology articles.

The indicator of citation cross-disciplinary transfer (citation transfer indicator) between Economics and Multidisciplinary Psychology was the number of Economics articles cited by Multidisciplinary Psychology expressed as a percentage of all documents citing Economics articles; the indicator of reference cross-disciplinary transfer (reference transfer indicator) between Economics and Multidisciplinary Psychology was the number of Economics documents referring to Multidisciplinary Psychology articles expressed as a percentage of all documents referring to Multidisciplinary Psychology articles.

Findings

The Spearman correlation between the citation transfer indicator when overlap is included and the citation transfer indicator when overlap is omitted

is for Economics .97 and for Multidisciplinary Psychology .94; the Spearman correlation between the reference transfer indicator when overlap is included and the reference transfer indicator when overlap is omitted is for Economics .74 and for Multidisciplinary Psychology .86 ($p < .01$ throughout).

Of course, both the citation transfer indicator and reference transfer indicator were increased by the inclusion of disciplinary overlap. Defining 'citation transfer ratio' as the ratio of the citation transfer indicator including overlap, to that excluding overlap, the median and highest values of citation transfer ratio are 1.26 and 1.95 for Economics and 1.31 and 2.67 for Multidisciplinary Psychology. Defining 'reference transfer ratio' as the ratio of the reference transfer indicator including overlap, to that excluding overlap, the median and highest values of citation transfer ratio for Economics are 2.05 and for Psychology Multidisciplinary 11.99 and 1.16 and 2.50.

Conclusions and Limitations

The highly significant correlations between the percentages of citing documents when overlap is omitted and the percentage when overlap is included, indicate that, for both subjects, the ranking of citation transfer indicator and reference transfer indicator by subject is not affected much by omitting disciplinary overlap. Given that it was much more time-consuming to omit disciplinary overlap, this finding may be used as a justification for including disciplinary overlap when investigating the ranking of these indicators by subject. The high reference transfer ratio for Economics indicates that the effect of not taking into account disciplinary overlap can result in an eleven-fold increase in the percentage of citing documents in the subjects; the high median of reference transfer ratio for Economics indicates that not taking into account disciplinary overlap can result in more than a 100% increase in the median of the reference transfer indicator.

An obvious limitation of our findings is that they are based on data for two social science subjects in one specific year; it is possible that the findings would be different for other social science subjects, for science subjects and for other years. A second limitation is that the data on reference cross-disciplinary transfer was deduced from the data on cross-disciplinary transfer and there was limited flexibility to fine-tune this data. A third limitation is that no allowance was made for the fact that some journals lie in several subjects.

Despite these limitations this paper indicates a technique for using data on citations to obtain findings on references. This technique can be used not only in other investigations of cross-disciplinary reference, but also in non-disciplinary research. For example, the extent to which the 10 countries with the highest number of Economics articles refer to one another can be deduced from the data on the extent to which these countries cite one another in Economics.

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