

Is the Higher Citation of Collaborative Research the same in Every Country: A Case Study of Economics

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Abstract

Many studies have found a positive association between high citation and collaboration, in that collaborative research is in general more highly cited than non-collaborative research. This paper describes an investigation into the extent to which the association between high citation and collaboration for Economics articles published in 2000 varies from country to country and depends on the choice of indicator of citation level. Using data from the Social Science Citation index (SSCI), it compares for 18 countries and 4 indicators of citation level the citation levels of the collaborative articles with the citation levels of the non-collaborative articles. The main findings are that: (a) for every country and every indicator the citation level of the collaborative articles is at least as high as that for the non-collaborative articles, (b) for each indicator there is considerable variation in the extent to which collaborative articles are more highly cited than the non-collaborative articles, and (c) for some countries the extent to which the collaborative articles are more highly cited varies very substantially from indicator to indicator.

Introduction

This research investigates the variations between countries in the extent to which collaborative research is more highly cited than non-collaborative research. The rationale is that major variations between countries would indicate that it cannot be assumed that findings on collaboration in one country would apply to other countries. Its definition of collaboration is that an article is collaborative if, and only if, the database from which the data is collected lists it as having more than one author; thus the authors of a collaborative article can be in the same institution or even in the same department. The data was obtained from the online SSCI. Persson, Glänzel and Danell (2004) found a linear relationship between Mean citation rates and the number of authors and Katz and Hicks (1997) found that articles by authors from two countries on average received about 50% more citations than articles by authors from one country only. Collaborative articles were found to be more highly cited for Scandinavian science (Glänzel, 2000), Brazilian Management Science (Pereira, Fischer & Escuder, 2000), Brazilian science (Leta & Chaimovich, 2002), New Zealand science (Goldfinch, Dale & DeRouen, 2003), Danish industry (Frederiksen, 2004), HIV/AIDS in Nigeria (Uthman, 2008), wood preservative chemical research (Yi, Ao & Ho, 2008), and library and information science (Levitt & Thewall, 2009).

Gómez, Fernandez and Sebastian (1999) compared the extent to which Latin American countries collaborated with other countries and Norris, Oppenheim and Rowland (2008) compared the inter-country citation levels of Economics articles. This current study seeks to establish the extent to which elevated citation varies from country to country and whether the findings depend on the indicator. This citation analysis of articles in the 18 countries with the most SSCI Economics articles published in 2000 addresses the following questions:

- 1) Does the difference between the citation levels of collaborative and non-collaborative articles vary substantially from country to country?
- 2) To what extent do the findings depend on the indicator of citation level used?

Method

This research examines collaboration in the 18 countries for which the SSCI has at least 70 Economics articles published in 2000. It uses five indicators of citation level: Mean number of citations per article, and the number of citations of the articles in the 95th, 90th, 75th and 50th percentiles. One reason for using citation percentiles is that percentiles can readily be compared with each other. For technical reasons citation is citation-to-date (November 2008). The data collection from the SSCI began by using a search query to isolate the 6,636 Economics articles published in 2000. Next, the 'Analyze' facility was used to identify the countries with over 70 articles and to isolate the articles in each country. For each country the number of citations, a list of authors and the language used was obtained from the record of each article. The rationale for recording the language is that this data is used to identify the extent to which the findings are affected when the study is limited to articles only in English.

Findings

Table 1 presents descriptive statistics and indicators for each country for all SSCI Economics articles published in 2000, including the percentage of articles that are collaborative. The citation percentiles were obtained by ranking the articles in decreasing order of citation; for example, the 95th citation percentile is the number of citations of the article with the lowest citation ranking that has at least as many citations as 95 percent of the articles.

Table 1: Inter-country comparison of citation indicators (all SSCI Economics articles in 2000).

Country	Articles	Collaborative	Mean	95 th perc.	90 th perc.	75 th perc.	50 th perc.
Australia	274	58.4%	6.09	24	17	8	3
Belgium	130	69.2%	10.00	38	23	12	4
Canada	341	64.5%	8.15	29	21	9	4
China	105	69.5%	10.63	30	24	10	3
Denmark	88	53.4%	8.89	39	26	10	4
England	880	60.5%	8.13	28	19	10	4
France	268	64.2%	8.22	32	22	10	3
Germany	323	51.7%	8.04	26	17	8	3
Israel	90	77.8%	12.80	50	31	10	6
Italy	152	61.8%	6.71	27	15	7	3
Japan	141	38.3%	3.61	11	9	5	2
Netherlands	245	65.3%	9.22	37	21	9	4
Norway	73	50.7%	6.22	20*	13	8	4
Scotland	101	74.3%	6.06	18	15	9	3
Spain	180	67.2%	8.11	21	14	9	3
Sweden	128	52.3%	12.47	50	30	15	5
Switzerland	82	61.0%	16.78	80	34	14	4
USA	3,089	59.5%	12.02	45	29	13	5
Median	147	61.4%	8.19	30	21	10	4

* evaluated on 4 articles.

In Table 1, three of the four countries with the highest Mean citation level had fewer articles than the Median number of articles (Israel, Sweden and Switzerland); for each citation

indicator the Spearman correlation between the number of articles and the indicator was evaluated but although in every case a low number of articles was positively associated with a high indicator value, none of the correlations was statistically significant. In the table the country with the lowest percentage of collaborative articles (Japan) is also the country with the lowest score on all indicators; for each citation indicator the Spearman correlation between the percentage of collaboration and the indicator was evaluated but although in every case a high percentage of collaboration was positively associated with a high indicator value, none of the correlations was statistically significant.

The Mean citation of articles not in English was only .50 citations per article; the downward effect on Mean citation has the strongest impact on France, Denmark and Germany which have the highest percentage of articles not in English (17.5% 12.5% and 10.2% respectively). Although the indicators were found to correlate (Table 2), there are marked differences in the citation profiles of countries; for instance, the 95th percentile for Switzerland is 80 and for Israel 50, yet the 50th percentile for Switzerland is 4 and for Israel, 6. Using Table 1, the Spearman correlation between each of the indicators was calculated and presented in Table 2.

Table 2: Spearman correlations between the indicators (p < .01 throughout).

Indicator	Mean	95 th percentile	90 th percentile	75 th percentile	50 th percentile
Mean	1	.96	.96	.86	.70
95 th percentile	.96	1	.97	.85	.75
90 th percentile	.96	.97	1	.87	.68
75 th percentile	.86	.85	.87	1	.64
50 th percentile	.70	.75	.68	.64	1

Table 3: Inter-country comparison of citation indicators (SSCI Economics articles in 2000).

Country	90 th percentile		75 th percentile		50 th percentile		Mean	
	Coll.	Solo	Coll.	Solo	Coll.	Solo	Coll.	Solo
Australia	18	12	9	6	4	3	6.67	5.27
Belgium	31	11	15	5	5	3	12.52	4.33
Canada	25	11	11	6	4	3	9.81	5.13
China	28	9*	13	6	4	2	13.52	4.03
Denmark	32	12	14	6	5	3	11.26	6.17
England	21	14	12	7	5	3	9.53	5.99
France	22	22	11	6	4	1	9.84	5.31
Germany	22	10	10	6	4	2	11.18	4.67
Israel	41	9**	11	7	6	5	14.97	5.20
Italy	19	13	8	6	4	2	7.60	5.28
Japan	10	8	6	5	3	2	4.39	3.13
Netherlands	25	17	13	6	5	3	10.84	6.16
Norway	19*	12*	8	8	5	3	6.97	5.44
Scotland	15	12**	10	8	4	2	6.52	4.73
Spain	14	14	9	4	4	2	9.76	4.71
Sweden	43	16	20	7	10	4	16.09	8.49
Switzerland	46	18*	17	9	6	3	22.60	7.69
USA	30	24	15	9	6	4	13.70	8.65
Median	24	12	11	6	5	3	10.34	5.28

* evaluated on 4 articles.

** evaluated on 3 articles.

In view of the very high correlations between the Mean, 95th percentile and 90th percentile it was decided to omit one of these indicators from the remainder of this paper; the 95th percentile was chosen because it is based on the fewest articles. Table 3 compares the statistics for collaborative and non-collaborative (solo) articles.

In Table 3, articles not in English could account for some low 50th percentiles (and to a lesser extent low values of mean). This effect is particularly strong for non-collaborative articles, as articles not in English are less frequently collaborative (the percentages of collaborative articles for France, Germany and Denmark are 31.91%, 30.30% and 36.36% respectively). This could account for the very low 50th percentile for French non-collaborative articles; 33.3% of the non-collaborative articles are not in English, and 29 of these are un-cited. Using the data in Table 3, for every country the ratio of the values of the indicators for collaborative and non-collaborative articles was calculated and the findings presented in Table 4.

Table 4: Ratio of collaborative to non-collaborative for each indicator and country.

Country	90 th percentile	75 th percentile	50 th percentile	Mean
Australia	1.50	1.50	1.33	1.27
Belgium	2.82	3.00	1.67	2.89
Canada	2.27	1.83	1.33	1.91
China	3.11*	2.17	2.00	3.35
Denmark	2.67	2.33	1.67	1.82
England	1.50	1.71	1.67	1.59
France	1.00	1.83	4.00	1.85
Germany	2.20	1.67	2.00	2.39
Israel	4.56**	1.57	1.20	2.88
Italy	1.46	1.33	2.00	1.44
Japan	1.25	1.20	1.50	1.40
Netherlands	1.47	2.17	1.67	1.76
Norway	1.58**	1.00	1.67	1.28
Scotland	1.25**	1.25	2.00	1.38
Spain	1.00	2.25	2.00	2.07
Sweden	2.69	2.86	2.50	1.90
Switzerland	2.56*	1.89	2.00	2.94
USA	1.25	1.67	1.50	1.58
Median	1.54	1.77	1.67	1.84

* the numerator and/or denominator are evaluated on 4 articles.

** the numerator and/or denominator are evaluated on 3 articles.

In Table 4 for every country and for every indicator the ratio of the collaborative to non-collaborative values is at least 1. In addition, at the global level there are considerable similarities between the indicators; for instance, for every indicator the median ranges from 1.58 and 1.85, the highest value ranges from 3.00 to 4.56, the lowest value ranges from 1.00 to 1.27 and the average value ranges from 1.85 to 2.01. Nonetheless, the ranking of higher citation associated with collaboration depends strongly on the choice of indicator. For example: (a) Israel is ranked first when the 90th percentile is the indicator, last when the 50th percentile is used, and 4th when the mean is used, and (b) France is ranked joint last when the 90th percentile is the indicator, last when the 50th percentile is used, and 9th when the mean is used. Special circumstances could account for some of these differences (the very small numbers of non-collaborative articles for Israel and the high percentage of non-collaborative

articles not in English for France). However, the similar values of the median provide some evidence that overall the indicators may be very roughly equivalent for this type of study.

Conclusions

This study found that for every country investigated and for every indicator the value of the indicator for the collaborative articles is greater than equal to that for non-collaborative articles. In addition, there is little variation between the indicator in the median, highest value, lowest value and average value (the ratios of the top of the range to the bottom of the range are respectively 1.17, 1.52, 1.27 and 1.10). The closeness of these ratios to 1 indicates that global indicators such as median and average do not depend much on the choice of indicator.

As illustrated in the above comparison between Israel and France, inter-country comparisons can depend critically on the choice of indicator. This finding indicates that inter-country comparisons of the increased citation associated with collaboration can depend critically on the indicator used. Nevertheless, the association between collaboration and citation is widespread, in that for every country and for every indicator the citation level for collaborative articles is greater than or equal to that for non-collaborative articles.

One limitation of this study is that it is for a single subject in social science and for a single year; the findings might be different for other social science subjects, for science subjects and for different years. In addition, the percentiles take only integer values, and so could be substantially by the presence or absence of a small number of cases; for example, the 50th percentile for non-collaborative France articles is 1, but the 55th percentile is 2. For this reason, the 50th percentile and ratios need to be interpreted with care. This research indicates that the extent of higher citation of collaborative articles varies by country and by indicator.

Acknowledgement: The research and its presentation are supported by the Economic and Social Research Council [grant number PTA-026-27-2228].

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