

# Canadian Economists' Citation and Publication Records\*

HERBERT G. GRUBEL†

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## ABSTRACT

*This paper uses the Social Science Citation Index to count the number of citations received and publications made by all economists teaching at Canadian universities in 1975.*

*It is shown that the top decile of individuals received 72 per cent of all citations and 50 per cent received none. The University of British Columbia and Simon Fraser University departments of economics have the highest and second-highest average citation counts of all Canadian universities, respectively. The age-profile of citations, self-citation propensities and the journals of publication are analysed from a sub-sample of data*

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## RESUMÉ

*Cet article utilise le Social Science Citation Index pour relever le nombre de citations reçues et de publications au crédit de tous les économistes qui enseignaient dans les universités canadiennes durant l'année 1975.*

*Il est démontré que le décile supérieur d'individus a reçu 72 pour cent de toutes les citations et que 50 pour cent en ont reçu aucune. Les départements d'économie des universités de la Colombie-Britannique et Simon Fraser ont respectivement le plus grand et le deuxième plus grand nombres moyens de citations de toutes les universités canadiennes. L'aspect temporel des citations, les propensions à l'auto-citation et les revues de publication sont analysés à l'aide d'un sous-échantillon de données.*

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Since 1974, the publication of the *Social Science Citation Index*<sup>1</sup> has made it practical to use citation and publication counts for individual economists as supplementary information in decisions about hiring, promotion and tenure of professors, the allocation of resources among and to university departments and the choice of university departments for study or work, much as has been done for many years in the physical sciences. One problem in the use of these counts for individuals is the absence of any information

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† Department of Economics, Simon Fraser University.

about such counts for a large number of social scientists by which individual records can be put into perspective. It is the main purpose of this paper to provide such a standard through the analysis of the distribution of publication and citation counts for all Canadian academic economists and subsets of economists in individual departments of economics. However, the data also provide some useful information about the relative research productivity of individual university departments as of the middle of the 1970's. The paper also provides basic information which can be used in the future to study trends in publication and citation records, to compare the records of Canadian economists with those of other subsets drawn from different countries or areas of specialization and to compare economists with groups of scientists from other fields.

In Part I of this paper the purpose and merit of publication and citation studies are considered in the light of similar work in the natural sciences that has been going on for over a decade. Part II discusses the nature and sources of the data underlying this study. Part III considers the characteristics of the total population. In Part IV, the records of individual Canadian university departments of economics are presented. The age and other characteristics of citations are studied in Part V. Part VI presents and analyses the list of journals in which Canadian economists publish. Individuals with the largest number of citations and publications are identified in Part VII. The paper closes with a summary and some implications of the analysis.

### THE PURPOSE AND MERIT OF PUBLICATION AND CITATION COUNTS

The popularity of studying publication and citation counts of individual scientists and institutions is evidenced by the large number of publications on this subject, a selection of which is shown in the attached bibliography. However, popularity is an unreliable guide to scientific merit and the field has a number of sceptics and critics. (See Hanson and Weisbrod, (1972) and Comfort, (1970)). Anyone exposed to, or involved in, academic politics knows all the arguments about the merit of quality against quantity of publications. The journals *Science* and *Nature* contain a number of letters to the editor in which scientists point out why citation counting may be an imperfect method for assessing a scientist's productivity or the importance of his contribution to knowledge.<sup>2</sup>

Whatever may be the appeal of theoretical arguments about the merit of citation and publication counts, basically it is an empirical question whether they are a useful measure of scientists' contributions to knowledge and the prestige and influence derived from them. Several studies have attempted to answer this empirical question. Clark (1957) conducted a survey of psychologists and on the basis of about 1,200 replies constructed a ranking of U.S. psychologists according to their peers' informal evaluation of the merit of their work and the resultant prestige and influence. Clark then correlated this ranking with rankings based on objective measures of productivity and prestige, such as membership in professional associations, number of publications, listing in *Who's Who*, editorship of professional journals and citations. He found the greatest correlation of informal peer judgements with the number of citations ( $R = .67$ ). In another study, Hagstrom (1971) attempted to explain the well-known Cartter (1966) ratings of U.S. graduate schools, which are based on surveys of a relatively large number of department chairmen in every field. Like Clark, the author used many other objectively measurable characteristics that can be expected to reflect or determine quality of university departments on a priori grounds. Of the about 12 such characteristics analysed, both the number of publications

and citations dominate the rest, but as a result of a multiple regression result the author concludes "Citations to published work are a better predictor of department prestige than is quantity of articles published." (Hagstrom, 1971, p. 373).<sup>3</sup>

### The Use of Citation Counts

Students and potential users of citation counts apparently have been convinced by the available evidence that the technique represents a low-cost and sufficiently reliable technique to find "major uses in decisions at the level of national science policy, as an adjunct to the peer-review process, and in evaluating the performance of individual scientists". (Wade, 1975, p. 429). The author of this quotation notes that the U.S. National Science Foundation already uses citation counts in its decisions about the allocation of research funds in chemistry, especially to aid in reducing awards to individuals who write good proposals but have a poor record of scientific achievement and increasing awards to those who are not good writers of proposals but have a superior record of citations.

### SOURCES OF DATA

The study was made feasible by the availability of the annual volumes of the *Social Science Citation Index* (SSCI) for the years 1970-76. It is produced by the private Institute for Scientific Information (ISI) of Philadelphia which manipulates electronically citation information contained in hundreds of journals from the social sciences published in many countries. Two ISI publications are relevant for this study. First, an alphabetic listing of authors shows their journal publications during a given year.<sup>4</sup> Book reviews are identified and are excluded from the counts prepared in this study. Papers with multiple authors are identifiable for each author. They are counted as one publication for each of the multiple authors.

Second, an alphabetical listing shows for every author the citations that were made to his works, including the name and publication in which the citation appeared. Importantly, while the publication counts cover only journals, the citations from journals cover all publications by the individuals, including books, edited works, government reports, mimeographed papers and dissertations. However, unfortunately citations to papers with multiple authors are attributed only to the first listed author. This fact introduces a bias of unknown but possibly serious magnitude into the ranking of individuals. In the ranking of departments, on the other hand, there should be no serious bias introduced since the incidence of multiple authorship can reasonably be assumed to be distributed normally across departments.

The collection and processing of the data was subject to a more than normal margin of error because the clerical work in searching and transferring the information is especially tedious. Also, there are sources of error resulting from sloppy citation habits, such as the use of only one or wrong initials, and from the fact that there are some individuals that have the same names and initials. Double-checking by two different clerks of citations to individuals who in the first run showed up as having had more than 3 citations during the period was used in an attempt to minimize clerical errors.

The number of social science journals fully surveyed by the SSCI is over 1,000. Furthermore, references to social scientists found in over 2,000 natural science journals are included. The journals cover those published in the United States and Canada as well as

many other countries. Indicative of the broad coverage is the fact that the 1,502 publications by Canadians appeared in 233 different journals (see Section VI below).

The population of Canadian economists was defined as consisting of individuals who were listed on the faculties of the universities shown in Table 5 according to the *Commonwealth Universities Yearbook*, 1976, giving the status as of the middle of 1975. Part-time lecturers and teaching assistants were excluded.

## CHARACTERISTICS OF THE TOTAL POPULATION

Table 1 shows the frequency distribution of citations and articles for the entire population of 768 Canadian academic economists, which in turn is summarized in Table 2 by the percentages by deciles, both absolute and cumulative. As can be seen, the top decile of Canadian academic economists accounts for 72.3 and 43.7 per cent of all citations and articles, respectively, while 50 per cent have not been cited or have not published at all. These results are similar to those found by Cole and Cole (1972) for physicists, though in all studies of this type it is difficult to obtain a list of names representing the full population, since those who do not publish or are not cited do not appear in the literature.<sup>5</sup>

However, the frequency distributions of Canadian academic economists' citation and publication counts do not conform with Lotka's Law (Lotka, 1926), which has been found to hold in many scientific disciplines. The law says that  $N = K/n^2$ , where  $K$  is the number of people publishing one article,  $n$  is the number of articles published by each of the individuals numbered  $N$ . Thus, according to Lotka's Law, the fact that 114 Canadian economists have published one article (see Table 1), implies that 28.5 should have published two, 13 published three, about 8 published four, etc. In reality, as can be seen from Table 1, the distribution is much less skewed. The same conclusions hold for the frequency distribution of citations. Perhaps this result is due to the fact that the present sample consists of academics with high publication propensities while Lotka's Law applies to professionals in all types of employment. Very likely, the results simply invalidate Lotka's Law, which has no theoretical foundation at all.

### Canadian and Global Performance

In an attempt to put the population of Canadian economists' records into a global perspective, a world-wide population of international trade economists was defined by obtaining 2,813 names of individuals who published at least one article that entered category 400 in the *Journal of Economic Literature* during the period 1970-76 and by comparing them with the 1,158 names of persons who identified themselves as specialists in international economics (category 400) in the American Economics Association *Handbook* (1974). Of those 1,158 specialists only 371, or 32 per cent showed up as having published according to the list derived from the *Journal of Economic Literature*. Since about 50 per cent of all Canadians published at least one paper, the comparison with the population of international economics specialists favors Canadian economists. However, the results of this comparison are probably biased since the number of journals surveyed by the *Journal of Economic Literature* is much smaller than that included in the *SSCI*.

For the population of international trade economists who have published at least three articles according to the *Journal of Economic Literature* ( $N = 455$ ), citations were counted for the period 1970-76 and analyzed in Grubel (1980). The list is headed by P.A.

Table 1

Frequency Distribution of the Number of Citations  
and Articles, 1970-76

Absolute Numbers of			
<u>Citations</u>	<u>Persons</u>	<u>Publications</u>	<u>Persons</u>
Above 200	3	17	1
199-100	15	15	2
99-90	3	14	1
89-80	5	13	3
79-70	4	12	4
69-60	5	11	8
59-50	6	10	7
49-40	10	9	9
39-30	16	8	4
29-20	34	7	15
19	3	6	25
18	8	5	37
17	5	4	40
16	4	3	60
15	5	2	90
14	7	1	114
13	10	0	<u>348</u>
12	6		768
11	11		
10	12		
9	10		
8	11		
7	27		
6	13		
5	20		
4	14		
3	30		
2	44		
1	71		
0	<u>356</u>		
	768		

Source: Compiled by the author from citations in annual volumes of the Social Science Citation Index, 1970-76. Names of persons from Commonwealth Universities Handbook, 1976.

Samuelson and H.G. Johnson with 2,898 and 1,498 citations, respectively. These two men are followed by five individuals with 613-682 citations. Canadian economists among the top 70 show up in 15th place, 37th, 53rd, 67th and 69th. Since Canada's population is about 10 per cent of that of the United States, random geographic distribution of a combined U.S.-Canada population with equal productivity should have produced the observed fact that about 10 per cent should be Canadian. While these results are sensitive to the field studied and the cut-off point chosen on the list (among the top 60 there are only 3 Canadians and none among the top 14), the results reported here may be interpreted tentatively as suggesting an approximate equality in the productivity of U.S. and Canadian academic economists.

Table 2

Inequality Measures of Citations and Articles of  
768 Canadian Economists 1970-76

Deciles Persons	Citations				Articles			
	Numbers		Percent		Numbers		Percent	
	N	Cumul.	Total	Cumul.	N	Cumul.	Total	Cumul.
1	4730	4730	72.3	72.3	636	636	43.9	43.9
2	989	5719	15.1	87.4	968	968	22.9	66.8
3	490	6209	8.5	94.9	1182	1182	14.8	81.6
4	228	6437	3.5	98.4	1328	1328	10.1	91.7
5	92	6529	1.4	99.8	1405	1405	5.3	97.0
6	16	6545	0.2	100.0	1448	1448	3.0	100.0
7	0		0					
8	0		0					
9	0		0					
10	0		0					

Gini Coefficient: .82 Gini Coefficient: .67

Source: Same as Table 1.

### The Cause of the Skewed Distribution

Generally, the extreme skewness of the frequency distribution of publication and citation counts represents a puzzle, since presumably practically all economists in the sample have a Ph.D. and therefore the basic qualifications to be contributors to the stock of knowledge through publications. Furthermore, all studies of single, measurable human abilities and characteristics show them to be normally distributed. Allison and Stewart (1974) analyze this question theoretically and empirically. On the theoretical level, they cite work which suggests that while single skills are distributed normally, combinations of skills are required to perform complicated tasks and the combinations determine productivity multiplicatively. (See Shockley (1957) and Aitchison and Brown (1957)). Since the publication of scientific work involves a more complicated task and requires the combination of a large number of specific skills and characteristics than does study leading to a Ph.D., the observed skewness theoretically is consistent with other empirical knowledge.

In addition to the purely theoretical explanation, Allison and Stewart also postulate that the reward structure of science reinforces the skewness of the distribution through what they call a process of cumulative advantage. This process is reflected in the fact that the award of resources, the invitation to conferences, journal editorships, etc., tend to favor productive individuals, further adding to their differential productivity. An empirical analysis of the Gini coefficients of scientists from several different disciplines in certain age-cohorts determined by the time since receipt of the Ph.D. showed that the degree of inequality increases through time.<sup>6</sup>

## ANALYSIS OF DEPARTMENT STATISTICS

Table 3 presents data on citation and publication counts averaged by university departments, according to economists' affiliation as of the middle of 1975. The first column shows the number of faculty in each department and the following columns show for each department the total, mean, variance, Gini-coefficient (for faculties with more than 21 members only) and rank by average, first for citations and then for publications. The correlation coefficient ( $R^2$ ) for the citations and publications is .65

As is well known, the mean is often a misleading measure of the average of a distribution, especially if it is as skewed as the one for all economists noted above. To deal with the problems inherent in the case of the mean, Table 3 contains the variance and Gini coefficients characterizing the distribution for each department. However, the biases introduced by the use of the mean are apparent much more directly through the data contained in Table 4, the number of citations received by the median and 80th percentile member of each faculty. Because the median was zero for many departments for reasons obvious from the fact that about 50 percent of all economists have zero citations, and because both the medians and percentile measures are not suitable measures in small departments, the list in Table 3 contains data on only the top 12 departments, though the rankings in each column are based on the full population of departments.

The most notable fact apparent from Table 4 is that the top 12 universities by the mean are also the top 12 by the 80th percentile, while by the median the University of Ottawa and Dalhousie University move from the top 12 into 13-18th rank. These two universities are replaced by the Royal Military College in 9th place and Mt. St. Vincent University in 10-11th rank. The fact that the latter 2 departments have faculties of 8 and 2 members only shows one of the difficulties in using the median as a measure of the average.

By all three measures the University of British Columbia heads the list consistently, while other universities show some changes in ranking. Most notable differences in the ranks by mean and median are that the University of Toronto moved from its 6th place by the mean rank, into a tie for second place with Simon Fraser University in the median rank and that Carleton University and University of Montreal, respectively, moved up from 8th to 4th and 12th to 5th. Lowering of rank finds Queens University drop from 3rd place by the mean to 7th by the median and the University of Western Ontario from 4th to 6th. The rankings by means and 80th percentile are remarkably consistent, with a move up of 3 by the University of Ottawa and the University of Montreal and a move down of 2 by Simon Fraser University and Queens University.

The main message implicit in Table 4 seems to be that the leading departments are characterized by both the presence of "stars", giving rise to large means and of a substantial proportion of faculty with high citation counts resulting in large medians and 80th percentile values. The University of British Columbia's position of leadership is strengthened not only by its consistent top ranking by all these measures of average, but also the absolute number of citations by all three measures in relation to those of any other Canadian university.

Returning to Table 3, it is worth noting the last column which shows the difference between the university's rank on the citation and publication counts. The interpretation of these figures is that large positive numbers indicate that in the future the department's ranking by citation counts is likely to improve and large negative numbers indicate the

Table 3  
Citation and Publication Averages by Universities

Name of University	Faculty No.	Citations				Rank Average	Publications				Rank Average	Difference* Rank Cit.-Rank Publ.
		Total	Average	Variance	Gini		Total	Average	Variance	Gini		
Univ. British Columbia	35	1,114	31.83	43.63	0.60	1	130	3.71	3.26	0.45	3	-2
Simon Fraser Univ.	24	700	29.17	67.41	0.45	2	95	3.96	4.31	0.51	1	1
Queens Univ.	36	905	25.14	78.90	0.74	3	69	1.92	2.66	0.63	14	-11
Univ. Western Ontario	39	895	22.95	41.25	0.72	4	149	3.82	3.00	0.42	2	2
Univ. Ottawa	18	375	20.83	45.82	-	5	35	1.94	2.92	-	13	-8
Univ. Toronto	64	1,287	20.11	31.94	0.65	6	198	3.09	3.28	0.55	6	0
Carleton Univ.	34	579	17.03	24.25	0.65	7	110	3.24	3.95	0.58	4	3
McGill Univ.	25	312	12.48	25.55	0.76	8	37	1.48	2.20	0.63	20	-12
McMaster Univ.	29	344	11.86	24.97	0.71	9	90	3.10	3.58	0.59	5	4
Dalhousie Univ.	19	221	11.63	32.17	-	10	33	1.74	2.42	-	17-18	-7.5
Univ. Guelph	18	182	10.11	25.85	-	11	36	2.00	3.05	-	11-12	-0.5
Univ. Montreal	20	154	7.70	8.76	-	12	56	2.80	2.33	-	7	5
Memor. Univ. Newfldd.	10	69	6.90	13.40	-	13	20	2.00	3.56	-	11-12	1.5
York Univ.	24	150	6.25	17.60	0.76	14	40	1.67	1.44	0.48	19	-5
Univ. Windsor	20	112	5.60	11.02	-	15	44	2.20	2.80	-	9	6
Univ. Victoria	12	60	5.00	7.15	-	16	26	2.17	2.08	-	10	6
Univ. Alberta	27	130	4.80	11.99	0.79	17	47	1.74	2.98	0.70	17-18	-0.5
Univ. Waterloo	15	64	4.27	8.69	-	18	20	1.33	1.96	-	22	-4
Univ. Lethbridge	4	16	4.00	8.00	-	19	4	1.00	1.41	-	25-26	-6.5
Univ. Laval	20	64	3.20	6.43	-	20	48	2.40	2.44	-	8	12
Royal Milit. College	3	24	3.00	3.96	-	21	9	1.13	1.36	-	24	-3
Univ. Calgary	22	45	2.05	3.12	0.65	22	41	1.86	2.61	0.60	16	6
Mt. St. Vincent Univ.	2	4	2.00	2.83	-	23	2	1.00	0.00	-	25-26	-2.5
Univ. Manitoba	34	63	1.85	4.69	0.78	24	25	0.74	1.50	0.78	28	-4
Univ. Saskatchewan	26	44	1.69	5.26	0.85	25	14	0.54	0.95	0.71	33	-8
Univ. Sherbrooke	11	16	1.46	2.77	-	26	14	1.27	1.68	-	23	3
U. Quebec @ Montreal	19	24	1.26	4.13	-	27	26	1.37	3.08	-	21	6
Univ. New Brunswick	13	15	1.15	3.87	-	28	3	0.23	0.83	-	37	-9
Lakehead Univ.	10	9	0.90	1.85	-	29	19	1.90	2.28	-	15	14
Mt. Allison Univ.	9	8	0.89	2.32	-	30	5	0.56	0.88	-	32	-2
Concordia Univ.	29	23	0.85	1.83	0.78	31	19	0.70	1.24	0.78	30	1
Brandon Univ.	4	2	0.50	1.00	-	32	0	0.00	0.00	-	40-44	-10
St. Mary's Univ.	7	3	0.43	0.79	-	33	3	0.43	0.54	-	34	-1
Univ. Winnipeg	8	3	0.38	1.06	-	34	6	0.75	2.12	-	27	7
St. Francis Xavier Univ.	6	2	0.33	0.82	-	35	6	0.00	0.00	-	40-44	-7
Wilfrid Laurier Univ.	12	4	0.33	0.65	-	36	7	0.58	1.44	-	31	5
Laurentian Univ.	9	2	0.22	0.67	-	37	0	0.00	0.00	-	40-44	-5
Bishop Univ.	5	1	0.20	0.45	-	38	0	0.00	0.00	-	40-44	-4
Trent Univ.	7	1	0.14	0.38	-	39	5	0.71	1.11	-	29	10
Univ. of Regina	9	1	0.11	0.33	-	40	3	0.33	0.71	-	36	4
Univ. of Moncton	8	0	0.00	0.00	-	41-44	3	0.38	0.74	-	35	7.5
Acadia Univ.	5	0	0.00	0.00	-	41-44	1	0.20	0.45	-	38	4.5
Univ. Pr. Edw. Isld.	6	0	0.00	0.00	-	41-44	1	0.17	0.41	-	39	3.5
Brock Univ.	8	0	0.00	0.00	-	41-44	0	0.00	0.00	-	40-44	0.5
Sum or (average)	768	8,027	(10.45)	(30.89)	0.82		1,493	(1.94)	(2.79)	0.67		

Source: Same as Table 1.

Note: \* Note on last column: In case of ties, difference is between midpoints.

opposite. This interpretation is based on the fact documented below, that publications lead to citations with a lag, so that high publication ranks may at a later time lead to high citation ranks and vice versa.

### CHARACTERISTICS OF CITATIONS

A stratified sample of 1/7th of all citations to the writings of Canadian economists was analyzed to establish facts in three areas: the distribution of citations between different forms of publications, their age profiles, and the frequency of self-citations.



Table 4  
Rankings of Top Departments by Alternative  
Measures of Average for Citations

Department	Mean	Rank	Median	Rank	80th Percentile	Rank
Univ. British Columbia	31.9	1	11	1	75	1
Simon Fraser Univ.	29.2	2	9	2-3	34	4
Queens Univ.	25.1	3	4	7	29.5	5
Univ. West. Ontario	23.0	4	5	6	36	3
Univ. Ottawa	20.8	5	1	13-18	41	2
Univ. Toronto	20.1	6	9	2-3	23	6-7
Carleton Univ.	17.0	7	8	4	23	6-7
McGill Univ.	12.5	8	2	10-11	16.5	8
McMaster Univ.	11.9	9	3.5	8	14	10
Dalhousie Univ.	11.6	10	1	13-18	7.5	11
Guelph Univ.	10.1	11	1.5	12	7	12
Univ. Montreal	7.7	12	5.5	5	16	9

Source: Same as Table 1.

Note: Ranks are based on full population of universities.

Table 5 shows that of the 1152 citations originating in journals 826, or about 72 per cent, made reference to journal articles or mimeographed discussion papers and 326, or about 28 per cent, to books, theses, government reports or anthologies. Unfortunately, the basic distribution of total writings published in these two different categories is not known so that no inferences can be made about the relative intensity of citations to journal and other forms of publications. However, the data do suggest that the publication counts shown above for individuals and departments are incomplete because they cover only journals. If there are different propensities of individuals to publish in forms other than journal articles, therefore, the rankings are biased. No attempts were made to correct for these biases. It could be that they account for some of the pronounced differences in rankings among university departments made according to citations and publications shown in Table 3.

The age-profile of citations is also shown in Table 5, using as the basic statistic the number of years between publication of the cited work and citations to it. A lag of zero years arises in cases of simultaneous publication years and when the reference is to work "to be published". As can be seen from Table 5, journal articles tend to be cited with a somewhat greater lag after publication than books, etc. This is a surprising result which may be explained by the fact that the latter forms of publication tend to have a longer

Table 5

Age Profile of Citations of Canadian Economists

Number of Years Between Publication and Citation	Journals Discussion Papers			Books, Theses, cvts. Reports, Anthologies		
	N	%	Cum.%	N	%	Cum.%
0	30	3.6	3.6	17	5.2	5.2
1	89	10.8	14.4	54	16.6	21.8
2	107	13.0	27.4	66	20.2	42.0
3	141	17.1	44.5	40	12.3	54.3
4	107	13.0	57.5	38	11.7	66.0
5	76	9.2	66.7	19	5.8	71.8
6	42	5.1	71.8	10	3.1	74.9
7	46	5.6	77.4	13	4.0	78.9
8	31	3.8	81.2	9	2.8	81.7
9	39	4.7	85.9	11	3.4	85.1
10	38	4.6	90.5	13	4.0	89.1
11	10	1.2	91.7	14	4.3	93.4
12	5	0.6	92.3	2	0.6	94.0
13	3	0.4	92.7	5	1.5	95.5
14	10	1.2	93.9	2	0.6	91.1
15	7	0.8	94.7	-	-	-
16	17	2.1	96.8	7	2.1	98.2
17	5	0.6	97.4	2	0.6	98.8
18	9	1.1	98.5	-	-	-
19	6	0.7	99.2	-	-	-
20	4	0.5	99.7	-	-	-
22	1	0.1	99.8	1	0.3	99.1
25	1	0.1	99.9	-	-	-
33	2	0.2	100.0	-	-	-
38				2	0.6	99.7
49				1	0.3	100.0
	826	100.0		326	100.0	

Notes and Sources: Sample of one seventh of all citations to Canadian economists 1970-76. Stratification achieved by use of list of names arranged in descending order of total citations received. For individuals ranked 1, 8, 15, 22, ... the year 1970 was used. For those ranked 2, 9, 16, 23 ... the year 1971 was used, and so on for 7 years.

lag between completion and publication, leaving more time for them to be circulated in manuscript and for their contents to be discussed informally and at meetings of specialists.

The data of Table 5 imply that scientific knowledge in economics is subject to rapid obsolescence. One half of all references are to journal articles published less than 4.0

years before and for the other forms of publication the figure is 2.6 years. Only about 10 per cent of all references are to works published more than 10 years before. Of course, the data refer to publications of only presently active Canadian economists, which sets an upper limit on the possible age of the citations in the sample. Perhaps this explains why the results differ from those found in some other studies. In a review of citation studies in different fields Broadus (1971) noted that in economics one analyst had found that 45 per cent of all citations were to works no older than 10 years while another found that 50 per cent were to works published within 6 years. Lovell (1973) found that in the year 1965, 46.5 per cent of citations in economics journals were to works published in the preceding five years.

It is possible to consider the age-profile of citations to the works of individual economists and departments and compare them with the norms presented in Table 5, though this is not done here. On the one hand one could argue that average ages of citations greater than the norm imply that an author has made contributions with a greater durability than average. This fact influences estimates of the quality of a person's life-time productivity. On the other hand, it is not certain that one can draw any particularly useful inferences about the relative productivity of two individuals with the same number of life-time citations to their work, if the average age of the citations of one is greater than that of the other. One simply may have produced more papers than the other, but by the criterion of citation counts assumed to measure influence as perceived by others, they have done equally well.

One question often raised in connection with citation counts is the frequency of self-citations. In the sample under consideration there are 221 individuals, 50 or 23 per cent of which have one or more self-citations. As can be seen from Table 6, about 18 per cent of all citations are to own work on average, with a wide dispersion around this mean. Further analysis of self-citation frequencies shows that of the eleven individuals who owed 100 per cent of citations to themselves, 8 had only one citation altogether, one each had only two, three and seven. One person owed 17 out of 18 citations to his own publications. However, there does not seem to be any correlation between total citations and the frequency of self-citations. The observed behavior seems to be determined by personal preferences.

## JOURNALS OF PUBLICATION

Table 7 shows the journals in which the 1502 publications of Canadian academic economists appeared during the period 1970-76. It comes as no surprise that the *Canadian Journal of Economics* contained 177 or 11.7 per cent and the French language *Canadian L'Actualite Economique* 91 or 6.1 per cent of all publications by Canadians. Surprising is, however, the large number of journals, 233, in which Canadians have published a mean of 6.45 articles. The distribution of articles per journal is quite skewed, with 66 journals having only one publication and the top 18, or 7.7 per cent of all journals accounting for about 50 per cent of all publications.

The international nature of much of the work by Canadian economists is reflected in the fact that out of the top 29 journals only five are Canadian, two are published in Britain (*Economica*, *Economic Journal*), three in Continental Europe (*Weltwirtschaftliches Archiv*, *Kyklos* and *Étude Internationales*), one in Australia (*Economic Record*) and the rest in the United States. Only three of the 29 journals have a French title, though some publish in both French and English, such as the *Canadian Journal of Economics* and

Table 6

Percentages of Self-Citations	<u>Self-Citation Percentages</u>	
	Number of Individuals	Total Sample Self/Total Citations
1 - 9	4	
10 - 19	6	142/799 = 18 percent
20 - 29	7	
30 - 39	3	
40 - 49	3	
50 - 59	5	
60 - 69	5	
70 - 79	1	
80 - 89	1	
90 - 99	1	
100	11	

Notes and Sources: sample of one seventh of all citations to Canadian economists 1970-76. Stratification achieved by use of list of names arranged in descending order of total citations received. For individuals ranked 1, 8, 15, 22, ... the year 1970 was used. For those ranked 2, 9, 16, 23 ... the year 1971 was used, and so on for 7 years.

*Kyklos*. Finally, it should be noted that for unexplained reasons the journal *Canadian Public Policy/Analyse de Politiques* has not been covered by the SSCI since it commenced publication in Winter 1974. Since this journal has become an important publication outlet for Canadian economists, the analyses of journals as well as of citations and publications of individuals and departments above are not complete.

### CITATION AND PUBLICATION COUNTS FOR INDIVIDUALS

For some purposes of analysis and policy it is useful to know the names of individuals who have received the largest number of citations and published the most journal articles. The names of Canadian economists with more than 100 citations during the period 1970-76 are shown in Table 8. Remarkable in this table is the dominance of persons from the University of British Columbia, which of course explains the institutions performance noted in Table 3.

Since there exists an often substantial lag between publications and their recognition through citations, highly productive individuals may not be found in Table 8 but could be expected to do so if a similar table were compiled in later years. Table 9 contains the names of persons who, during the period 1970-76 had at least 10 publications but fewer than 100 citations.

It should be noted that the rankings of individuals by citations is subject to the bias

Table 7

Journals in Which Canadian Economists Published

Rank		Publication	
		Number	Percent
1)	Canadian Journal of Economics	177	11.7
2)	L'Actualité Économique	91	6.1
3)	Econometrica	66	4.4
4)	American Economic Review	56	3.7
5)	Review of Economics and Statistics	51	3.4
6)	Industrial Relations Industrielle	44	2.9
7)	Journal of Political Economy	40	2.7
8)	Journal of Economic Inquiry (Western Economic Journal)	27	1.8
9)	Journal of Finance	25	1.6
10)	Economica	24	1.6
11)	Canadian Public Administration	24	1.6
12)	Southern Economic Journal	21	1.4
13)	Journal of the American Statistical Association	21	1.4
14)	Public Finance	20	1.3
15)	Land Economics	20	1.3
16)	Journal of Regional Science	18	1.2
17)	Journal of Economic History	16	1.1
18)	Economic Record	16	1.1
19)	Quarterly Journal of Economics	15	1.0
20)	Economic Journal	15	1.0
21)	Journal of International Economics	15	1.0
22)	Weltwirtschaftliches Archiv	14	0.9
23)	American Journal of Agricultural Economics	14	0.9
24)	Kyklos	14	0.9
25)	Journal of Canadian Studies	13	0.9
26)	Economic Development and Cultural Change	12	0.8
27)	Industrial Relations	11	0.7
28)	Etudes Internationales	11	0.7
29)	Public Finance Quarterly	11	0.7

Frequencies for remaining journals:	<u>Number of Journals</u>	<u>Publications</u>
	3	10
	5	9
	11	8
	3	7
	10	6
	13	5
	17	4
	22	3
	30	2
	66	1
Total number of Journals	233	
Publications	1502	

noted above and arising from the fact that references to publications with multiple authors are given only to the first-named author. While this bias, as well as clerical errors, tend to cancel in the calculation of university department means and medians, they may distort the rankings of persons in the last two tables. Therefore, in interpreting these tables, it may be safer to consider them to contain the names of groups of most widely cited and publishing individuals rather than a precise ranking.

Table 8  
Individuals with over 100 Citations 1970-76

Name	University	Number of	
		Citations	Publications
Lipsey, R.G.	Queens	474	6
Grubel, H.G.	SFU	334	17
Laidler, D.E.W.	U. of W. Ontario	200	10
Higgins, B.H.	Ottawa	187	6
Archibald, G.C.	UBC	172	5
Breton, A.A.	Toronto	149	6
Marfels, C.T.	Dalhousie	140	8
Helliwell, J.F.	UBC	138	11
Scott, A.D.	UBC	126	4
Dales, J.H.	Toronto	120	2
Helleiner, G.	Toronto	120	7
Cragg, J.G.	UBC	115	11
Wannacott, R.J.	U. of W. Ontario	111	2
Vandercamp, J.	Guelph	110	5
Winch, D.M.	McMaster	110	3
Melvin, J.R.	U. of W. Ontario	108	12
Diewert, W.E.	UBC	105	10
Bird, R.M.	Toronto	103	9

Source: Same as Table 1.

Table 9  
Individuals With More Than Nine Publications and  
 Fewer Than 100 Citations 1970-76

Name	University Affiliation	Number of	
		Articles	Citation
Maule, C.J.	Carleton	15	9
Chung, J.H.	Quebec @ Montreal	12	18
Adam, J.	Calgary	11	9
Casas, F.R.	Toronto	11	13
Palmer, J.P.	U.W. Ontario	11	5
Abouchar, A.	Toronto	10	18
Belanger, G.	Montreal	10	6

Source: Same as Table 1

## SUMMARY AND CONCLUSIONS

This paper has analysed the citation and publication counts of Canadian economists as a whole and grouped by individual departments, which may be useful in combination with other information about individuals in tenure and promotion decisions by departments and universities and in the allocation of resources among departments within and between universities. Of particular interest is the result that such a very large percentage of all economists appear to be concentrating their energies on teaching, synthesis and administration rather than publication. University administrators may find the information about department rankings useful in intra university resource allocation strategies. Sociologists and other specialists in organizational behavior may find the results worth attempts to explain differences in departments' productivity. Agencies and governments granting resources for research and the development of centers of excellence may add the information in this paper to their data on which they base their decisions. Undergraduate, graduate students and faculty members may wish to choose their universities of study or employment keeping in mind the results of this study. The data on journals of publication provide useful insights into the relative popularity and prestige of these publications outlets.

## FOOTNOTES

1. See Part II below for a detailed description of this publication.
2. References to these letters and the papers prompting them are not shown in the bibliography appended to this paper. They can be found in the bibliography in the front of the annual volumes of the *Social Science Citation Index*.
3. Further analysis in this tradition is found in Bayer and Folger (1966); Margolis (1967); Cole and Cole (1967) and (1972); Garfield (1970) and (1979); Roche and Smith (1978); Miller and Tollison (1975); Hogan (1973); Siegfried (1972); and Dean (1976), the last four of which deal with departments of economics ranking using measures other than citations.
4. Since 1975 this list also indicates whom the author has cited in these publications. No use was made of this information, though it could serve as a base of studies of citation networks among Canadians and with foreign centers of learning.
5. Allison and Stewart, 1974 give reference to 8 studies that have found such skewness in the distribution for other scientific disciplines. They also report that in these studies citation counts are more skewed than publication counts, just as in the case of Canadian economists.
6. The result could also be due to the more rapid growth in the stock of publications by scientists who were more productive initially and did not enjoy any cumulative advantage through the reward system. This proposition is valid clearly for the life-time citations used in the study but may or may not be significant for the publication Ginis which are based on the record of the preceding 5 years.

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