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Some Quantitative Aspects of the Economics Journal Literature

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The paper investigates various aspects of citation practices on the basis of all citations appearing in full volumes of eight principal journals at 10-year intervals. The growth of the number of citations is in good agreement with the findings for other fields, and the mean age of citations declines over time by about 6 months per decade. Most journal articles have a significant tendency to cite other articles published in the same journal, and the cross-reference patterns are employed to rank the journals in terms of importance. An examination of the list of most frequently cited authors reveals that Nobel prizewinners are characteristically on at least one, but most often more than one, list (a decade apart) and permits tentative predictions as to who future prizewinners will be.

1. Introduction

Recent years have witnessed a fair amount of introspective effort among economists. This introspection has principally taken the form of various examinations of the journal literature in economics. Most recently, Stigler and Friedland (1975) have examined questions of who cites whom among the Ph.D's of certain leading institutions, and Eagly (1975) has treated journal-citation practices as shedding light on the communications network in economics. Somewhat earlier, Lovell (1973) estimated production functions for the production of economic articles and also analyzed citation practices from a sample of four journals in 1965. In this work he also discusses the frequency with which certain authors are cited and the age of cited articles, both of these being subjects of interest for the

I am indebted to numerous undergraduate research assistants for combing the journals for the citation data; to Roman Tymiak, Jorge Vizcaino, and Un Chan Chung for various research assistance; to Lester V. Chandler and Albert Rees for catching some errors in the raw data; and to Gregory C. Chow and Fritz Machlup for constructive comments. Support from NSF grant 43747X is gratefully acknowledged.

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present paper. Hanson and Weisbrod (1972) examined, on the basis of the *Index of Economic Journals (IEJ)*, which economists have produced the most articles (or pages), either in their lifetimes or in the current biennium. Hawkins, Ritter, and Walter (1973) produced a prestige rating of economics journals on the basis of questionnaire data, and Weber (1972) analyzed the journals' acceptance lags and their reasons for rejecting manuscripts. Holt and Schrank (1968), again relying on the *IEJ*, estimated the average growth rate of the journal literature from 1886 on at about 5.5 percent per year.

There is no doubt that all these contributions to the economics or history or sociology of our discipline shed much light on just how it operates. They follow in the tradition of the path-breaking work of de Solla Price (1965), who analyzes the incidence of references and the decay of citations with the increasing age of an article, based on citation indices of disciplines other than economics. He estimates the growth rate of the world scientific literature at about 7 percent per year and estimates the frequency distribution of articles by the number of citations to them: he finds that 35 percent of all existing articles are never cited, some 49 percent are cited only once, and only 1 percent of all articles are cited six times or more.

There are numerous questions one might address to the body of economic literature in existence. Among those that are of particular interest in the present paper are the following: (1) How does the "immediacy factor" of de Solla Price (1965) change over time; that is, to what extent is there a change over time in the well-known phenomenon that recent papers are cited more frequently than older ones? To put it in a different way, how does the distribution of the age of citations change over time? (2) What patterns of citation exist among authors publishing in the various journals? (3) Who are the most frequently cited economists?

I shall attempt to answer some of these questions by examining citations in leading economic journals at 10-year intervals from 1890 to 1970.¹ This procedure has, of course, a number of flaws. I have, for example, completely omitted an examination of references occurring in books: a common practice in studies of this kind, but nevertheless a serious omission. I also take the occurrence or nonoccurrence of a citation as a fact from which important inferences can be drawn with respect to the age of citations, that is, the "memory" of the profession as well as the "fame"

¹ Since various inferences are drawn from the data collected at 10-year intervals, it is fair to ask how sensitive the results might be to the particular years chosen. To collect substantially more data would have been prohibitively expensive. Since particular attention is paid to citations appearing in 1970, corresponding information from the 1971 issues of the journals in question was also collected, and I will, wherever indicated, compare the 1970 and 1971 results in order to check on the sampling variability of the underlying data. In essence it will be seen, as is customarily believed, that *natura non facit saltum*.

of various authors. Yet it is clear that as time passes certain concepts become so intrinsic to a field that their mention no longer requires citation at all. Moreover, intertemporal comparisons of citation frequency of authors must be undertaken only cautiously; since the absolute number of citations grows over time, we may compare citation frequencies over time only in percentage terms or in terms of who is cited most often. There is clearly a possible source of bias in which journals I have selected for examination and a loss of scope in not having identified citations by title but only by author, date, and source of the cited work. I am thus not capable of retracing de Solla Price's study of how often reference is made to a given piece of work.

Finally, I must comment briefly on the underlying article of faith upon which this and many other similar studies rest: namely, that information of importance is gained about the development of a field and about the significance of the contributors to it by examining the citations in the field's literature. To put it in a nutshell, I quote Garfield (1963): "It is preposterous to conclude blindly that the most quoted author deserves a Nobel prize. On this basis, Lysenko and others might have been judged the greatest scientists of the last decade. . . . The mere ranking by numbers of citations or the numbers of papers published is no way to arrive at objective criteria of importance" (p. 290). Obviously these cautionary remarks are well taken. Citation frequency does not reveal who will turn out to have been a charlatan and which paradigm is soon to be replaced by another. Yet, since it is difficult to arrive at reasoned historical judgments concerning the contributions of recent decades of the quality that, say, Stigler (1965) can confidently make about the eighteenth and nineteenth centuries, I am forced to take citations at face value and hope that serious error survives but briefly.

Section 2 deals in detail with my sources of data and the many uncomfortable decisions that had to be made in handling them. Section 3 is devoted to the question of the aging of citations, Section 4 to cross-reference patterns among journals, and Section 5 to identifying the most cited authors.

2. Data Sources and Principles of Collecting Data

The journals which form the corpus of the study are the following: *American Economic Review* (*AER*), *Journal of Political Economy* (*JPE*), *Quarterly Journal of Economics* (*QJE*), *Economic Journal* (*EJ*), *Economica* (*E*), *Econometrica* (*EM*), *Southern Economic Journal* (*SEJ*), and *Review of Economics & Statistics* (*RESTAT*). Data were culled from all issues of as many of these journals as were in existence in the years 1890, 1900, 1910, 1920, 1930, 1940, 1950, 1960, and 1970. Citations in all articles appearing in these years, referred to as source articles, were recorded, with the following

provisos and exceptions: (1) Articles that could be identified as primarily review articles or as works dealing in a major way with subject areas other than economics (such as political science or sociology) were omitted. The former omission was motivated by the expectation that such works would have unusually numerous references, thus being atypical of standard articles in terms of the number of references as well as their overall citation practices. The latter omission was justified by the belief that inclusion of such works would essentially introduce noise into the data. (2) Articles which are comments on recent articles or replies or rejoinders and the like were excluded on the grounds that the age of references contained in them would clearly be biased in favor of the very recent.² (3) A reference appearing in an article was counted only once, irrespective of the number of times it was mentioned. Thus a reference followed by 20 footnotes containing "Ibid" would all constitute, for purposes of counting references, a single reference to what we shall refer to as a "target journal" (or book or author). References were classified under the eight journals that represent the source journals of the study and under the additional categories of "other journal," "book," and "Ph.D. thesis." (4) References to data sources such as various government publications were excluded, as were references to other works written anonymously or issued by governmental or other agencies, commissions, or committees without explicit indication of authorship. (5) References were recorded only if they appeared in footnotes and/or in the source article's bibliography. References to an author and his work appearing only in text were omitted, on the grounds that to record all such instances would have required an effort of an order of magnitude greater than that required for scanning footnotes. (6) References to authors, even if occurring in footnotes, were omitted if they did not associate the author with a specific piece of work. To illustrate the nature of such references, I cite footnote 2 on page 323 of Clower's article on "Keynes and the Classics: A Dynamical Perspective" (*QJE*, vol. 74 [May 1960]): "It is only necessary to mention such names as Harrod, Domar, Hicks, Modigliani, Samuelson, Goodwin, Duesenberry and Patinkin in order to appreciate the significance of this comment." Clearly, these authors are being referred to primarily because of their written work; but, since there is no indication which of their works are the relevant ones, the references are not useful for measuring longevity of articles (although they could have been useful for measuring how often economists are cited). (7) In some of the early years, references are often given without indication of

² The data were gathered by undergraduate student assistants. Although they were given reasonably precise guidelines as to how to resolve dubious cases, spot-checking by the author revealed that there are indeed some instances in which I would have decided differently.

the year of publication. In these instances reasonable efforts were made to ascertain the proper dates; if this effort failed, the reference was deleted.

3. Growth and Longevity

The basic data are described in table 1. It gives the total number of source articles from which citations were taken and the total number of citations to (1) articles appearing in any of the group of eight journals under examination, (2) all articles published anywhere, and (3) all works including books. The journals selected for examination are clearly among those that in some sense may be thought to be important *today*. Not all of them existed in all the years reported. The compound annual rate of growth of articles in the group of eight is 4.1 percent over the 80-year period. This figure is slightly higher than, but not too different from, the growth rate of 3.7 percent implied by Stigler's (1965) figures (p. 41) dealing with the total number of articles published in English journals from 1802 to 1853. It is slightly lower than the 5.5 percent growth rate reported by Holt and Schrank (1968) for the period 1886–1963 on the basis of the *IEJ*. This latter growth rate is clearly based on a period more comparable with the one used here and also on a more complete enumeration of articles. Yet if, as seems plausible, the later decades are characterized by a larger percentage of review articles and "communications" (such as comments, notes, rejoinders, and the like), all of which I have omitted, than the earlier ones, my estimated growth rate would have been closer to theirs were it not for the omission. We find that the number of citations of journal articles and the number of all citations grow somewhat faster, at an annual rate of 5.4 and 5.1 percent, respectively. This is in complete agreement with de Solla Price's findings, based on Garfield's 1961 Index 2, that the number of citations roughly doubles every 13.5 years (implying an annual growth rate of 5.26 percent). In 1970 my average number of references per article also agrees excellently with de Solla Price's (1965) estimate of 15 for articles published about a decade earlier in various other fields, although Kaplan (1975) notes that this figure is subject to fairly substantial variation among fields. On the whole, the number of references per published article has tended to grow.³

In discussing the "immediacy" factor—that is, the tendency to cite more recently published works more frequently than older ones—de Solla Price observes that 30 percent of all papers cited are between 1 and

³ The comparison of the gross figures for 1970 with those for the year 1971, selected as a check, reveals broad agreement. For the latter year the total number of source articles was 438, the number of citations of the eight journals covered here 1,764, and the total number of citations 5,863, giving a mean number of citations of 13.39.

TABLE 1
NUMBER OF SOURCE ARTICLES AND CITATIONS

Year	Number of Source Articles (1)	Citations of the 8 Journals (2)	All Article Citations (3)	All Citations (4)	(4) ÷ (1)
1890	17	14	67	116	6.82
1900	32	31	93	271	8.47
1910	31	23	128	181	5.84
1920	51	67	155	252	4.94
1930	104	141	478	1,043	10.03
1940	163	262	809	1,429	8.77
1950	225	597	1,347	2,076	9.23
1960	291	804	2,250	3,218	11.06
1970	426	1,688	4,414	6,265	14.71

6 years old, the remaining 70 percent being a random sample of all papers ever published. I examine the immediacy factor and its changes over time by analyzing the mean age as well as the median age of citations.

It is clear that, in spite of the attractive aspects of dealing with the mean, caution must be exercised in attaching too much significance to it. A single article dealing with the history of thought published in any one of the years sampled and referring to Aristotle or even St. Thomas Aquinas would inflate the mean unreasonably and would constitute, by all reasonable standards, an outlier. I therefore deal exclusively with trimmed means—that is, means of ages of citations less than K years, where K is a predetermined number. In fact I employ the two values $K = 75$ and $K = 150$. The mean ages of citations and the standard deviations trimmed by 150 and 75, respectively, taking all journals together, are displayed in table 2.

The mean as well as the standard deviations for the individual journals appear superficially to change over time in an essentially haphazard manner. For each of the four series, I regressed the dependent variables (being either a mean age or a standard deviation of age of citations) on time, t , with 1890 equal to 1 and incremented by 1 for each decade. The results are shown in table 3.

The only regression in which the slope comes near to being significant at the .05 level is the one for mean age trimmed at 75 years. According to that regression, the mean age of citations diminishes by about 3 months for every 10-year period. This statistically barely significant finding is, however, inconsequential, since it implies that the diminution of citation age over a century may amount to some 2.5 years.⁴

⁴ If we consider that subset of citations which consists of references to our basic group of eight journals, we do notice an increase in the mean age over time from means between 7.77 and 9.76 in 1950, 1960, and 1970. This, however, is not surprising, since in the early

TABLE 2
 MEANS AND SDs OF CITATION AGES FOR THE AGGREGATE OF JOURNALS

YEAR	MEAN		SD	
	$K = 150$	$K = 75$	$K = 150$	$K = 75$
1890	13.23	12.70	16.53	15.38
1900	10.31	9.04	14.28	10.77
1910	12.01	9.54	17.41	10.03
1920	12.62	10.57	18.98	14.03
1930	13.71	11.51	20.72	14.89
1940	14.99	11.19	22.09	13.45
1950	10.64	9.57	15.13	11.23
1960	11.44	9.77	17.23	11.46
1970	9.67	8.27	15.96	10.72

If we consider the median age of citations, a rather similar picture emerges. From 1890 to 1970, these median figures are 7, 7, 10, 3, 13, 4, 6, 6, and 6 at 10-year intervals. The regression of the median ages on time yields a slope of $-.233$ with an estimated standard error of 0.359, again suggesting an inconsequential decline in age with time that is statistically not significant. We note in conclusion that 50 percent of all references were less than or equal to 6 years old at each of the last three turns of a decade and were less than or equal to 4 years old in 1940—a finding that is again broadly consistent with the more extensive data base employed by de Solla Price.

The fact that there is no particular trend in the mean values over time does not imply that the age distribution for all journals in one year is essentially the same as that in another year. In fact, there are some rather noticeable fluctuations in the median from some one decade to another. The nonstationariness of these age distributions has been tested by performing the Kolmogorov-Smirnov two-sample test on all possible pairs of years. There are 36 such pairs, and, although I well recognize that the Kolmogorov-Smirnov tests for all 36 pairs are not independent of one another, I simply report that the null hypothesis that the age distributions of citations are from the same parent population is rejected in 27 instances.

This suggests that a more disaggregated analysis may reveal some more marked patterns in citation practices. Accordingly, I hypothesized that citation practices, and thus the mean age of citations, may depend not only on time but also on several other variables: specifically, (a) whether the journal is primarily oriented toward econometrics; (b) whether it is British; and (c) the age of the journal. We define the variable y_{it} as the

years the group of journals had only a very brief past history—the observed increase in the mean age of citations simply reflects the fact that references to these journals can in the later years have an age distribution similar to the group of all references.

TABLE 3

RESULTS OF REGRESSIONS OF MEAN AGE AND SD OF AGE ON TIME

	Intercept	Slope	R^2
Mean age, $K = 150$	13.005 (1.137)	-.187 (.202)	.09
Mean age, $K = 75$	11.478 (.719)	-.248 (.128)	.43
SD, $K = 150$	17.163 (1.741)	.086 (.309)	.02
SD, $K = 75$	13.668 (1.294)	-.245 (.230)	.11

NOTE.—Numbers in parentheses are estimated SEs.

mean age (trimmed at 75) of citations in journal i and year t ($t = 1, \dots, 9$), x_{1t} as time (t), x_{2i} as 1 for *EM* and *RESTAT* and 0 for all other journals, x_{3i} as 1 for *EJ* and *E* and as 0 for all other journals, and, finally, x_{4it} as the (integer) number of decades of existence that journal i has completed at time t (x_{4it} thus starts with 0 and can become as large as 8). Regressing y_{it} on the x 's yields

$$y_{it} = 11.91 - 0.52x_{1t} + 0.10x_{2i} - 3.47x_{3i} + 0.43x_{4it} \quad R^2 = .37,$$

(0.98) (0.25) (1.26) (0.88) (0.25)

where the numbers in parentheses are standard errors. Time is now significant, and the decline in the mean age, holding other factors constant, is more substantial, being $\frac{1}{2}$ year per decade. Being a British journal is highly significant and takes $3\frac{1}{2}$ years off the mean age. The age of the journal itself is not significant (although nearly so) and has a positive influence on the mean age. This is precisely what one would expect if articles in a given journal had a notable tendency (as I shall establish in the next section) to refer to articles in themselves; for then the younger the journal, the shorter the span of time during which self-references can be made.

If we take as our dependent variable the standard deviation of age (again trimmed by 75), we obtain as the regression

$$y_{it} = 13.88 - 0.97x_{1t} - 0.66x_{2i} - 3.92x_{3i} + 1.05x_{4it} \quad R^2 = .46.$$

(1.26) (0.32) (1.62) (1.13) (0.32)

Only x_{2i} is not significant. The standard deviation diminishes by about a year for each elapsed decade and by almost 4 years if the journal is British, and it increases by a year for each additional decade of life the journal in question has had. This latter conclusion is again consistent with the tendency for journal articles to refer to the same journal, since the longer the past history of a given journal, the greater the dispersion of such "self-references" may be. The fact that a journal's primary orientation is toward econometrics—that is, toward a relatively more mathematical

branch of economics—has no significant influence on either the mean or the standard deviation.

The overall conclusion is that (a) growth trends and citation practices in the sample analyzed are in rough agreement with the findings of others for economics as well as for other fields and (b) that, as time passes, the memory span of our discipline, as reflected in the mean or median age of citations, shortens almost imperceptibly and statistically not very significantly, if we take the aggregate of journals, but does shorten more noticeably and significantly if the analysis is disaggregated by journal. This is what one would expect in the light of the increasing volume of scientific literature; the more that is published in the present, the harder it may be to remain aware of the more distant past. Indeed, it would be interesting to find out whether the enormous proliferation of works in recent decades might not have created a greater frequency of ideas being unwittingly rediscovered. Finally, it is also clear that British journals' citation practices are markedly different from those of U.S. journals and that the age of the journal itself does have some influence on the age of citation.

4. Cross-Reference Practices

We have tabulated the percentage of references in each journal and each year to every journal in the basic group of eight, to books, to other journals, and to Ph.D. theses. The amount of such tabular material is too much to be reproduced here. We shall summarize basic tendencies for the early decades in general terms and present the entire cross-reference table for 1970 only (table 4). For several cross-reference patterns not discussed here, the reader is referred to Eagly (1975).

The first general observation is that the fraction of total references accounted for by books is highly variable over time and over journals. For, say, *AER*, this fraction is 58.1 percent in 1890, 76.5 percent in 1900, 25.3 percent in 1920, 54.0 percent in 1940, etc. Fairly comparable fluctuations are noticeable for the other journals. There is also substantial variation among journals: thus, in 1930 68.9 percent of the references in *JPE* are to books, but only 23.9 percent are to books in *EJ*.

The most interesting aspects of cross-reference tabulations are, of course, the implied relations among the eight journals in question. In 1890 there were only a few journals and references, and cross-reference patterns are of no particular interest. By 1900 we have *AER*, *JPE*, *QJE*, and *EJ*. References in *AER* are at this time entirely to books and the category "other journals." Although over 75 percent of references in the other journals in 1900 are also to these two categories, these journals also cite articles in themselves and each other. These references directly to the group of eight journals will be referred to as "group references." References in a journal to an article in the same journal will be referred to as "self-references." Forty-nine percent of *JPE*'s group references are

TABLE 4
CROSS-REFERENCE PATTERNS IN 1970

	<i>AER</i>	<i>JPE</i>	<i>QJE</i>	<i>EJ</i>	<i>E</i>	<i>EM</i>	<i>SEJ</i>	<i>RESTAT</i>	Books	Other Journals	Ph.D. Theses
<i>AER</i>	11.3	4.0	3.2	2.0	1.3	3.5	0.3	4.5	26.6	41.6	1.8
<i>JPE</i>	5.2	8.4	2.4	3.4	1.0	2.7	0.3	3.3	38.8	32.4	2.0
<i>QJE</i>	8.0	7.6	8.1	2.0	2.4	3.4	0.4	2.4	31.3	32.9	0.7
<i>EJ</i>	7.2	4.1	4.6	8.5	0.9	1.1	0.0	3.5	39.0	31.0	0.2
<i>E</i>	7.5	4.2	1.7	4.5	10.3	6.4	0.0	1.1	26.3	37.7	0.3
<i>EM</i>	2.2	1.7	1.3	1.2	0.9	15.4	0.1	3.1	26.3	47.1	0.8
<i>SEJ</i>	9.3	3.3	3.5	2.4	3.3	5.4	2.2	7.1	22.5	38.7	2.2
<i>RESTAT</i>	8.7	6.2	2.3	0.9	0.8	8.1	0.3	10.3	26.8	33.9	1.8

self-references; the corresponding fractions are 72 percent for *QJE* and 71 percent for *EJ*. The picture does not change dramatically in 1910: at this time *AER* begins in a modest way to have group references, and *JPE*'s percentage of self-references rises to 86 percent. Self-references decline proportionately by 1920, although they account in each journal for the single largest percentage of group references. With relatively few exceptions, it continues to be generally true that self-references constitute the single largest percentage of group references. Certain obvious intellectual debts are noticeable, however. In 1930 *E* refers to *EJ* twice as often as to itself, while *EJ* refers to *E* not at all; in 1940 *EJ* refers to itself three times as often as to *E*, while the latter refers to *EJ* somewhat less than that. In 1950 *EJ* refers to itself almost five times as often as to *E*, while *E* refers to itself and *EJ* about equally often. With some variations, this pattern continues to hold for later years as well. The entire cross-reference pattern for 1970 is displayed in table 4, showing the percentage of references occurring in the journals listed on the left to the targets listed on top. It is clear that, within the subset of references we called group references, self-references are the most numerous, with the sole exception of *SEJ*. If citations are taken to be a sign of intellectual debt, then we must conclude that authors tend to submit articles to, and get them accepted for publication by, journals to which their intellectual debt is greatest. Among those seven journals where the self-references are the largest in the set of group references, the fraction of self-references ranges from a low of 23.1 percent for *QJE* to a high of 59.7 percent for *EM*, with all others clustered between 27 and 38 percent.⁵

A final observation that can be made from this table is that one may think of each source journal's reference frequency to other journals as ranking those journals in the group of eight in terms of their importance. If we average the ranks for each target journal (a crude measure, to be sure), we obtain the following mean ranks:

<i>AER</i>	1.14
<i>RESTAT</i>	3.07
<i>EM</i>	3.14
<i>JPE</i>	3.21
<i>QJE</i>	4.00
<i>EJ</i>	4.71
<i>E</i>	5.71
<i>SEJ</i>	7.00

⁵ Cross-reference patterns are very similar in 1971. There is some variation in the percentages, but no basic patterns change. Self-references still predominate except in the case of *SEJ*. The self-reference frequency for *AER* is 13.6 percent, *JPE* 10.8 percent, *EM* 14.4 percent, etc. The *JPE* is the second most frequently referred to journal by *AER* and conversely, exactly as in 1970. The overall fraction of references in the various journals to journals in the group of eight changes by only a few percentage points. The *SEJ* still refers to *AER* and *EM* most frequently, the relevant frequencies being 8.7 and 5.1 percent. Overall, the agreement between the 2 years is very good.

The reader may form his own conclusions as to whether this rank order is reasonable.

5. Who Are Cited Most Often?

From my data base it was relatively easy to determine who are the writers cited most often. In fact, for each year I determined the 50 most frequently cited authors, irrespective of whether they are cited for journal contributions or books. I nevertheless report only the top approximately 20 of each turn of the decade since 1920. I omit the early years, since the total number of citations is extremely small then, and the number of citations of any one author is negligible, except for the top three or four.

I shall not, however, pass by the early years without at least a brief comment. Stigler (1965) presents a table (pp. 34–36) of 56 important English economists active in the period 1777–1915. Few would argue with the soundness of his list. If we now consider, among the 50 most frequently cited authors in each of the years 1890, 1900, and 1910, those who have been cited more than once in any one of these years, we find that the overlap with Stigler's list is extremely small and extends only to Cairnes, Cannan, Edgeworth, Jevons, Malthus, McCulloch, J. S. Mill, Ricardo, and Smith. (Some non-English economists of note cited more than once include Böhm-Bawerk, J. B. Clark, Ely, Fisher, Taussig, Veblen, and von Wieser.)

In table 5 I report the approximately 20 most frequently cited authors for the remaining years. The reason for the approximation is that there are numerous ties—I do not want to omit any author with as many citations as another already on the list. The fact that I report approximately the same number of authors for each year implies that the group becomes more and more select as the decades advance, since the number of economists, articles, and citations has grown significantly. Being in the top 20 in 1920 is clearly not so great a distinction as being in that group in 1970. For this reason, I biased the list so that it tends to include a slightly larger number of names in the later years. Clearly, it is arbitrary where I cut the lists—nevertheless, a few generalizations may be permitted. (1) With the exception of Myrdal and Kantorovich, all Nobel prize-winners appear on the list at least once—most of them two or three times. If frequency of appearance on the lists is any guide toward predicting Nobel prizewinners, the top candidates for a prize in the near future are R. F. Harrod and J. Robinson (3) and then, with two appearances each and in alphabetical order, W. J. Baumol, M. Friedman, G. Haberler, H. G. Johnson, L. R. Klein, F. Machlup, R. Solow, and G. J. Stigler.⁶

⁶ The cutoff points on the list happen to be so selected that, if we included one additional group of names all tied with each other in 1950, one in 1960, and one in 1970, no author who has one mention or none on the present list would advance to the category of

(2) The econometricians compose a very large proportion of the list in 1970, accounting for a third of the names. (3) The only institutions with more than one name on the list for 1970 are the University of Chicago (6), Harvard University (5), the Massachusetts Institute of Technology (3), and Northwestern University (2). These four institutions account for two-thirds of the list in 1970. (4) If a name appears on three or more consecutive lists, a typical pattern (although by no means the only one) is established and is what one would expect: that is, the person starts out low, rises, and then declines. Examples are Keynes, whose ranks at four consecutive turns of a decade are 11 (tied), 1 (tied), 2, and 15 (tied); Samuelson, with 2, 1, and 4; and Harrod, 20 (tied), 14 (tied), and 15. This same pattern is in fact evidenced by cases where a name continually rises on the list and then suddenly disappears or starts high, having never before appeared, and sinks steadily (e.g., Hicks, 1, 3, 4, and 25 [tied]). (5) The fields of microtheory, macrotheory, and econometrics account for nearly the whole list for 1970 as well as earlier years. This appears amply to justify the emphasis of graduate curricula on these three areas. (6) Hanson and Weisbrod (1972), in their "economists' hall of fame," list the "current batting champions" in terms of most articles published in each of the four biennia 1960-61, 1962-63, 1964-65, and 1966-67. The union of the four lists includes a total of 51 different names and represents a total of 508 articles (neglecting the possibility of two or more persons on the list having coauthored articles). If our earlier findings are correct, namely that in 1970 the mean age of citations was less than 10 years and the median was 6, then this pool of articles and authors represents the group that has in some sense the highest probability of being cited frequently in 1970. Alas, this is not the case for most of those in Hanson and Weisbrod's list of "current batting champions." The overlap with our list of most frequently cited authors consists only of Balassa, Baumol, Griliches, Johnson, Jorgenson, Modigliani, Samuelson, and Stigler. It must certainly be true, as we have always suspected, that the quantity of our output does not ensure that it will be remembered.⁷

two or more mentions. It may be noted that an earlier draft of this paper was written prior to the announcement of the 1975 award of the prize; in that version, Koopmans was among those predicted to receive it.

⁷ It is relevant to inquire how the rankings and some of the conclusions would have to be modified if 1971 data had been used instead of 1970 data. (1) The 26 most frequently cited economists in 1971 include 21 who made the top 26 in 1970, with J. Bhagwati, J. M. Buchanan, F. M. Fisher, T. C. Koopmans, and H. Uzawa replacing five names from the second half of the 1970 list. (2) The rank correlation (Spearman's rho) between the ranks of the 21 on both lists is 0.54, significantly different from zero at the .01 level. (3) No change is needed in any of the qualitative conclusions above, except that Yale would have joined the other institutions with more than one name on the list and that F. M. Fisher would be added to the overlap between the 1971 list of the top 26 and the Hanson-Weisbrod list of "current batting champions." Overall, the agreement between the two sets of results is excellent and sampling variability negligible.

TABLE 5
APPROXIMATELY 20 MOST FREQUENTLY CITED ECONOMISTS

1920		1930		1940	
C. Gini	12	A. Marshall	11	J. R. Hicks*	22
H. G. Moulton	9	J. M. Keynes	11	J. M. Keynes	17
A. C. Pigou	6	H. L. Moore	10	F. A. Hayek*	16
W. S. Thomson	6	F. H. Hansen	8	F. H. Knight	13
P. F. Brissenden	5	A. C. Pigou	8	E. Ginsberg	12
A. Marshall	5	L. Robbins	8	A. H. Hansen	12
W. C. Mitchell	5	F. W. Taussig	8	J. D. Black	11
J. S. Nicholson	5	C. Davenant	7	R. Frisch*	11
E. G. Nourse	5	H. G. Moulton	7	G. Haberler	11
F. W. Taussig	5	W. Petty	7	N. Kaldor	11
P. H. Douglas	4	J. A. Schumpeter	7	J. Tinbergen*	11
I. Fisher	4	J. Viner	7	M. Ezekiel	10
L. H. Haney	4	N. Allen	6	J. M. Clark	9
J. M. Keynes	4	H. G. Brown	6	P. H. Douglas	9
W. F. Ogburn	4	E. Frickey	6	J. J. Spengler	9
E. R. A. Seligman	4	P. Wicksteed	6	T. Balogh	8
D. A. Tomkins	4	P. G. Wright	6	E. D. Domar	8
S. Webb	4			J. Robinson	8
				J. Viner	8
				J. R. Commons	7
				R. F. Harrod	7
				F. Machlup	7
Total	18	...	17	...	22
1950		1960		1970	
J. A. Schumpeter	42	P. A. Samuelson*	42	K. J. Arrow*	68
P. A. Samuelson*	38	M. Friedman	35	M. Friedman	68
J. R. Hicks*	30	L. R. Klein	33	R. M. Solow	53
W. C. Mitchell	23	J. R. Hicks*	28	P. A. Samuelson*	51
A. H. Hansen	21	H. A. Simon	26	J. Tobin	48
L. A. Metzler	21	R. Frisch	25	Z. Griliches	41
F. Machlup	17	J. Robinson	25	D. W. Jorgenson	38
O. Lange	16	R. M. Solow	24	F. Modigliani	38
A. Marshall	16	J. M. Keynes	21	H. G. Johnson	37
S. H. Schlichter	15	A. Marshall	21	H. B. Chenery	36
F. H. Knight	14	L. A. Metzler	20	M. Nerlove	33
W. W. Leontief*	14	W. J. Baumol	19	L. R. Klein	31
E. D. Domar	13	R. Dorfman	19	H. Theil	29
R. F. Harrod	13	G. J. Stigler	19	J. Johnston	26
E. Ginsberg	12	R. F. Harrod	18	E. S. Phelps	26
J. M. Keynes	12	K. J. Arrow*	17	A. Zellner	26
V. Pareto	12	H. G. Johnson	17	O. Eckstein	25
A. C. Pigou	12	N. Kaldor	17	R. Eisner	24
J. Viner	12	S. Kuznets*	17	G. J. Stigler	24
C. Clark	11	A. W. Phillips	17	G. S. Becker	23
F. D. Graham	11	F. A. Hayek*	16	W. J. Baumol	22
G. Haberler	11	T. C. Koopmans*	16	J. M. Lintner	22
T. C. Koopmans*	11	J. Tinbergen*	16	B. Balassa	21
J. Robinson	11			A. S. Goldberger	21
				G. Debreu	20
				J. R. Hicks*	20
Total	24	...	23	...	26

NOTE.—Number following each name is citation frequency; asterisks indicate Nobel prize recipients.

6. Conclusion

I have found broad consistency between the growth and citation patterns in the economics-journal literature and that found by others in the same as well as in different fields. I noted that our memories are getting a bit shorter as time passes and that there is a definite propensity for an article to cite the journal in which it is published. I determined who are the authors cited most often and found with gratification that Nobel prize-winners are among them but also that the quantity of one's publications does not necessarily guarantee high citation frequency. I suspect that there may be a difference in "fame" consisting of having one article cited 100 times and having written 100 articles, each cited only once. It remains, however, for a more ambitious researcher to determine who belongs in the hall of fame by yet another measure—namely, the number of citations per article published.

References

- de Solla Price, Derek J. "Networks of Scientific Papers." *Science* 149 (July 1965): 510–15.
- Eagly, R. V. "Economics Journals as a Communication Network." *J. Econ. Literature* 13, no. 3 (September 1975): 878–88.
- Garfield, Eugene. "Citation Indexes in Sociological and Historical Research." *American Documentation* 7 (October 1963): 289–91.
- Hanson, W. Lee, and Weisbrod, Burton. "Toward a General Theory of Awards; or, Do Economists Need a Hall of Fame?" *J.P.E.* 80, no. 2 (March/April 1972): 422–31.
- Hawkins, Robert G.; Ritter, Lawrence S.; and Walter, Ingo. "What Economists Think of Their Journals." *J.P.E.* 81, no. 4 (July/August 1973): 1017–32.
- Holt, Charles C., and Schrank, William E. "Growth of the Professional Literature in Economics and Other Fields, and Some Implications." *American Documentation* 9 (January 1968): 18–26.
- Kaplan, Norman. "The Norms of Citation Behavior: Prolegomena to the Footnote." *American Documentation* 16 (July 1975): 179–84.
- Lovell, Michael C. "The Production of Economic Literature: An Interpretation." *J. Econ. Literature* 11, no. 1 (March 1973): 27–55.
- Stigler, George J. *Essays in the History of Economics*. Chicago: Univ. Chicago Press, 1965.
- Stigler, George J., and Friedland, Claire. "Citation Practices of Doctorates in Economics." *J.P.E.* 83, no. 3 (June 1975): 477–508.
- Weber, John A. "Economics Journals: Policies, Trends and Problems." *Southern Econ. J.* 38, no. 4 (April 1972): 559–65.