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Evidence of a Harvard and Chicago Matthew Effect

Marshall H. Medoff

Abstract The Matthew Effect refers to the hypothesis that a scientific contribution will receive disproportionate peer recognition whenever there are sharp and distinct differences in prestige within the academic stratification system. This paper empirically examines whether there is an institutional Matthew Effect in economics: does the prestige of an author's economics department influence the visibility or allocation of peer recognition of a scientific contribution? After controlling for author quality, journal quality and article-specific characteristics, the empirical results showed nineteen universities classified as elite have a statistically and numerically positive impact on the level of peer recognition of a scientific contribution. However, further analysis found that the positive institutional Matthew Effect of these elite universities was due solely to the differential peer recognition of scientific contributions by economists affiliated with the economics departments of Harvard University and the University of Chicago.

Keywords: citation analysis, Matthew Effect

> In the long run, the economic scholar works for the only coin worth having – our own applause. (Paul A. Samuelson 1962: 18)

1 INTRODUCTION

In academia, intellectual property rights have a uniquely paradoxical characteristic. A researcher's property rights are established when the intellectual property is given away to other researchers who are free to use it as they see fit. It is only when academics publish their research in journals, books, monographs, working papers or on the internet that ownership is legitimately established. Publishing affirms and protects an academic's intellectual property rights for an innovative or significant contribution.

In order for this open intellectual property market to affirm a researcher's property rights requires a means to explicitly acknowledge authors for using their research. These means are accomplished through the use of the citation. The acknowledgement by citation assigns the intellectual property

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rights of that research to the cited source. Peer recognition of an academic's research by citation is central to the reward system in academia. It guides the allocation of pecuniary and non-pecuniary rewards. As David (1994: 70) has noted, 'Recognition of one's contributions and consequent collegiate reputation, or esteem in the eyes of one's scientific colleagues, is the key currency of the open science reward system. To this are tied the academic researcher's material rewards, such as salary and job tenure, and access to the human resources and physical facilities that scientists typically need to produce published results.'

In 1968, Merton (1968) introduced the concept of the 'Matthew Effect' to explain the role of collegial reputation on the recognition/reward system in academia. The phrase 'the Matthew Effect' is derived from the first book of the New Testament, the Gospel according to St Matthew (13: 12 and 25: 29): 'For unto every one that hath shall be given, and he shall have abundance; but from him that hath not shall be taken away even that which he hath.' Merton argued that in science, as in numerous other areas of life, those who are already rich are likely to become even richer. The Matthew Effect in science consists 'in the accruing of greater increments of recognition for particular scientific contributions to scientists of considerable repute and the withholding of such recognition from scientists who have not yet made their mark' (Merton 1968: 58).

Previous research on the Matthew Effect has been conducted mainly by sociologists. One of the most extensive studies of the Matthew Effect was conducted by Cole and Cole (1973) on a sample of university physicists (also see Merton 1973 and Zuckerman 1977 for similar results). Cole and Cole found that (1) peer recognition of articles of equal quality is disproportionately skewed in favor of the author with the greater scientific reputation; (2) the greater an author's scientific reputation the greater the retroactive recognition of earlier research; (3) lesser quality articles by high ranking scientists receive more peer recognition than similar quality articles by lower ranked scientists; and (4) scientists of lesser repute who co-author with a scientist of higher repute receive greater recognition than if the collaborators are of equally lesser repute.

In economics there is some indirect evidence of a Matthew Effect. Yotopoulos (1961) studied the institutional affiliation of the contributors to the *Journal of Political Economy*, edited at the University of Chicago and the *Quarterly Journal of Economics*, edited at Harvard University. He found each economics journal tended to publish a higher proportion of articles by authors affiliated with their university. Blank (1991) conducted a controlled experiment to analyze the effects of single-blind refereeing (referee knows the identity of the author, but the author does not know the identity of the referee) and double-blind refereeing (neither the author nor referee knows the other's identity) on papers submitted to the *American Economic Review* between 1987 and 1989. She found that the acceptance rates of authors at

the top five ranked economics departments were not affected by the type of review process. One reason for this result may be that, according to Blank, nearly half of all the referees of the double-blind papers knew the identity of the author. Authors at highly ranked universities (ranks 6–50) had lower acceptance rates under double-blind refereeing as compared to single-blind refereeing.

The theoretical foundation underlying Merton's Matthew Effect is that a researcher's time is a scarce resource that has a positive shadow price which has been increasing and researchers also have imperfect information about the quality of others' published research. There has been an enormous growth in the volume of scientific journals, books and articles over time. This has made it increasingly difficult and costly for researchers to read everything in their particular field of study, specialty or area of interest (e.g. EconLit lists more than 1,000 economics journal titles). The overloading of the scientific communication system is further exacerbated by the presence of asymmetric information – researchers do not know which of the numerous articles is a significant, high-quality contribution. Optimizing researchers rationally allocate their limited time by substituting away from the time-intensive activity of trying to read everything towards a time-saving search method which uses the reputation or the professional standing of an author as a market signal about the perceived quality of the published research. Researchers are able to economize on their scarce time by using an author's reputation as a screening mechanism for identifying research presumed to be of substantive value.[1]

Merton (1968: 59) hypothesized that, since the choice of reading material depends upon an author's professional reputation, 'a scientific contribution will have greater visibility in the community of scientists when it is introduced by a scientist of high rank than when it is introduced by one who has not made his mark'. In other words, articles by already prestigious scientists will receive more peer recognition than articles by those with less prestige. Merton originally introduced the Matthew Effect to explain the disproportionate recognition/credit received by Nobel Laureates who collaborate with co-authors who have lesser reputations. However, Merton noted that the Matthew Effect could be generalized to apply to the peer recognition of all scientific research whenever there exist sharp and distinct differences in the location of authors within the academic stratification system.

Previous studies that have ranked US economics departments all consistently find clear and unmistakable differences in prestige (repute). This finding of the existence of a hierarchical prestige ordering of US economic departments is robust regardless of the ranking criteria utilized (e.g. number of publications, number of pages published or number of citations from a sample of top economics journals). The marked stratification of prestige between economics departments may produce an

institutional Matthew Effect. The institutional affiliation of an author may send a market signal about the quality of the article to potential citing researchers.[2] An economist's current academic affiliation may produce a 'halo effect' on an economist's research so that it is more likely to receive disproportionate peer recognition because of the institutional prestige and reputational capital behind it.

The purpose of this paper is to empirically investigate whether an institutional Matthew Effect operates on the research produced by economists located at different prestige levels in the academic stratification system. Does the prestige of an economist's current academic affiliation influence the extent of peer recognition of an economist's research? Is there an institutional Matthew Effect which heightens the visibility of an economist's research and accelerates the diffusion of that research to the scientific community?

The answer to these questions should be of obvious interest to both graduate economics students and currently employed academic economists on the job market. The reward structure in academia is, for the most part, based on peer recognition of research. Collegial recognition of published research is the currency of the reward system in academia. Reputation and professional standing are dependent upon the visibility or recognition of one's research. Monetary and non-monetary rewards such as salary and salary increments, job tenure and promotion, merit pay, repute and prominence stem from peer recognition. Being an economist of note or consequence is synonymous with peer recognition. Faculty benefit from information on the best academic environment for enhancing their professional standing, particularly since universities do reward reputation. Graduate economics students are interested in knowing which academic institutions provide optimum postgraduate research opportunities for attaining peer recognition.

2 DATA

The data from this study come from eight top economics journals (*American Economic Review*, *Econometrica*, *International Economic Review*, *Journal of Economic Theory*, *Journal of Political Economy*, *Quarterly Journal of Economics*, *Review of Economic Studies* and *Review of Economics and Statistics*). These eight journals publish a broad range of different types of economics research (general interest, theoretical, applied, econometrics, microeconomics and macroeconomics). These eight economics journals are all highly ranked and are considered to be higher quality journals within the economics profession on the basis of the extent to which others cite the articles that appear in each journal. Laband and Piette (1994b: 663) ranked 130 economics journals in 1990 and Diamond (1989: 6) ranked fifty economics journals in 1986 based on the number of citations received by

each journal. Both studies ranked the *American Economic Review*, *Econometrica*, *Journal of Political Economy*, *Journal of Economic Theory* and the *Quarterly Journal of Economics* among the top six economics journals. The *Review of Economic Studies*, *Review of Economics and Statistics* and the *International Economic Review* ranked in Diamond's top twelve and in Laband and Piette's top twenty.

It might be argued that the empirical results presented in this paper are an artifact of the paper's eight economics journals sample. There may be less variation in the quality of articles in these eight top economics journals than there is between articles published in these eight top journals (taken together) and articles published in a set of lesser ranked economics journals (taken together). Appearance of an article in any of these eight top economics journals may, by itself, signal to readers that the article is of high quality independent of the author's reputation or institutional affiliation. Readers may have a greater degree of uncertainty about the quality of an article in lesser ranked economics journals and may be more inclined to use an author's institutional affiliation as a screening mechanism for identifying research of high quality. If this is the case then selecting these eight top economics journals may actually induce a bias towards reducing the likelihood of empirically observing an institutional Matthew Effect.

Detailed information was compiled from 291 articles published in these eight economics journals during the year 1990. Excluded from the analysis were notes, shorter papers, book reviews, papers from the American Economic Association proceedings issue, communications, Presidential addresses, Nobel Laureate lectures, comments and replies. Because the focus of this study is the impact of US academic economics departments, also excluded were articles written by authors affiliated with US governmental agencies (e.g. Federal Reserve, Department of Labor), private sector research firms, non-US economics departments and non-US governmental agencies (e.g. World Bank). The data collected from each article included the length of the article, academic affiliation of the author(s) and the position number of the article in the particular journal issue.

3 MODEL

The empirical question this paper addresses is whether an institutional Matthew Effect exists in economics: does an article receive disproportionate peer recognition when it is written by an author affiliated with a more prestigious US economics department than when it is written by an author affiliated with a less prestigious US economics department (after controlling for author quality, journal quality and article-specific characteristics)?

The specification of the peer recognition of an article equation is:

$$\begin{aligned} \text{CITATIONS}_{i,\ 1991-2000} = {} & b_0 + b_1\text{AUTHORQUALITY}_i + \\ & b_2\text{JOURNALQUALITY}_i + b_3\text{PAGES}_i + \\ & b_4\text{LEADARTICLE}_i + \\ & b_5\text{COLLABORATION}_i + \\ & b_6\text{ACADEMICAFFILIATION}_i \end{aligned} \tag{1}$$

In the social sciences literature, including economics, the most widely used measure of peer recognition of a scientific contribution is the number of citations received by that article.[3] The number of citations an article receives reflects the degree to which one's peers have made use of that work.[4] Article citation counts are highly correlated with other indicators of peer recognition: membership in honorific societies, the Nobel Prize, awards of distinction, prestige of awards, honorary memberships (Quandt 1976; Hamermesh *et al.* 1982). Virtually all of the pre-eminent economists, discussing their classic articles, expressed the belief that the peer recognition they received after their articles were published was clearly evident from the number of times the articles were cited (Gans and Shepherd 1994).

The dependent variable in equation (1) is the total number of citations received by article i during the ten-year period (1991–2000) following its 1990 publication from each issue of the eight economics journals previously listed (excluding self-citations).[5] There are several reasons why a ten-year post-publication period is chosen. First, peer recognition of an article tends to peak in the fourth or fifth year after publication (Liebowitz and Palmer 1988: 91). Second, the ten-year post-publication period is sufficiently long enough to capture peer recognition of theories or contributions that may have been ahead of their time or not immediately recognized. Third, the ten-year post-publication period is short enough so that there is insufficient time for an idea or theory to become incorporated into the language of the literature without explicit citation to their well-known source (e.g. Friedman's permanent income or Becker's human capital concept).

Author quality (AUTHORQUALITY) is measured by the total number of citations received by the author of article i (or the average for multi-authored papers) during the twenty years (1970–89) prior to the publication of article i, excluding self-citations. The quality/reputation of author i may influence the number of citations to article i for several reasons: (1) The total number of citations an author's prior research has accumulated is a signal to researchers about the excepted quality of article i. (2) The reputation of author i, as represented by the stock of prior citations, may produce an author Matthew Effect resulting in the disproportionate recognition of article i.[6] (3) The stock of author i's prior citations may be used by citing

researchers to signal to journal editors or journal referees that they are conversant with the reputation of author i (David 1994: 77). (4) Author i's stock of prior citations may serve as a signal of parochial loyalty by doctorates to cite an article by the more productive faculty of their doctoral institution (Stigler and Friedland 1975: 495).

There exists a well-documented hierarchy in reputation, influence and professional standing between economics journals. Articles appearing in a prestigious economics journal may send a signal to potential citers about the probability of reading a high-quality substantive contribution. Journal quality is measured using the Laband–Piette (1994b) impact index of economics journal weights (0 to 100). The journal weights (JOURNALQUALITY) are based on the relative influence an article published in each journal has on the community of economics researchers.

It has been argued that higher quality research generally requires greater elucidation than lesser quality research (Vandermeulen 1972). Longer articles typically address more substantive topics, controversies or seminal contributions. To account for the variation in journal page size, each article was standardized to *American Economic Review* page equivalents (PAGES).

A widely held belief in the economics literature is that economists who collaborate produce scientific contributions of higher quality than sole authors. The underlying rationale for this increase in quality varies from skill complementarities to synergies between the co-authors. Barnett *et al.* (1988: 539) argues that collaboration allows economists to capture the efficiency gains from specialization and division of labor. Hudson (196: 157) maintains that 'gains from collaborative work result … from a sort of synergy where multiple contributors develop ideas that none would have developed on his or her own'. Fox and Faver (1984: 351) assert that 'working with others creates a social context and reality for the research which, in turn allows for better assessment of the project' and higher quality research. Johnson (1997) found in a study of Yale University economists that, after controlling for author characteristics, co-authored articles received more citations than sole-authored articles. Regardless of the reason, collaboration on article i may signal to researchers that article i is of high quality. The variable COLLABORATION equals one if article i had two or more authors.

Laband and Piette (1994a: 198) assert that 'lead articles are published in that position precisely because the editors expect these articles to have special relevance to the readership'. A paper chosen by a journal editor to be the lead article in a journal issue may send a market signal to readers about the perceived quality of the article. This market signal may provide readers a screening mechanism for identifying research of high quality. The variable LEADARTICLE equals one if article i is in the lead position in an issue of the eight economics journals previously listed.

Scott and Mitias (1996) ranked the top 240 economics departments in the US based on the number of pages published in thirty-six economics journals over the period 1984–93. Scott and Mitias reported that their economics department rankings clearly showed that there are well-defined differences between universities such that universities could be stratified into four distinct prestige levels. The first nineteen ranked universities were clearly the elite economics departments, followed in order by the universities ranked from 20 to 49, 50 to 100, and 101 to 240. In order to determine if there is an institutional Matthew Effect, two dummy variables are used to measure the different prestige levels of economics departments within the academic stratification system. The dummy variable ELITE equals one if author i is affiliated with any of Scott and Mitias' top nineteen ranked economics departments[7] and RANK 20–49 equals one if author i is affiliated with any of the economics departments ranked from 20 to 49. In the case of multiple authors, the ranking of the author affiliated with the highest ranked economics department is used. Because the percentage of articles published in the eight journal sample by authors at economics departments ranked from 101 to 240 was less than 4 per cent this category was combined with those economics departments ranked from 50 to 101. The omitted category is authors affiliated with economics departments ranked from 50 to 240. If there is an institutional Matthew Effect, then it is expected that the location of an author in the academic hierarchy will have a significantly positive impact on the peer recognition of an article. If there is no institutional Matthew Effect, then an author's academic affiliation should have no statistically significant impact on the peer recognition of an article.

Laband (1986: 174) sampled 5,880 articles published in forty major economics journals during the period 1974–6. He compiled the number of citations received by each of the 5,880 articles in the subsequent six-year period (1977–82) following publication. His breakdown of the citation distribution of the 5,880 articles is listed in Table 1, column 2. Laband's figures show that in the broader population of all economists who do research most articles are rarely cited. Eighty-four per cent of all articles were cited fewer than ten times, only 3 per cent receive more than thirty citations, and only 0.7 per cent of all articles were cited more than fifty times. Table 1, column 3 lists the subsequent citation distribution of the 291 articles published in the eight journal sample used in this paper. In contrast to the broader distribution of all economists who do research, this paper's sample consists disproportionately of articles by economists whose research is relatively heavily cited. Only 42 per cent of the articles published in the eight top economics journal sample were cited less than ten times, 25 per cent of the sample articles were cited more than thirty times, and 12 per cent were cited more than fifty times. In addition, the sample of authors from these eight economics journals is disproportionately drawn from very highly rated economics departments. Nearly 55 per cent of the authors are

Table 1 Population and sample citation distribution of articles published

Total citations	*Population distribution % of articles*	*Eight journal sample % of articles*
0–9	84.4	41.6
10–19	9.4	22.4
20–29	3.1	11.4
30–39	1.5	10.0
40–49	0.6	2.7
50–59	0.3	2.7
60–69	0.1	3.2
70–79	0.1	0.5
80–89	0.1	0.9
90–99	0.2	0.9
100–149	0.0	2.3
150–199	0.0	0.0
200–249	0.1	0.9
250+	0.0	0.5

affiliated with the nineteen highest ranked economics departments (see note 7) and 25 per cent were at five of the highest ranked economics departments. If a Matthew Effect exists, this paper's sample selection biases the empirical results towards a numerically smaller Matthew Effect than would be found in the broader population of economists who engage in research.

It is also important to note that an institutional Matthew Effect may have a direct effect and/or an indirect effect. This paper examines only the direct effect: does the prestige or professional standing of an economist's academic institution influence the peer recognition of his or her published research. But it may be that an economist's academic affiliation indirectly affects other measures of recognition accorded to an article. In particular, it is possible that holding constant an article's quality, the quality of the economics journal an author's article is published in and the placement position of that article in the journal issue may also be influenced by the prestige or professional standing of the author's academic institution. Thus a positive and statistically significant coefficient for the journal quality variable (JOURNALQUALITY) and for the favorable article placement variable (LEADARTICLE) may, in part, be interpreted as evidence of an indirect institutional Matthew Effect.

The means and standard deviations of all the variables used in equation (1) are shown in Table 2.

4 EMPIRICAL RESULTS

Estimation of equation (1) by ordinary least squares is an inappropriate technique since the dependent variable, the total number of citations to

Table 2 Variable means and standard deviations

Variable	*Mean*	*Standard deviation*
CITATIONS, 1991–2000	25.36	50.96
AUTHORQUALITY	213.26	605.35
JOURNALQUALITY	59.33	30.52
PAGES	15.54	6.23
COLLABORATION	0.46	0.49
LEADARTICLE	0.12	0.32
ELITE	0.54	0.49
RANK 20–49	0.30	0.73

article i, is left censored at zero and takes on only discrete values (number of citations to article i=0, 1, 2, …). A more appropriate method of estimating a citation count model is the negative binomial regression which is an extension of the generalized Poisson model. The negative binomial regression results of equation (1) appear in Table 3, column (1).

The empirical results strongly support the hypothesis that the reputation/quality of an author and of an economics journal influence the peer recognition of an article. Both author quality and journal quality are statistically and numerically significant. Publishing an article in the *American Economic Review* (journal ranking=100) will generate twenty-eight citations in the ten-year post-publication period. An author with 300 prior citations produces nearly four citations over the next ten years. A twenty-page article yields eighteen post-publication citations. Neither the lead article nor the collaboration variable is statistically significantly different from zero.

Of the two institutional prestige dummy variables, only ELITE is statistically significantly different from zero. Affiliation with an elite university has a statistically positive institutional Matthew Effect on the number of citations an article receives during the ten-year time horizon after publication. *Ceteris paribus*, being an author affiliated with any of the nineteen elite economics departments increases the number of citations an article receives by nearly thirteen over the ten-year post-publication period. This number is numerically significant when one considers that 85 per cent of all published economics articles are cited fewer than ten times (Laband 1986).

The previous estimation assumed that all the economics departments in the ELITE institution category are of identical quality. However, in the Scott and Mitias economics department rankings there are significant differences in the number of journal pages published between the nineteen elite universities. There is a difference of 4,500 pages between the nineteenth ranked university (Illinois) and the number one ranked university (Harvard). There is a difference of more than 2,500 pages between the

Table 3 Negative binomial regression results of equation (1)

	Dependent variable: total citations, 1991–2000			
Independent variables	*Coefficient (1)*	*t-value (1)*	*Coefficient (2)*	*t-value (2)*
CONSTANT	−17.401[d]	−1.77	−15.513[d]	−1.70
AUTHORQUALITY	0.013[b]	2.32	0.009[d]	1.67
JOURNALQUALITY	0.278[c]	2.18	0.317[a]	2.66
PAGES	0.921[c]	1.95	0.523[d]	1.85
LEADARTICLE	11.623	1.09	5.477	0.51
COLLABORATION	−1.864	−0.27	3.607	0.55
ELITE	12.678[d]	1.72	—	—
RANK 20–49	−0.778	−0.15	−0.935	−0.20
Elite universities:				
Harvard			33.016[b]	2.31
Chicago			114.687[a]	6.15
Penn			1.025	0.06
MIT			8.264	0.53
Northwestern			8.421	0.57
Stanford			19.454	0.69
Princeton			9.726	0.59
Michigan			31.923	1.22
Berkeley			11.230	0.68
UCLA			−3.183	−0.16
Yale			−11.032	−0.45
Columbia			6.361	0.30
NYU			3.129	0.15
Rochester			15.698	0.76
Wisconsin			−8.438	−0.36
Carnegie-Mellon			13.910	0.43
Cornell			−21.828	−0.77
Duke			3.069	0.14
Illinois			0.045	0.01
Log likelihood	−1410.4		−1490.5	

Notes: Number of observations=291. t-value significant at: a=0.01 level of significance. b=0.02 level of significance. c=0.05 level of significance. d=0.10 level of significance.

tenth ranked university (UCLA) and the fourth ranked university (MIT). This suggests that there may be different institutional Matthew Effects between the nineteen universities in the ELITE institution category. In order to test for institution-specific Matthew Effects, each of the nineteen universities in the ELITE institution category is represented by a separate dummy variable and equation (1) was re-estimated. The empirical results are shown in Table 3, column (2). The coefficients of AUTHORQUALITY, JOURNALQUALITY, and PAGES are virtually identical to those previously reported in column (1) (the null hypothesis of equality of coefficients cannot be rejected).

Of the nineteen universities in the ELITE institution category only the economics departments of Harvard University and the University of Chicago are statistically significantly different from zero. The estimated coefficients for Harvard and Chicago clearly indicate there is a numerically significant Matthew Effect for both institutions. *Ceteris paribus*, affiliation with Harvard University's economics department results in an author's article receiving an additional thirty-three citations in the ten-year period following publication; affiliation with the University of Chicago's economics department generates an additional 114 citations for an article during the ten-year post-publication period. The empirical evidence is consistent with the hypothesis that there exists a significant institutional Matthew Effect that affects the peer recognition of articles written by economists affiliated with Harvard University and the University of Chicago.[8] An article written by an author affiliated with either Harvard's or Chicago's economics department received disproportionate peer recognition relative to the recognition received by an article authored by those at less prestigious universities.

5 ROBUSTNESS OF THE EMPIRICAL RESULTS

How robust are the empirical results reported in the prior section? In order to test the sensitivity of the previous results various alternative specifications of equation (1) are estimated.

The theoretical justification for including the variables LEADARTICLE and COLLABORATION in the estimation of equation (1) may seem arguably weak, especially since both variables are statistically insignificant. The regressions were re-estimated omitting both LEADARTICLE and COLLABORATION and the empirical results are reported in Table 4, column (1) using the aggregate ELITE variable and column (2) for each of the nineteen universities in the ELITE institution category. The estimated coefficients are virtually identical to those previously reported in columns (1) and (2) of Table 3 (the null hypothesis of equality of coefficients cannot be rejected). Even when the LEADARTICLE and COLLABORATION variables are dropped from the estimation of equation (1) the estimated coefficients for Harvard and Chicago indicate there is a numerically significant Matthew Effect for both institutions.

Table 5 shows the percentage sample distribution of the authors affiliated with the nineteen elite universities. As can be seen in Table 5 many of the elite universities have very few authors who published in the eight journal sample in 1990. The statistical insignificance of each of the seventeen elite university dummy variables (other than Harvard or Chicago) may be because some of these individual elite universities do not contain enough authors to provide consistent (precise) coefficient estimates.

Table 4 Negative binomial regression results of equation (1)

	Dependent variable: total citations, 1991–2000			
Independent variables	*Coefficient (1)*	*t-value (1)*	*Coefficient (2)*	*t-value (2)*
CONSTANT	−17.567[d]	−1.82	−14.185	−1.59
AUTHORQUALITY	0.015[a]	2.69	0.009[d]	1.81
JOURNALQUALITY	0.269[c]	2.11	0.313[a]	2.63
PAGES	0.986[d]	1.67	0.599[c]	1.99
ELITE	12.778[d]	1.65	—	—
RANK 20–49	−1.310	−0.25	−1.016	−0.21
Elite universities:				
Harvard			33.582[b]	2.35
Chicago			113.751[a]	6.14
Penn			0.813	0.05
MIT			8.479	0.54
Northwestern			7.342	0.51
Stanford			24.610	0.92
Princeton			8.778	0.53
Michigan			30.782	1.17
Berkeley			12.764	0.78
UCLA			−3.656	−0.18
Yale			−10.794	−0.44
Columbia			5.683	0.27
NYU			3.460	0.17
Rochester			14.813	0.71
Wisconsin			−9.966	−0.43
Carnegie-Mellon			13.678	0.42
Cornell			−21.407	−0.76
Duke			2.867	0.13
Illinois			1.455	0.04
Log likelihood	−1110.2		−1190.8	

Notes: Number of observations=291. t-value significant at: a=0.01 level of significance. b=0.02 level of significance. c=0.05 level of significance. d=0.10 level of significance.

In order to investigate this possibility equation (1) was re-estimated with three elite university dummy variable categories instead of nineteen individual variables: one for Harvard, one for Chicago and one for the remaining seventeen elite universities (RANK 3–19). In addition, Scott and Mitias (1996: 384) noted that, based on the total number of pages published, there are three distinct breaks in their ranking of the other seventeen elite universities (after Harvard and Chicago): those ranked 3 to 7 (RANK 3–7), 8 to 12 (RANK 8–12), and 13 to 19 (RANK 13–19). Equation (1) was also re-estimated with these three more homogenous elite university dummy variable categories along with the Harvard and Chicago dummy variables.

The empirical results appear in Table 6, column (1) when the elite university dummy variable RANK 3–19 is used in equation (1) and in column (2) when the three elite university dummy variable categories

Table 5 Percentage distribution of authors by university affiliation

Rank	*Elite universities*	*% of authors*
1	Harvard	5.9
2	Chicago	3.2
3	Penn	5.0
4	MIT	4.6
5	Northwestern	5.5
6	Stanford	1.4
7	Princeton	4.1
8	Michigan	1.4
9	Berkeley	4.1
10	UCLA	2.7
11	Yale	1.8
12	Columbia	2.3
13	NYU	2.7
14	Rochester	2.3
15	Wisconsin	1.8
16	Carnegie-Mellon	0.9
17	Cornell	1.4
18	Duke	2.3
19	Illinois	0.9
Total		54.3

Table 6 Negative binomial regression results of equation (1)

	Dependent variable: total citations, 1991–2000			
Independent variables	*Coefficient (1)*	*t-value (1)*	*Coefficient (2)*	*t-value (2)*
CONSTANT	−14.675[d]	−1.63	−14.618[d]	−1.62
AUTHORQUALITY	0.008[d]	1.65	0.008[d]	1.67
JOURNALQUALITY	0.318[a]	2.72	0.320[a]	2.73
PAGES	0.473[d]	1.80	0.456[d]	1.77
LEADARTICLE	8.943	0.91	8.351	0.84
COLLABORATION	2.390	0.38	2.675	0.42
Harvard	33.279[b]	2.32	33.352[b]	2.32
Chicago	114.942[a]	6.14	115.103[a]	6.15
RANK 3–19	5.887	0.75	—	—
RANK 3–7	—	—	7.714	0.83
RANK 8–12	—	—	6.318	0.58
RANK 13–19	—	—	2.550	0.23
RANK 20–49	−0.727	−0.15	−0.747	−0.15
Log likelihood	−1092.6		−1092.5	

Notes: Number of observations=291. t-value significant at: a=0.01 level of significance. b=0.02 level of significance. c=0.05 level of significance. d=0.10 level of significance.

RANK 3–7, RANK 8–12 and RANK 13–19 are used in equation (1). Table 6 shows that regardless of how the other seventeen elite university variables are specified their coefficients are statistically insignificant and the estimated coefficients of the Harvard and Chicago dummy variables are numerically (and statistically) identical to those previously reported in Table 3, column (2). Once again the empirical results are consistent with the presence of a numerically significant institutional Matthew Effect for the Harvard and Chicago economics departments.

Sometimes the empirical results of regressions involving citations can be influenced by outlying observations or outliers. These outliers may arise if a very small number of authors produce 'superstar' articles which receive an inordinately large number of citations. Regression estimation places a relatively heavy weight on these outliers and can produce estimates that are sensitive to their presence. An outlier may be an article that garners a large number of citations because it is an innovative, substantive, or pathbreaking scientific contribution irrespective of an author's institutional affiliation. The article may also receive disproportionate recognition for its scientific contribution because of the author's institutional affiliation. It is not unreasonable to ask whether the finding that an institutional Matthew Effect exists is due to the inclusion of a few very highly cited articles. It is possible that the previous estimates of the elite university coefficients are sensitive to these outliers. The econometric solution most often suggested is to re-estimate equation (1) without the outliers. The new parameter estimates provide evidence about the sensitivity of the previous empirical results to the presence of outliers.

When the five most cited articles are removed the empirical results when equation (1) is re-estimated are shown in Table 7, column (1) when the ELITE dummy variable is included and in column (2) when the nineteen individual elite university dummy variables are included. The empirical results are consistent with the prior reported results that, even after excluding outliers, a statistically and numerically significant institutional Matthew Effect exists for elite universities. But the institutional Matthew Effect is solely attributable to the economics departments at Harvard University and the University of Chicago.

Thus even when alternative specifications of equation (1) are estimated the empirical results reported in the prior section remain robust. The empirical results suggest quite strongly the presence and uniqueness of an institutional Matthew Effect for the economics departments at both Harvard University and the University of Chicago.

6 TIMING OF CITATIONS

The Merton (see also Siow 1991) information signaling model argues that a Matthew Effect occurs because a researcher's time is limited, and not being

Table 7 Negative binomial regression results of equation (1), excluding outliers

	Dependent variable: total citations, 1991–2000			
Independent variables	*Coefficient (1)*	*t-value (1)*	*Coefficient (2)*	*t-value (2)*
CONSTANT	−14.016[a]	−2.73	−14.150[a]	−2.83
AUTHORQUALITY	0.005[d]	1.64	0.004[d]	1.71
JOURNALQUALITY	0.227[a]	3.42	0.243[a]	3.74
PAGES	0.613[d]	1.84	0.543[d]	1.64
LEADARTICLE	22.609[a]	4.04	20.096[a]	3.36
COLLABORATION	5.432	1.53	7.436[c]	2.09
ELITE	10.158[b]	2.34	—	—
RANK 20–49	0.173	0.06	−0.111	−0.04
Elite universities:				
Harvard			18.646[b]	2.34
Chicago			39.802[a]	3.64
Penn			4.540	0.55
MIT			8.976	1.06
Northwestern			9.565	1.20
Stanford			7.918	0.51
Princeton			13.046	1.46
Michigan			34.077	1.38
Berkeley			9.024	1.01
UCLA			−0.598	−0.05
Yale			−6.458	−0.48
Columbia			5.933	0.52
NYU			7.471	0.68
Rochester			17.938	1.59
Wisconsin			−6.285	−0.50
Carnegie-Mellon			15.570	0.89
Cornell			−14.931	−0.97
Duke			5.750	0.50
Illinois			1.296	0.07
Log likelihood	−966.7		−956.3	

Notes: Number of observations=286. t-value significant at: a=0.01 level of significance. b=0.02 level of significance. c=0.05 level of significance. d=0.10 level of significance.

able to read everything, researchers rationally allocate their scarce time by using the location/reputation of the author within the academic stratification system as a signal of the presumed quality of the scientific contribution.

David (1994: 77) has suggested an alternative, although not necessarily mutually exclusive, explanation for the presence of an institutional Matthew Effect that emphasizes the role played by the 'gatekeepers of science' – journal editors/referees. In his model researchers, when deciding which authors to cite, may be motivated to signal to editors/referees that they are conversant with the reputational ranking of these journal editors/referees. Journal editors/referees while primarily concerned with the quality of an

article, also care about the respect, recognition, approval or praise they receive from their colleagues in the scientific community. Researchers may use citations as a signal of approbation to journal editors/referees who are disproportionately more likely to be affiliated with an elite university.

If an institutional Matthew Effect is present, then one way to test these alternative theories is to examine the timing of citations. If Merton's information signaling explanation is more important, then one would expect the initial positive impact of an institutional Matthew Effect on an article's citations should decrease over time as readers accurately assess an article's true quality, irrespective of the prestige of the author's academic affiliation. However, if David's approbation explanation is more important, then the impact of the institutional Matthew Effect on an article's citations should remain positive and not diminish over time.

In order to test whether the institutional affiliation of an author influences the timing of an article's citations the dependent variable in equation (1), the total number of citations article i received from 1991 to 2000, is disaggregated into two separate dependent variables: (i) the total number of citations received by article i from 1991 to 1995 and (ii) the total number of citations received by article i from 1996 to 2000. Since over half of the citations in economics articles published in a given year are to research published in the preceding five years the existence of an information signaling institutional Matthew Effect suggests that articles written by economists at more prestigious universities should receive greater initial peer recognition (more citations) during the first five years after publication than the second five years after publication.

Equation (1) is re-estimated for each five-year period interval when the two institutional prestige dummy variables ELITE and RANK 20–49 are included in equation (1). The empirical results appear in Table 8, columns (1) and (2) for the time periods 1991–5 and 1996–2000, respectively. Author quality, journal quality and article length have a significantly positive and stable impact on the number of citations received over the two five-year periods (the null hypothesis of equality of coefficients across the two five-year intervals cannot be rejected).

Column (1) of Table 8 shows that only authors affiliated with an elite economics department have a statistically significantly positive impact on the number of citations an article receives in the first five years after publication. *Ceteris paribus*, the Matthew Effect of being affiliated with one of the nineteen elite universities is to increase the number of citations an article receives the first five years after publication by approximately six. An article is more immediately recognized during the first five years after publication when the author is affiliated with an elite economics department. Column (2) of Table 8 shows that none of the academic affiliation variables are statistically significantly different from zero during the later time interval 1996–2000. The positive impact of the institutional

Table 8 Negative binomial regression results of equation (1)

	Dependent variable: citations, 1991–1995		*Dependent variable: citations, 1996–2000*	
Independent variables	*Coefficient (1)*	*t-value (1)*	*Coefficient (2)*	*t-value (2)*
CONSTANT	−12.172[a]	−2.90	−12.751[d]	−1.97
AUTHORQUALITY	0.005[c]	2.10	0.008[c]	2.19
JOURNALQUALITY	0.139[a]	2.57	0.150[d]	1.80
PAGES	0.597[b]	2.22	0.572[c]	1.83
LEADARTICLE	6.481	1.45	7.126	1.03
COLLABORATION	2.612	0.91	−5.221	−1.18
ELITE	6.426[c]	1.83	7.011	1.27
RANK 20–49	−1.042	−0.48	0.252	0.07
Log likelihood	−996.6		−948.9	

Notes: Number of observations=291. t-value significant at: a=0.01 level of significance. b=0.02 level of significance. c=0.05 level of significance. d=0.10 level of significance.

Matthew Effect of elite universities on an article's citations occurs only during the first five years after publication.

In order to determine if the institutional Matthew Effect on the timing of citations to an article is homogenous among all nineteen elite universities the ELITE institution variable was disaggregated into 19 separate dummy variables representing each elite university. Equation (1) is re-estimated and the empirical results appear in Table 9, column (1) (for the five-year interval 1991–5) and column (2) (for the five-year interval 1996–2000). The empirical results in column (1) show that the institutional Matthew Effect on the timing of an article's citations during the time interval 1991–5 is due solely to the impact of the institutional prestige of Harvard's and Chicago's economics departments. *Ceteris paribus*, the Harvard institutional affiliation on an article produces an additional fifteen citations and the Chicago institutional affiliation on an article generates forty-six more citations during the initial five-year post-publication period. The empirical results in column (2) show that, consistent with David's approbation hypothesis, the institutional Matthew Effect of Harvard and Chicago on the initial reception of an author's article not only does not diminish during the next five-year interval, it even somewhat increases. *Ceteris paribus*, the Harvard affiliation on an economist's article produces an additional nineteen citations and the Chicago name increases an article's citation count by seventy during the second five-year post-publication interval 1996–2000.

In sum, affiliation with the economics department at either Harvard University or the University of Chicago significantly (statistically and numerically) increases an article's recognition during both the first and second five-year period after publication. Consistent with the approbation theory proposed by David, the institutional Matthew Effect of being

Table 9 Negative binomial regression results of equation (1)

	Dependent variable: citations, 1996–2000		*Dependent variable: citations, 1996–2000*	
Independent variables	*Coefficient (1)*	*t-value (1)*	*Coefficient (2)*	*t-value (2)*
CONSTANT	−11.379[a]	−2.92	−10.901[d]	−1.79
AUTHORQUALITY	0.004[d]	1.68	0.005[d]	1.71
JOURNALQUALITY	0.159	3.18	0.170[c]	2.16
PAGES	0.430	1.69	0.324[d]	1.81
LEADARTICLE	3.817	0.85	3.020	0.43
COLLABORATION	4.844	1.60	−2.158	−0.50
RANK 20–49	1.139	−0.58	0.139	0.04
Elite universities:				
Harvard	15.838[a]	2.65	18.937[b]	2.02
Chicago	45.941[a]	5.91	69.991[a]	5.76
Penn	2.681	0.43	−0.939	−0.09
MIT	5.623	0.87	4.685	0.46
Northwestern	1.202	0.19	6.378	0.66
Stanford	7.863	0.67	12.040	0.65
Princeton	7.825	1.14	0.815	0.07
Michigan	21.821	1.09	5.047	0.27
Berkeley	6.959	1.01	5.908	0.54
UCLA	−0.273	−0.03	−8.389	−0.62
Yale	−6.756	−0.66	−2.935	−0.18
Columbia	2.937	−0.34	5.564	0.41
NYU	−1.077	−0.12	6.445	0.49
Rochester	9.444	1.09	5.290	0.38
Wisconsin	−4.065	−0.42	−8.386	−0.53
Carnegie-Mellon	6.897	0.51	10.466	0.50
Cornell	−10.050	−0.85	−9.482	−0.51
Duke	−1.230	−0.14	7.058	0.52
Illinois	−3.785	−0.28	7.185	0.34
Log likelihood	−976.1		−931.3	

Notes: Number of observations=291. t-value significant at: a=0.01 level of significance. b=0.02 level of significance. c=0.05 level of significance. d=0.10 level of significance.

affiliated with the economics department at Harvard or Chicago does not diminish over time and may even increase. This suggests that the institutional Matthew Effect on peer recognition of an article during the initial five years after publication becomes a reinforcing process of cumulative advantage that further enhances the institutional impact of Harvard and Chicago during the next five-year post-publication period.

7 CONCLUSION

The Matthew Effect refers to the disproportionate allocation of peer recognition of an author's scientific contribution whenever there are clear

and well-defined differences in prestige within the academic stratification system. This paper examined whether an institutional Matthew Effect exists in economics: does the prestige of an academic economist's affiliation influence the level of peer recognition and speed of diffusion of a scientific contribution?

All articles written by US academic economists in eight journals during 1990 are examined. The empirical results show that after controlling for author quality, journal quality and article-specific characteristics, academic economists affiliated with any of nineteen elite universities received disproportionately greater increments of peer recognition (as measured by the number of post-publication citations) for their articles. Affiliation with any of these elite universities also affected the initial reception of an article by accelerating the diffusion of peer recognition to the community of economics scholars.

However, when allowance was made for the existence of differences in prestige between these nineteen elite universities, the empirical results found that an institutional Matthew Effect was in operation for only two economics departments: Harvard University and the University of Chicago. *Ceteris paribus*, an article written by an economist affiliated with Harvard University or the University of Chicago had significantly (statistically and numerically) greater peer recognition than if it was written by an economist affiliated with a less prestigious university. Scientific contributions by economists affiliated with Harvard University and the University of Chicago were also more recognized by the economics community and the institutional Matthew Effect operated throughout the entire post-publication period studied.

One implication of the finding that an institutional Matthew Effect exists for scientific contributions by economists affiliated with Harvard University or the University of Chicago is that these inequalities in peer recognition are self-perpetuating. Economists affiliated with Harvard or Chicago receive disproportionate peer recognition of their scientific contributions because of their institutional affiliation which in turn facilitates greater peer recognition of these contributions. This self-perpetuating process of cumulative advantage suggests that there are increasing returns to peer recognition as a result of being affiliated with Harvard's or Chicago's economics department. One unanswered question beyond the scope of this paper is: do Harvard University and the University of Chicago have a permanent institutional Matthew Effect duopoly in economics? Are there any countervailing market forces to mitigate or constrain their institutional Matthew Effect?

Professor Marshall H. Medoff
Department of Economics, California State University
mmedoff@csulb.edu

NOTES

1 Siow (1991) has proposed a theoretical model that if a reader's time is limited, there is an elastic supply of new scholars, and the cost of switching scholars is small, then first impressions about an article are crucial. The optimal strategy of readers, to maximize the probability of reading a substantive article, is to select articles written by researchers with an established reputation of high-quality research.

2 One of the primary arguments by proponents of the single-blind reviewing process used by economics journals (anonymous reviewers know the author's name and institutional affiliation) is that the name and institutional affiliation of an author is a useful and important signal to a referee (Blank 1991).

3 Citation counts have been used to rank the prestige of economics departments (Liebowitz and Palmer 1988), economics journals (Laband and Piette 1994b), and economists (Medoff 1989).

4 Stigler and Friedland (1975: 486) note that '… citations are influence for they influence the reading by readers of the citing paper'.

5 All citation figures were obtained from the Social Sciences Citation Index.

6 The impact of an author Matthew Effect has been aptly summarized by Samuelson (1962: 5), 'No one gets a Nobel Prize for an essay on the relationship of quantum mechanics to free will and God; but one who has already received such a prize will get a better hearing for his random or systematic thoughts on the topic.'

7 The nineteen elite universities in rank order are: (1) Harvard, (2) Chicago, (3) Pennsylvania, (4) MIT, (5) Northwestern, (6) Stanford, (7) Princeton, (8) Michigan, (9) Berkeley, (10) UCLA, (11) Yale, (12) Columbia, (13) NYU, (14) Rochester, (15) Wisconsin, (16) Carnegie-Mellon, (17) Cornell, (18) Duke and (19) Illinois.

8 It is possible that the finding of a Harvard and Chicago institutional Matthew Effect is due to reverse causality. If an institution affects an article's citations perhaps citations to articles influence the opinion of the economics profession about the reputation and prestige of an economics department; the Harvard and Chicago institutional dummy variables may be endogenous. Using a Hausman test the null hypothesis of exogeneity of the Harvard and Chicago institutional variables could not be rejected.

REFERENCES

Barnett, A., Ault, R. W. and Kaserman, D. L. (1988) 'The rising incidence of coauthorship in economics: further evidence', *Reviews of Economics and Statistics* 70: 539–43.

Blank, R. M. (1991) 'The effects of double-blind versus single-blind reviewing: evidence from the *American Economic Review*', *American Economic Review* 81: 1041–67.

Cole, J. R. and Cole, S. (1973) *Social Stratification in Science*, Chicago: University of Chicago Press.

David, P. A. (1994) 'Positive feedbacks and research productivity in science: reopening another black box', in Ove Grandstrand (ed.) *Economics of Technology*, New York: North-Holland, pp. 65–89.

Diamond, A. M. (1989) 'The core journals of economics', *Current Contents* 21: 4–11.

Fox, M. F. and Faver, C. A. (1984) 'Independence and cooperation in research: the motivation and costs of collaboration', *Journal of Higher Education* 55: 347–59.

Gans, J. S. and Shepherd, G. B. (1994) 'How are the mighty fallen: rejected classic articles by leading economists', *Journal of Economic Perspectives* 8: 165–79.
Hamermesh, D. S., Johnson, G. E. and Weisbrod, B. (1982) 'Scholarship, citations and salaries: economic rewards in economics', *Southern Economic Journal* 49: 472–81.
Hudson, J. (1996) 'Trends in multi-authored papers in economics', *Journal of Economic Perspectives* 10: 153–8.
Johnson, D. (1997) 'Getting noticed in economics: the determinants of academic citations', *American Economist* 41: 43–52.
Laband, D. N. (1986) 'Article popularity', *Economic Inquiry* 24: 173–80.
Laband, D. N. and Piette, M. J. (1994a) 'Favoritism versus search for good papers: empirical evidence regarding the behavior of journal editors', *Journal of Political Economy* 102: 194–203.
Laband, D. N. and Piette, M. J. (1994b) 'The relative impacts of economics journals: 1970–1990', *Journal of Economic Literature* 32: 640–66.
Liebowitz, S. J. and Palmer, J. P. (1988) 'Assessing assessments of the relative quality of economics departments', *Quarterly Review of Economics and Business* 28: 88–113.
Medoff, M. H. (1989) 'The ranking of economists', *Journal of Economic Education* 20: 405–15.
Merton, R. K. (1968) 'The Matthew Effect in science', *Science* 159: 56–63.
Merton, R. K. (1973) *The Sociology of Science*, Chicago: University of Chicago Press.
Quandt, R. E. (1976) 'Some quantitative aspects of the economic journal literature', *Journal of Political Economy* 84: 741–55.
Samuelson, P. A. (1962) 'Economists and the history of ideas', *American Economic Review* 52: 1–18.
Scott, L. C. and Mitias, P. M. (1996) 'Trends in rankings of economics departments in the U.S.: an update', *Southern Economic Journal* 34: 378–400.
Siow, A. (1991) 'Are first impressions important in academia?', *Journal of Human Resources* 26: 236–55.
Stigler, G. J. and Friedland, C. (1975) 'The citation practices of doctorates in economics', *Journal of Political Economy* 83: 477–507.
Vandermeulen, A. (1972) 'Manuscripts in the maelstrom: a theory of editorial process', *Public Choice* 13: 107–11.
Yotopoulos, P. A. (1961) 'Institutional affiliation of the contributors to three professional journals', *American Economic Review* 51: 665–70.
Zuckerman, H. (1977) *Scientific Elite: Nobel Laureates in the United States*, New York: *Free Press*.