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Determinants of Citations to the Agricultural and Applied Economics Association Journals

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This paper investigates citations to articles published in the *Review of Agricultural Economics* and in the *American Journal of Agricultural Economics* to better understand the impact of articles published in these journals and to evaluate recent policy decisions made by the Agricultural and Applied Economics Association. The biggest factors affecting non-self citations are self-citations and whether the article received at least one citation in the year after publication, suggesting that "advertising" and "signaling" play important roles in the extent to which a paper is cited. Principal papers and comments/replies are associated with significantly fewer citations for both journals.

The primary purpose of the Agricultural and Applied Economics Association (AAEA) is to "further the development and dissemination of systematic knowledge of agricultural economics" (pg. 2, AAEA). The primary method used by the AAEA to disseminate knowledge is the publication of peer-reviewed journals, and yet not all published articles are equal in terms of the extent to which they contribute to the Association's purpose.

One of the key metrics used to evaluate the extent to which a work is used by others and contributes new knowledge is citations. Since 1981, ISI's Web of Knowledge has been tracking citations in the social sciences including economics. On an individual level, there is perhaps no greater measure of an academic's impact than the extent to which their work contributes to development of knowledge and is used by others. In fact, the number of citations to a person's work is often used in promotion decisions, salary determination, and as criteria to judge whom to honor as fellows of professional associations (e.g., see Moore, Newman, and Turnbull; Siow). Moreover, Hamermesh, Johnson, and Weisbrod found that that the marginal return to a citation was greater than the marginal return to a publication

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in terms of academic economists' salaries. On a more general level, citations data have also been used to determine which research areas have been most prominent and to rank economics programs (e.g., Kim, Morse, and Zingales). Given these considerations and the stated purpose of the AAEA, it would seem prudent to gain a better understanding of the factors affecting whether and to what extent agricultural economics research contributes to the state of knowledge as measured by citations.[1]

The publishing landscape has changed dramatically in recent years, both in regards to the AAEA journals specifically and to all academic journals more generally. With the advent of the Internet and online journals, authors are now able, with a simple search and click of the mouse, to rapidly gain access to published research and working papers. How have these changes influenced the quantity of citations and the types of articles that are cited? The answer to this question is important because the number of citations to the work published in a journal, via statistics such as the impact factor, is increasingly being used as metric of journal quality and stature (Barrett, Aliakbar, and Bailey; Pieters and Baumgartner). Indeed, the rising importance of citations has prompted the AAEA to make significant changes regarding the association's journals. First, beginning in 2003, the *Review of Agricultural Economics* (*RAE*) began being listed in ISI's Web of Science Citation Index, the leading provider of citation statistics on academic journal citations. Second, beginning in 2005, the proceedings from the association's winter meetings were no longer published in the *American Journal of Agricultural Economics* (*AJAE*) and were instead published in the *RAE*, a decision that has subsequently been reversed. What have been the effects of these changes to the AAEA, *AJAE*, and *RAE*? The purpose of this paper is to determine the association between author/article characteristics and citations to articles published in the *RAE* and *AJAE* and to investigate whether these citation patterns have changed over time.

Previous Research

A handful of studies have investigated factors associated with citations to articles published in general economics journals. Hudson and Medoff both analyzed citations to papers published in the top economics journals. Both papers found that longer articles tended to receive more citations. Interestingly, Hudson found that the number of self-citations significantly increased the number of non-self citations, a finding he attributes to "advertising." He also showed that a highly cited article in a particular journal issue could increase citations to all other articles in the same issue perhaps because of the increased visibility of the issue. Thus, highly cited papers seem to create positive externalities for other papers in the same issue. Hudson and Medoff both found that the number of authors was unrelated to citations. Hudson found an east coast bias for the *American Economic Review*. Authors from the east coast were more highly cited than non-east coast authors, but the same result was not true of the *Economic Journal*.

To our knowledge, the only previous research to address citations in an agricultural economics journal is Laband and Tollison (2006). They studied the effect of authorship order on citations to papers published in the *American Economic Review* and the *AJAE* and found that whereas alphabetized two-authored papers received more citations in the first five years after publication than non-alphabetized

two-authored papers in the *American Economic Review*, the same was not true in the *AJAE*. This led Laband and Tollison (2006), to speculate that (p. 1649), "the preponderance of nonalphabetized papers in agricultural economics, as compared to economics, is due in some part to the differential importance of nonmarket-based criteria to evaluate research in this area as opposed to economics departments."

Other authors have noted general phenomenon associated with publishing and citations related to the current study. Laband and Tollison (2003) reviewed citations to papers published in 73 journals in 1974 and 91 journals published in 1996. They found that in five years after initial publication, just over 26% percent of papers in 1974 and in 1996 were "dry holes," i.e., the papers had not received a single citation. They also found that in both time periods, over 85% of the papers received fewer than 10 citations within five years of publication. They interpreted these findings to mean that much of academic research is a wasted effort (however, see the comment by Mayer). Laband and Tollison's (2003) choice of studying citations only five years after publication is somewhat supported by Fok and Franses, who found that citations to articles published in the *Journal of Econometrics* and *Econometrica* tended to peak around 4 to 6 years after an article was published.

Ellison demonstrated that there has been a marked showdown in the publication process for economics papers, with today's papers receiving more and longer reviews than papers a few decades ago. He also showed a significant decline in citations to second-tier, general-interest economics journals and field journals relative to top general-interest economics journals from 1970 to 1998. He found that, (p. 977), "in 1970 and 1980 the top field journals and the second-tier general-interest journals typically received about 30 percent fewer citations than the top general interest journals. Now they typically receive about 70 percent fewer." Ellison also suggested a possible link between review times and citations, showing that journals with longer review times tended to garner more citations.

The present study builds on previous research in a number of ways. First, besides the study of Laband and Tollison (2006), to our knowledge, no research has focused specifically on citations to the *AJAE*, *RAE*, or any other agricultural economics journal for that matter. This is important because the sub-discipline of agricultural economics differs from the general economics field in many important ways as indicated by Laband and Tollison's (2006) findings related to alphabetized co-authorship. Second, because of the AAEA's recent decisions on which outlet to publishing the winter proceedings papers, it is of interest to determine the relative impact of proceedings papers and comments/replies on citation rates. Third, unlike several previous studies, we study all citations to date rather than restricting attention only to citations within the first five years after publication. Fourth, we explicitly compare citation patterns before and after *AJAE* articles were readily available online allowing us to determine whether technological change has affected citation patterns.

Methods

Data on authorship, article length, and so forth were collected on every article published in the *AJAE* in 1991, 1993, 2001, 2003, and 2005 and in the *RAE* in 2003 and 2005.[2] Although most studies automatically omit proceedings issues

and comments and replies, we purposefully included such papers in our dataset and in portions of our analysis to investigate the extent to which such works obtain fewer citations than regular papers. We chose to include data from the early 1990s for the *AJAE* because it represents a time prior to the advent of the Internet and the explosive growth in economics journals, but it is a time period for which the types of articles published in terms of style and methodology were not substantively different than what is currently published. The three years in the early 2000s were chosen to represent a time after which the *AJAE* was available online, and for which there is comparable data from the *RAE*. Clearly, the works published in 2001, 2003, and 2005 are likely to gain many more citations in the future. However, it is fruitful to compare citation rates obtained in the first few years after publication between the 1990s and the 2000s to identify whether some of the patterns related to article length and citations are observed very soon after publication or whether these effects only gradually take effect. Data on total citations, total self-citations, and total citations in each year following publication were collected on each article from ISI's Social Science Citation Index through June 2007.[3]

Previous literature suggests several variables that might influence citations such as article length, number of authors, and position of the article in the journal. We recorded each of these measures for each article in the sample. In addition to these measures, based on the findings of Ellison, we also recorded (when reported at the end of the article) length of review time in months for regular articles by subtracting the article submission date from the article acceptance date published. For each article, we also counted all equations (numbered and unnumbered) to provide an indication of the degree of quantitative-ness of the article. To investigate whether citations were related to author and/or school quality, we recorded whether any author was employed at a tier 1, tier 2, tier 3, or unranked university according to Perry's classification or at a government agency. These definitions are mutually exclusive; for example, if a paper has two authors and one is at a tier 1 school and another is at a tier 2 school this paper is placed in a tier 1 category. To determine whether the location of authors influenced citations, we noted whether all authors were employed outside the United States. To determine if well-known authors garner more citations than lesser-known authors, we noted if at least of the authors was an AAEA fellow as of 2007. To investigate how citations vary across topic areas, we recorded which subject category the article fell into as indicated in the December issues of the *AJAE*.[4] Finally, to investigate the potential of a "Matthew effect" we identified whether an article was cited at least once in the year following publication.[5] Finally, due to the findings of Hudson, we determined the number of self-citations from all article authors to determine the effect of such self-citations on total non-self cites.

In addition to some basic statistical tests carried out to determine whether citation patterns differ across years and across article type, the tobit model is used to investigate the effect of each of the aforementioned variables on citations.

Results

Table 1 reports summary statistics by paper type and year for the *AJAE*. As would be expected, papers published in 1991 and 1993 have received about twice

Table 1. Summary statistics for *AJAE* citations data by type of paper and publication year

	Total Citations—All Papers	Total Citations Less Self-Citations—All Papers	Total Citations—Regular Papers	Total Citations—Principal Papers	Total Citations—Comments and Replies
Year = 1991					
Mean	9.541	8.584	14.954	2.033	1.647
Median	3	3	8.5	0	0
Maximum	180	159	180	25	19
Standard deviation	17.741	15.967	21.343	4.588	4.527
Number of papers	185	185	108	60	17
Year = 1993					
Mean	8.561	7.598	13.967	2.065	1.583
Median	4	3	9.5	1	0
Maximum	77	69	77	20	8
Standard deviation	11.868	11.041	13.572	3.254	2.843
Number of papers	164	164	90	62	12
Year = 2001					
Mean	4.688	3.713	6.167	3.358	0.167
Median	3	2	4	2	0
Maximum	32	26	32	18	1
Standard deviation	5.724	4.629	6.611	4.067	0.408
Number of papers	125	122	66	53	6
Year = 2003					
Mean	3.008	2.389	4.388	1.610	1.000
Median	2	1	3	1	1
Maximum	32	22	32	24	2
Standard deviation	4.278	3.117	4.722	3.322	1.000
Number of papers	131	131	67	59	5
Year = 2005					
Mean	0.940	0.761	1.365	0.000	1.000
Median	0	0	1	0	1
Maximum	6	5	6	0	2
Standard deviation	1.493	1.283	1.660	0.000	1.095
Number of papers	113	113	74	33	6

as many citations to date as compared to papers published in 2001 and 2003. Papers published in 2005 received roughly one-third the number of citations published in 2003 implying that citations (per year) rise rapidly in the few years following publication. On average it appears that each paper is self-cited about once, indicating a relatively low level of self-citing behavior. The last three columns of table 1 compare the citation rates between regular papers, principal papers, and comments/replies. One interesting note about table 1 is that the *AJAE* published fewer regular papers in the early 2000s than in the early 1990s.

Table 2. Summary statistics for *RAE* citations data by type of paper and publication year

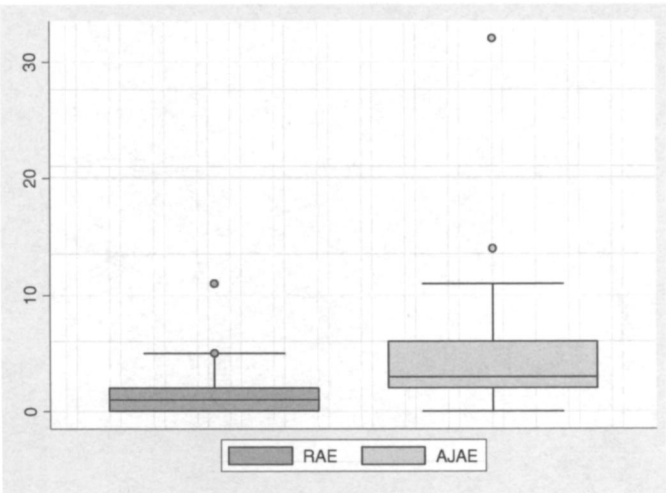
	Total Citations—All Papers	Total Citations Less Self-Citations—All Papers	Total Citations—Regular Papers	Total Citations—Principal Papers	Total Citations—Comments and Replies
Year = 2003					
Mean	1.703	1.378	1.794	n/a	0.667
Median	1	1	1	n/a	0
Maximum	11	10	11	n/a	2
Standard Deviation	2.146	1.861	2.199	n/a	1.155
Number of Papers	37	37	34	n/a	3
Year = 2005					
Mean	0.527	0.382	0.700	0.347	0
Median	0	0	0	0	0
Maximum	5	4	5	2	0
Standard Deviation	0.997	0.850	1.208	0.647	0
Number of Papers	55	55	30	23	2

Table 1 clearly shows that regular papers in the *AJAE* are cited much more frequently than principal papers or comment/replies. We can reject the hypothesis (p-value <0.001) that total citations are equal across the three categories of papers (regular, principal, comment/replies) according to both ANOVA and nonparametric Wilcoxon rank sum tests for each year. Of course principal papers are typically shorter than regular papers. But even if we compare citations per page across paper type, we continue find that regular papers generate more citations per page (p-value <0.01 according to Wilcoxon rank sum tests) than principal papers and comment/replies for every year in our sample except 2001, for which there was no significant difference. Subsequent regression analysis will yield further insight into whether citation rates differ across paper type holding constant a host of other factors such as article length.

Table 2 reports similar statistics for the *RAE*. As with the *AJAE*, the average paper published in the *RAE* in 2005 has received about one-third fewer citations to date than papers published in 2003. In 2003, the *RAE* did not publish principal papers, but following the policy shift by the AAEA, the *RAE* published 23 principal (or proceedings) papers in 2005. Table 2 reveals that the average number of citations to the principal papers in the *RAE* in 2003 was only 0.327, whereas regular papers published in the same year obtained more than twice the number of citations on average, 0.700.

Comparing tables 1 and 2 reveals that within a given year (either 2003 or 2005) and category of paper (regular, principal paper, comment and reply), *RAE* papers receive many fewer citations on average than papers published in the *AJAE*. The average number of citations to all regular papers in 2003 was 4.388 for the *AJAE*,

Figure 1. Box plot of citations to regular articles published in 2003 for the *AJAE* and *RAE*

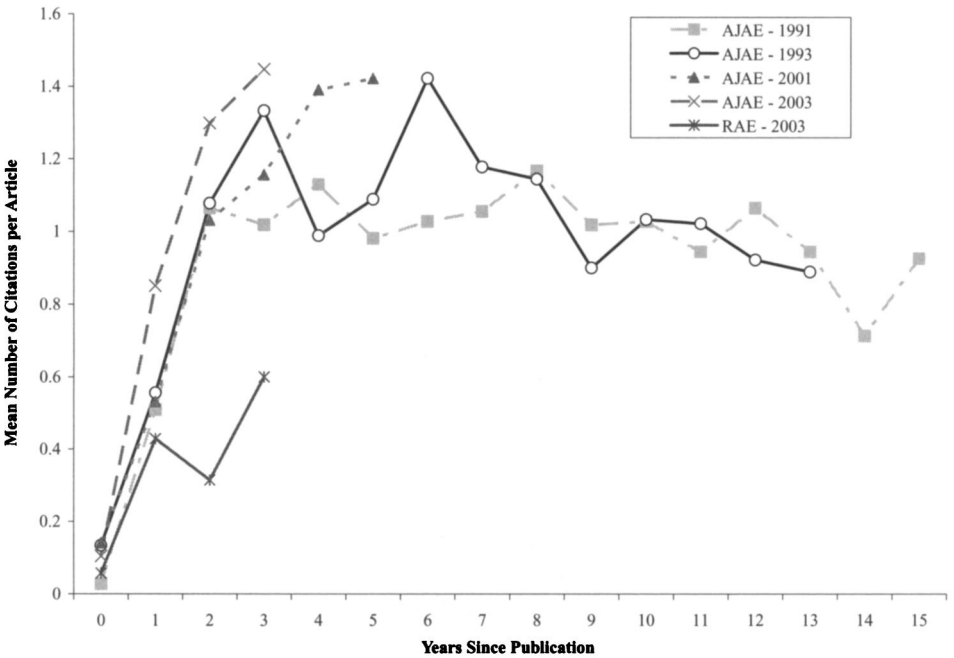


but only 1.794 for the *RAE*. The average number of citations to all regular papers in 2005 was 1.365 for the *AJAE*, but only 0.700 for the *RAE*. The only deviation from this pattern is that none of the principal papers published in 2005 in the *AJAE* has been cited, whereas one of the *RAE* principal papers in 2005 has been cited twice.

Figure 1 compares the distribution of citations between regular articles in the *AJAE* and *RAE* for 2003. This figure shows that articles published in the *AJAE* are cited more often as the median number of cites in the *AJAE* is 3 while the median number of cites in the *RAE* is 1 and the 25th quartile of *AJAE* cites is approximately the same as the 75th quartile for the *RAE*. It is also evident from this figure that the distributions of citations overlap. Indeed, the most cited article in the *RAE* garners more cites that 93% of papers published in the *AJAE*. Interested readers are referred to tables A1 and A2 in the appendix to see the most highly cited papers in each journal by year of publication.

Overall, the frequency of "dry holes" for the *AJAE* is much lower than the figure of 26% for general economics journals reported by Laband and Tollison (2003). The percentage of papers receiving exactly zero citations to date is only 5.5% in 1991, 2.2% in 1993, 10.6% in 2001, 9% in 2003, and 45% in 2005. Clearly the *AJAE* performs much better than the average journal in Laband and Tollison's (2003) sample of over 91 journals in terms of publishing research that is ultimately cited. Of further note is that a relatively large frequency of papers (over 20%) from the 1991 and 1993 publication years have received 20 or more citations. Although only about 10% of papers published in 2001 and 2003 have attained this level of citations, if the same trend continues we would expect the figure to double over the next decade. The *RAE* experiences a higher level of "dry holes" – 32% in 2003 and 67% in 2005. The most cited paper published by the *RAE* in 2003 has received 11 citations to date. By contrast, the most cited paper published by the *AJAE* in 2003 has received 32 citations to date.

Figure 2. Average number of citations per article in each year since publication by publication year (excluding principal papers and comments and replies)



One of the key questions we address is whether citation rates have risen or fallen in recent years and figure 2 was constructed to investigate this issue. Figure 2 reports the average number of citations per regular article (excluding principal papers and comments/replies) in each year after publication by publication year (excluding 2005 for which there have not been many citations per year). The *AJAE* data seem to indicate that papers published more recently will peak at a higher level than the papers published in the early 1990's. For example, in the third year after publication, the mean number of citations received was 1.02, 1.33, 1.16, and 1.45 for papers published in 1991, 1993, 2001, and 2003, respectively. However, neither an ANOVA test ($p = 0.30$) nor a Wilcoxon rank sum test ($p = 0.13$) indicates that this is a statistically significant difference in citation rates across publication years.

There does appear to be some slight evidence that cumulative citations through the first three years after publication is higher in 2003 for the *AJAE* than in previous years. Data reveal that cumulative citations through the first three years after publication were 2.62, 3.10, 2.86, and 3.70 for papers published in 1991, 1993, 2000, and 2003, respectively. Results from an ANOVA fail to reject the hypothesis that mean cumulative citations through the first three years is equal across publication years ($p = 0.19$). However, results from a non-parametric Wilcoxon rank sum test suggests that the hypothesis that the distribution of cumulative citations through the first three years are identical across publication year can be rejected at the $p = 0.05$ level of significance. Pair-wise tests indicate this finding is primarily a

Table 3. Average number of total citations for regular papers in the *AJAE* and the *RAE* by subject category and publication year

	AJAE					*RAE*	
Category	**1991**	**1993**	**2001**	**2003**	**2005**	**2003**	**2005**
Consumer	20.25[a]	19.89	9.86	7.56	2.21	2.00	3.00
Demand	(11.24)[b]	(13.9)	(10.24)	(9.67)	(2.01)	—	—
	{4%}[c]	{10%}	{11%}	{13%}	{18%}	{3%}	{6%}
Production Economics	11.8	14.42	10.67	3.00	1.17	1.40	3.00
and Supply	(13.14)	(12.)	(9.02)	(2.26)	(1.6)	(0.89)	(3.00)
	{19%}	{14%}	{5%}	{18%}	{9%}	{14%}	{10%}
Agricultural Products	11.18	9.69	6.73	3.43	0.625	4.4	0.3333
	(11.4)	(6.01)	(6.15)	(1.9)	(.74)	(4.15)	(0.58)
	{16%}	{18%}	{17%}	{10%}	{10%}	{14%}	{10%}
Agricultural Inputs:	15.30	13.10	5.50	5.67	1.67	0.50	0.00
Land, Labor, Finance	(14.57)	(9.32)	(4.14)	(3.06)	(1.15)	(.71)	—
	{9%}	{13%}	{9%}	{4%}	{4%}	{5%}	{6%}
Natural Resources	9.89	12.11	6.5	3.8	1.14	2.5	—
	(7.22)	(12.08)	(5.83)	(3.19)	(.69)	(3.54)	
	{8%}	{10%}	{12%}	{15%}	{9%}	{5%}	{0%}
Environmental	60.00	24.25	2.33	9.80	1.50	3.00	0
Economics	(61.67)	(24.06)	(2.96)	(5.36)	(2.07)	(1.00)	—
	{6%}	{14%}	{14%}	{7%}	{8%}	{8%}	{6%}
Agricultural and Food	18.92	14.83	9.75	3.11	0.444	0.333	1.44
Policy	(16.05)	(17.99)	(7.5)	(2.52)	(1.01)	(.58)	(1.59)
	{12%}	{7%}	{6%}	{13%}	{12%}	{8%}	{29%}
Economic Development	16	9.67	7.4	3.67	1.29	—	0
	(17.09)	(10.02)	(11.65)	(3.79)	(2.36)		—
	{11%}	{3%}	{8%}	{4%}	{9%}	{0%}	{3%}
International Economics	8.33	—	4.00	2.00	2.50	1.00	0
	(7.71)		(4.00)	(2.00)	(3.54)	(1.73)	(.)
	{6%}	{0%}	{8%}	{4%}	{3%}	{8%}	{3%}
Industrial Organization	24.00	12.00	4.25	2.67	1.00	1.29	0
and Market Structure	(10.68)	(3.24)	(3.3)	(2.08)	(1.26)	(1.11)	—
	{4%}	{6%}	{6%}	{4%}	{8%}	{19%}	{3%}
General: Extension,	7.43	6.50	3.25	3.00	1.50	0.67	0.14
Research Methodology,	(6.90)	(6.35)	(3.77)	(1.00)	(1.69)	(0.82)	(0.38)
Professional	{6%}	{5%}	{6%}	{4%}	{10%}	{16%}	{23%}

[a] Average number of citations.
[b] Numbers in parentheses () are standard deviations.
[c] Numbers in brackets {} are the percentage of articles published in each category in the given year.

result of the difference in three-year cumulative citations between 1991 and 2003. Overall, there does not appear to be any evidence of an increasing or decreasing trend in citations to regular articles published by the *AJAE* between the early 1990s and 2000s.

Table 3 reports average number of citations to regular papers across subject categories over the years as well as the percentage of papers published in each of

Table 4. Average number of citations for regular papers for fellows versus non-fellows in the *AJAE* and the *RAE* by year

	AJAE					*RAE*	
Category	**1991**	**1993**	**2001**	**2003**	**2005**	**2003**	**2005**
Fellow	17.65[a]	17.00	9.13	3.29	1.80	1.00	1.00
	(15.79)[b]	(12.19)	(7.66)	(2.55)	(1.81)	—	(1.73)
	{29%}[c]	{22%}	{12%}	{21%}	{10%}	{3%}	{10%}
Non-Fellow	13.87	13.1	5.78	4.78	1.13	1.72	1.00
	(23.21)	(13.9)	(6.42)	(5.12)	(1.59)	(2.17)	(1.61)
	{71%}	{78%}	{88%}	{79%}	{90%}	{97%}	{90%}

[a] Average number of citations.
[b] Numbers in parentheses () are standard deviations.
[c] Numbers in brackets {} are the percentage of articles published by fellows or non-fellows, respectively, in the given year.

the categories. For the *AJAE*, papers published on topics related to environmental economics garnered the highest average number of citations in 1991, 1993 and 2003. Papers on production economics and supply were the most cited topic area in 2001 and international economics had the highest average citations in 2005. A preponderance of the articles published in the *AJAE* in the early 1990s was in production economics and supply and in agricultural products. By the early 2000s more articles were published in consumer demand, production economics and supply, and agricultural products. As for the *RAE*, agricultural products received the highest average number of citations in 2003 while consumer demand and production economics and supply were cited most in 2005. Almost 20% of the articles published in the *RAE* in 2003 were in industrial organization and close to 30% of the articles published in 2005 were in agricultural and food policy. Overall, these results imply that the popularity of a topic category, in terms of the number of articles published in a category, does not necessarily imply higher citation rates. That is, picking to write an article on a fashionable topic does not ensure that the paper will be cited or vice versa.

Table 4 presents summary statistics on the average number of citations to papers published by AAEA fellows and non-fellows. In the *AJAE* in the early 1990's and in 2001 fellows receive more citations than non-fellows but in 2003 and 2005 non-fellows receive more citations. Of course, there is an endogeneity issue here in that people who published highly cited papers in the early 1990s are more likely to have become fellows in recent years. In the RAE, there is not a significant difference between citations to the work of AAEA fellows and non-fellows. These statistics in table 4 also illustrate that AAEA fellows tend to publish much more often in the *AJAE* as compared to the *RAE*.

We now turn attention to investigating factors affecting citations. We perform our regression analysis for the *AJAE* both on the entire sample of papers and again for regular papers excluding proceedings papers and comments/replies. For regressions involving the *AJAE* data, we restrict our attention to only those papers published on or before 2003, which have had more time to accrue citations.

Table 5. Variable definitions and mean values for variables used in regression analysis; *AJAE* data only

Variable	Definition	All Papers	Regular Papers Only
yr1991	1 if article published in 1991; 0 otherwise	0.306	0.326
yr1993	1 if article published in 1993; 0 otherwise	0.271	0.272
yr2001	1 if article published in 2001; 0 otherwise	0.207	0.199
Proceedings Paper	1 if article was a proceedings paper; 0 otherwise	0.387	
Comment or Reply	1 if article was comment or reply; 0 otherwise	0.066	
Lead Article	1 if article was first in issue; 0 otherwise	0.033	0.048
Number of Pages	Number of pages	8.605	11.341
Number of Equations	Number of numbered and unnumbered equations in article	9.063	14.828
Review Time	Length of time between submission and acceptance in months	7.245	12.686
Cited the Year after Pub	1 if the article was cited at least once in the year following publication; 0 otherwise	0.331	0.486
Self-Citations	Total number of citations to article by all authors through June 2007	0.891	1.369
Total Citations less Self-Citations	Total number of non-self citations received by non-authors through June 2007	5.967	9.426

Following the analysis on the *AJAE* data, we perform a similar analysis for the *RAE*.

Table 5 reports summary statistics and definitions for the variables used in the *AJAE* regression analysis. About 39% of the papers are proceedings papers and about 6.6% are comments/replies. Only about 3.3% of papers were lead articles in their issue. Across all papers, the average paper length was 8.6 pages and papers had an average of 9 equations; these figures jumped to 11.3 and 14.8, respectively when focusing only on regular papers. For regular papers, the average review time was about 12.6 months. This is substantially shorter than the mean submit-to-accept times for the top economics journals reported by Ellison, most of which were in the 18 to 24 month range. Other data collected but not shown in table 5 indicates that the majority of articles had three authors. Moreover, published articles were about evenly spread across the three school tiers. In the entire data set, about a third of articles were cited at least once in the year following publication and articles received about 0.8 self-citations on average.

Table 6. Tobit marginal effects for total citations net self-citations and cites first year after publication for all paper types and regular papers; *AJAE* only

Variable	All Papers	Regular Papers
yr1991	7.304**	11.751**
	(1.305)	(1.959)
yr1993	5.521**	7.969**
	(1.369)	(2.022)
yr2001	0.831	1.296
	(1.362)	(2.007)
Proceedings Paper	−1.838**	
	(0.670)	
Comment or Reply	−4.069**	
	(2.011)	
Lead Article	4.779**	6.043**
	(2.426)	(2.937)
Number of Pages	0.314*	0.105
	(0.164)	(0.236)
Months to Acceptance		0.195**
		(0.088)
Cited the Year after Pub	2.596**	2.335*
	(1.029)	(1.343)
Self-Citations	3.045**	3.096**
	(0.240)	(0.282)
Number of Obs.	585	326

Notes: ** and * signify statistical significance at the 5 and 10 percent levels. Standard errors are in parentheses. Dummy variables related to subject categories were also included in the regressions and are available from the authors upon request.

Table 6 reports marginal effects from two tobit regressions where the dependent variable is the total number of citations through June 2007 less self-citations and less citations occurring the first year after publication. The first column of results pertain to the tobit model fit to the full sample of data from the four publication years and the second column limits the analysis to regular papers only. The year dummy variables correspond to the effect of a particular year relative to 2003. Subject categories were also included in the regressions, but were not included in table 6 to conserve space. Furthermore, our initial model specifications included variables relating to authors' tier of school, whether the author was employed domestically or abroad, number of authors, number of equations, and whether one of the authors was an AAEA fellow. None of these variables were statistically significant so they were omitted from the regressions reported in table 6.

The results reveal that papers and proceeding articles yield about five fewer citations than regular articles and comments/replies yield about 3.5 fewer citations than regular articles. Lead-articles (those published first in an issue) garnered 4.8 more citations than non-lead articles. Consistent with previous literature, we generally find that longer articles are associated with more citations. The only subject

category that had a statistically significant effect on citations was the environmental economics topic and it accounted for 6.9 more citations than the omitted category, general. Citations are significantly affected by whether an article was cited at least once in the year after publication. If the article is cited the year after publication, total citations increase by 2.6, on average. This finding is consistent with a Matthew effect—the rich got richer. Receiving an immediate citation could be an indication of quality as higher quality papers are likely to receive more immediate and late citations. However, the result could also be due to an "advertising" or "signaling" effect. Seeing an article cited quickly after publication brings it to the attention of others. A similar "advertising" effect can be noted by the result associated with self-citations. Each self-citation boosted citations from others by an average of 3 citations.

The second column restricts attention only to regular papers that have gone through the normal review process. Dummy variables for paper type were omitted and a variable for review time was included. Overall, results are similar to those in the first column. In this specification, article length is unrelated to citations, which is probably a result of the fact that in the first specification article length was picking up the fact that proceedings articles are typically shorter than regular articles. For regular papers, review time was found to be positive and statistically significant. According to Ellison's arguments, longer review times lead to an increase in quality and it is perhaps this higher quality that generates greater citations. Even when attention is restricted to regular papers, we continue to find that self-citations and receiving a citation in the year after publication have significant effects on non-self cites. When restricting attention to regular papers only, environmental economics continues to be cited most often, garnering 12.6 more citations than the general category, and consumer demand yielded 5.6 more citations than papers in the general category; no other topic area was significantly different than the general category at a 10% significance level.

Table 7 reports a similar analysis carried out only on regular papers published by the *RAE* in years 2003 and 2005. Subject categories were included in the initial analysis but since no categories were statistically significant they are omitted from the results presented in table 7. Similar to the findings from the *AJAE*, we find being cited in the year following publication significantly influence non-self citations. Holding other factors constant, the lead *RAE* article does not receive more cites as compared to other non-lead articles. Although the previous tables indicated that the *AJAE* receives more citations than the *RAE*, comparing tables 6 and 7 reveals that the factors that influence the number of citations are similar between the two AAEA journals.

Conclusions

This manuscript investigated whether citation patterns to the *AJAE* have changed over the past 15 years, identified differences in citations between the two AAEA journals, and investigated factors correlated with citations. We found that even though the *AJAE* was online and therefore more readily accessible in the 2000s than in the early 1990s, there is no statistical difference between citations-per-year in the first three years after publication between the 2000s and 1990s.

Table 7. Tobit marginal effects total citations net self-citations and cites first year after publication for regular papers only; *RAE* only

Variable	Pooled
yr2003	−1.683**
	(0.759)
Lead Article	0.870
	(1.295)
Number of Pages	−0.097
	(0.162)
Number of Equations	−0.099
	(0.0.94)
Cited the Year after Pub	1.723**
	(0.679)
Self-Citations	−1.071
	(0.812)
Number of Obs.	66

Notes: ** and * signify statistical significance at the 5 and 10 percent levels. Standard errors are in parentheses.

Overall, papers published in the *AJAE* tend to have an impact. For papers published in the early 1990s, the average number of citations as of June 2007 for regular papers was about 14.5 and the median number of citations was around 9. The number of regular papers in the *AJAE* that are "dry holes" (i.e., failed to obtain at least one citation) is less than 6% for papers published in the 1990s and less than 11% for papers published in 2001 and 2003, which is much less than the figure of 26% in Laband and Tollison's (2003) study of 91 economics journals. The *AJAE* not only out-performs the average economic journal in terms of citations, it out-performs top economics journals in terms of review times. The mean time from submission to acceptance averages about a year for the *AJAE*, but by contrast, Ellison reports that the review time for top economics journals ranges from 1 to 2.5 years.

The *RAE* also has an impact, but to a lesser extent than the *AJAE*, at least as measured by citations from other academic journals. For example, the average number of citations to all regular papers in 2003 was 4.4 for the *AJAE*, but only 1.8 for the *RAE*. Despite the fact that the average *AJAE* article receives significantly more citations than the average *RAE* article, the distribution of citations overlap. The most cited article in the *RAE* in 2003 garnered 11 citations, which is more citations than was received by 93% of papers published by the *AJAE* in the same year. This finding suggests that some caution must be taken in inferred impact of a particular article from the overall impact of the journal in which it was published.

Although the number of citations an individual article receives is important, professional associations and journal editors are also interested in total citations to the journal, which factor prominently in journal rankings. According to Barrett, Aliakbar and Bailey, journal rankings are used in hiring and promotion and tenure decisions, allocating library funds, and authors' decisions as to where to submit

manuscripts and which journals to read. The ISI impact factor for the *AJAE*, which is an indication of the frequency with which the average article in a journal is cited in the two years after publication, has increased from around 0.6 in the early 2000s to about 1.2 in 2006.

Our analysis suggests, however, that this rise in impact factor is primarily due to the fact that the *AJAE* stopped publishing the winter proceedings papers and has convinced ISI to omit the fifth issue, which contains the summer proceedings papers, from its impact factor calculation. Although some might see these changes as "gaming the system" to increase the impact factor, our analysis suggest that signals of paper quality (as measured by self-citations and immediate citations) have a substantive effect on citation rates. To the extent these findings carry over to imply signals of journal quality, such changes in journal policies may well capitalize on the Matthew effect: perceived higher citation rates improve journal rankings and higher ranked journals induce higher-quality submissions.

Appendix

Table A1. Top three most highly cited articles in the *AJAE* by year

Year	Rank	Authors	Citations	Title
1991	1	Hanemann, M.; Loomis, J.; Kanninen, B.	180	Statistical Efficiency of Double-Bounded Dichotomous Choice Contingent Valuation
1991	2	Fan, S.	61	Effects of Technological Change and Institutional Reform on Production Growth in Chinese Agriculture
1991	3	Johnson, S.L.; Adams, R.M.; Perry, G.M.	58	The On-Farm Costs of Reducing Groundwater Pollution
1993	1	Morey, E.R., R. Rowe and M. Watson	77	A Repeated Nested-Logit Model of Atlantic Salmon Fishing with Comparisons to Six Other Travel-Cost Models
1993	2	Kealy, M.J.; Turner, R.W.	53	A Test of the Equality of Closed-Ended and Open-Ended Contingent Valuations
1993	3	Place, F.; Hazell, P.	51	Productivity Effects of Indigenous Land Tenure Systems in Sub-Saharan Africa
2001	1	Lusk, J.L.; Fox, J.A.; Schroeder, T.C.; Mintert, J.; Koohmaraie, M.	32	In-Store Valuation of Steak Tenderness
2001	2	Deller, S.C.; Tsai, T.H.; Marcouiller, D.W.; English, D.B.K	28	The Role of Amenities and Quality of Life in Rural Economic Growth
2001	3	Gundersen, C.; Oliveira, V.	21	The Food Stamp Program and Food Insufficiency

Continued

Table A1. Continued

Year	Rank	Authors	Citations	Title
2003	1	Lusk, J.L.; Roosen, J.; Fox, J.A.	32	Demand for Beef from Cattle Administered Growth Hormones or Fed Genetically Modified Corn
2003	2	Reardon, T.; Timmer, C.P.; Barrett, C.B.; Berdegue, J.	24	The Rise of Supermarkets in Africa, Asia, and Latin America
2003	3	Lusk, J.L.	14	Effects of Cheap Talk on Consumer Willingness-to-Pay for Golden Rice
2005	1	Lusk, JL; Coble, KH	9	Risk perceptions, risk preference, and acceptance of risky food
2005	1	Ready, RC; Abdalla, CW	9	The amenity and disamenity impacts of agriculture: Estimates from a hedonic pricing model
2005	1	Sobolevsky, A; Moschini, G; Lapan, H	9	Genetically modified crops and product differentiation: Trade and welfare effects in the soybean complex

Table A2. Top five most highly cited articles in the *RAE* by year

Year	Rank	Authors	Citations	Title
2003	1	Maynard, LJ; Franklin, ST	11	Functional foods as a value-added strategy: The commercial potential of "cancer-fighting" dairy products
2003	2	Yoder, J; Tilley, M; Engle, D; Fuhlendorf, S	5	Economics and prescribed fire law in the United States
2003	2	Crespi, JM	5	The generic advertising controversy: How did we get here and where are we going?
2003	4	Lusk, JL; Little, R; Williams, A; Anderson, J; McKinley, B	4	Utilizing ultrasound technology to improve livestock marketing decisions
2003	4	Vukina, T	4	The relationship between contracting and livestock waste pollution

Continued

Table A2. Continued

Year	Rank	Authors	Citations	Title
2005	1	Wilson, WW; Dahl, BL	6	Costs and risks of testing and segregating genetically modified wheat
2005	2	Sheriff, G	4	Efficient waste? Why farmers over-apply nutrients and the implications for policy design
2005	3	Kuchler, F; Tegene, A; Harris, JM	3	Taxing snack foods: Manipulating diet quality or financing information programs?
2005	3	Stewart, H; Harris, JM	3	Obstacles to overcome in promoting dietary variety: The case of vegetables
2005	3	Wilde, P; Nord, M	3	The effect of food stamps on food security: A panel data approach

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Endnotes

[1]Social citation counts are not a perfect corollary to knowledge or impact for reasons such as those mentioned by Klein and Chiang. Nevertheless, citation counts are perhaps the best metric available for identifying the extent to which a work contributes to the body of knowledge. Indeed, counts of citations in patents are often used to study "knowledge dissemination" and "knowledge diffusion," e.g., see Alcacer and Gittelman.

[2]The *RAE* was not included in ISI's Citation Index until 2003, and thus we are limited by this date. Because we have data on citations to every article published in a given year, it could be argued that we have a population rather than a sample of papers, which would suggest standard tests of statistical significance would be misplaced. In one sense, this is true. However, when we use this data to make inferences about citations in the future or to make statements about counterfactuals regarding the citations a paper could have received if it had a different set of characteristics, it becomes apparent that we conceptualize the data as a *sample* from some true population of citations that extends into the future and for which we happen to have witnessed a set of draws with particular characteristics.

[3]Some Internet web sites such as www.googlescholar.com also report the number to citations to academic journal articles. However, unlike the ISI Social Science Citation Index, the exact methodology used to count citations is unclear, and casual perusal of the citations from such web sites reveals a high level of "double counting" and citations from unpublished working papers. To determine the extent to which citations from googlescholar may different from the ISI Social Science Citation Index, we compared citations across these two sources to all papers published in the *AJAE* in 2003. The average number of citations to a paper was over two times higher according to googlescholar than according to the ISI Social Science Citation Index (6.96 vs. 3.01), most likely due to the fact that googlescholar includes a much wider range of sources than the ISI Social Science Citation Index and because, as previously mentioned, there is a fairly high level of "double counting" in googlescholar. Nevertheless, the correlation coefficient between citations from these two sources was 0.86, meaning both sources seem to be measuring roughly the same thing in a relative sense, i.e., a paper that is highly cited in the ISI Social Science Citation Index is also highly cited in googlescholar. For the remainder of the paper, we restrict our attention solely to citations from the ISI Social Science Citation Index.

[4]A slightly different classification scheme was used in the 1991 issue of the *AJAE* as compared to subsequent years, and as such the authors' judgment was used to re-classify the 1991 articles using the post-1991 scheme. The *RAE* does not publish subject classifications, so we used our judgment to assign papers to one of the 11 categories.

[5]This effect relates to the biblical verse Matthew 13:12, which in the King James Version reads, "For whosoever hath, to him shall be given, and he shall have more abundance: but whosoever hath not, from him shall be taken away even that he hath."

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