

# ***AMERICAN JOURNAL OF AGRICULTURAL ECONOMICS* VOLUME 100: A CENTURY OF PUBLISHING THE FRONTIERS OF THE PROFESSION**

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The *American Journal of Agricultural Economics* reached its 100<sup>th</sup> volume this year. We take this landmark volume as an opportunity to reflect on the evolution of this leading field journal—and one of the original research journals in economics. We document changes in the editorial structure of the journal—from a sole editor-in-chief to the present system of four rotating co-editors—and in the management of the publication process overseen by these editors. Using bibliometric analysis, we then track various trends in the journal over the past century. We assess changes in the structure of articles, including increased article length, reliance on mathematical modeling and empirical analysis, and the dramatic rise in collaborative publication in the form of expanding co-author teams. We also explore changes in the degree of topical specialization and the geographic coverage of research published in *AJAE*. We use co-authoring relationships to construct collaboration networks specific to the journal and document the striking increase in the density of these networks. We conclude with some perspectives on the implications of this century-long evolution of the journal for the coming decades of pushing and publishing the frontiers of the profession.

*Key words:* Applied economics, editorial structure, bibliometric analysis, collaboration networks, professional communication.

*JEL codes:* A1, B0, D0, Q0.

In June 1919, the Executive Committee of the American Farm Economic Association announced the formation of the *Journal of Farm Economics*. In their preface to the inaugural issue of this new journal, members of the Executive Committee described the motivation behind, as well as their vision for, this newly established scientific publication.

“The fundamental purpose of the JOURNAL will be to serve those interested in the economic forces and influences as they operate to affect the business of farming. It will aim to be a seeker for and an expounder of the scientific facts as they are made known and can be classified and interpreted in the interest of sound farm practice.

This is a day of great economic changes, of high tension, of unusual moment to the farming interests, and the scope of present economic trend is such as to place this JOURNAL, if it shall assume its greatest responsibility, in a most important position of service,” (Preface, Vol.1, Issue 1, p.1).

In the subsequent 100 volumes of this journal—renamed the *American Journal of*

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*Agricultural Economics* in 1968 with volume 50 and referred to hereafter as “the Journal”—thousands of authors and hundreds of editors and associate editors have contributed to a vast scientific effort to fulfill this charge to “assume its greatest responsibility, in a most important position of service.” Through the continual professional evolution and revolution of the past century, including early mergers and renaming the association to the current *Agricultural and Applied Economics Association* (AAEA), as well as tectonic shifts in the topical coverage and methodological approaches showcased in its pages, the Journal has maintained its symbiotic relationship with the Association and its status as the leading journal in the field. Its accumulated archive of more than 15,000 research articles provides a remarkable record of the frontiers of research in the field—or, more accurately, a broad range of related fields that would have astonished the inaugural editor, L.A. Moorhouse of the U.S. Department of Agriculture.

Volume 100 of the Journal presents an opportunity to reflect back on a research record that spans generations of scholars and a century of economic, social, and political change. With support from the Association Board, we—the current editors of the Journal—aim to commemorate this milestone by analyzing and reflecting on this record. To broaden the scope of this professional reflection, we engaged several past editors of the Journal as panelists in a special session at the 2018 Association Annual Meetings; their insightful perspectives accompany this article as comments.

Our reflection on the Journal is intentionally modest. While the 100th volume is momentous, it is not the first occasion to prompt professional stocktaking and synthesis. Two such efforts that preceded the 100th volume were more ambitious. First, in 1993, the 75th Volume of the Journal included a Special Issue with a collection of perspectives on the evolution and current state of agricultural and applied economics. Of note, the issue included a short introduction by John Kenneth Galbraith in which he identified “the defining feature of agricultural economics as a field of scholarly research and instruction” to be “an alert, informed concern with problems and their solution,” (Galbraith 1993). Second, in 2010, the 100th Anniversary of the Association prompted an even more ambitious effort to reflect on the state of the

profession broadly defined. Of particular note is the sweeping overview of the progression of research undertaken by Association members provided by McCalla, Castle, and Eidman (2010). These earlier efforts provide a wealth of perspectives and insights. While recent years have seen some interesting developments, it is premature to launch a similarly ambitious and broad reflection just a few years after the latter special issue. While our effort is distinct, we appreciate the continuity we enjoy with these earlier efforts thanks to the contributions of past Journal editors as commenters on this article—many of whom also contributed substantively to these earlier commemorations (i.e., Tomek, Rausser, Segerson, Buccola).

In this article, we aim to complement these prior commemorations by digesting the record of the Journal and documenting the evolution in the structure and organization of editors, articles, and collaborators over this history.<sup>1</sup> The Journal has evolved alongside the broader economics discipline. To commemorate its own 100th volume, the *Review of Economics and Statistics* (*REStat*), which also launched in 1919, concurrently conducted a similar analysis showing pronounced changes in article structure (Khwaja and Mangal 2018a) and authorship (Khwaja and Mangal 2018b) that bear a strong resemblance to some of the patterns we report in this article. These similarities suggest important interconnections between the Journal and top general and field journals in the broader economics profession. As the flagship outlet for the Association, the Journal’s research record can shed unique light on the progression of the agricultural and applied economics field over the past century.

We begin by discussing the editorial structure and institutional evolution of the

<sup>1</sup> Our approach is somewhat related to a now dated documentation of the evolution of research methodologies in the Journal presented by Debertin and Pagoulatos (1992), who focus on the first 70 volumes of the Journal. A similar and more recent assessment of the progression in research methods evident in the 40-volume publication record of the *Journal of Environmental Economics and Management*, a younger and narrower field journal, documents the shift away from economic theory in favor of greater empirical rigor, including experimental methods (Kube et al. 2018). Extending the Debertin and Pagoulatos (1992) analysis to the subsequent 30 volumes of the Journal would likely uncover common shifts in the methods used in research published in the Journal, including the rapid rise of contemporary econometrics focused on causal inference and experimental methods—including lab experiments, lab-in-field experiments and randomized controlled trials. While interesting and important, we do not explicitly document these methodological changes in this article.

Journal. We then describe our bibliometric methodology, which includes five angles on the organization, topical coverage, and structure of work published in the Journal. This approach detects patterns and trends in the body of work published in the Journal as a whole—patterns and trends that may not be apparent in a given article, issue, or volume. Our presentation of these results emphasizes patterns and trends per se, and is intentionally thin on interpretation, giving greater scope to past editors to offer their own perspectives and interpretations in the comments that follow this article. We conclude with brief forward-looking reflections on the future of the Journal as it continues to probe research frontiers as the flagship publication of the Association.

### **Evolving Editorial Structure, Journal Management, and Publication Process**

As anyone who has served in an editorial capacity of any research journal can attest, much of the work to curate content and manage the publication process is hidden from public view. This includes handling submissions, interacting with authors, arranging reviewers, mediating the dialogue between authors and reviews, navigating editorial and production phases, and—along the way—making a steady stream of decisions that shape the substance of the journal. In the past century of the Journal, this (mostly) behind-the-scenes bustle has seen a steady evolution into its current form. Each year, editors are charged with producing an Editors Report. In this section, we use these reports to document these changes in the operations that produce the published research material that makes up the Journal.

#### *Editorial Structure*

The editorial structure of the Journal has been remarkably stable over most of its history. All editorial tasks have typically been conducted by up to four editors—variously called editors, co-editors, senior associate editors, and associate editors (pre-1986) who are responsible for choosing referees and making editorial decisions—and a larger group who advise on manuscripts at the request of the editors, variously called the editorial board or the associate editors (post-1986).

In its early history, the Journal appointed an editor (occasionally two), who would in turn appoint one or two associate editors at their own institution (in later years they were referred to as senior associate editors). So, for example, Cornell's Bill Tomek (editor 1975–1977) was assisted by Richard Boisvert and Donald Freebairn, who were also at Cornell. Editorial terms were typically three years, and the editorial office was physically located at the home department of the editor. This changed in 1998, when the Journal moved to the current system of four co-Editors—typically at different institutions. Importantly, this more complex structure was enabled by the early stages of migration to an electronic submission system, without which coordinating among co-editors in different locations would have likely been infeasible. The first group of co-Editors were all appointed in 1998, but this quickly moved to a staggered system where two new editors, serving four-year terms, were appointed every two years. This shift was made possible by the advent of electronic manuscript management systems and publishers taking responsibility for much of the manuscript production process. A detailed timeline of these Editors and co-Editors with their respective tenures of service and institutions is provided as [table 1](#).

Soon after its inaugural 1919 Volume, the Journal established an editorial council to assist the Editor(s) in making decisions. In the earliest days, the editorial council provided the first instance of peer review. The editorial council provided feedback and assisted with the process of selecting the best paper award. This changed during the Just–Rausser editorship (1984–1986). These editors expanded the ranks of Associate Editors “Beginning with the Berkeley editorial regime in 1984, the Journal moved from a system involving one or two in-house associate editors to an expanded staff of associate editors at various locations representing a variety of subject matter areas,” (1985 Editor Report). When Peter Barry assumed the Editorship in 1987, he reverted the management structure to the status quo ante-Berkeley. He retained the title Associate Editor, but the responsibilities were those of the old Editorial council, which was disbanded:

“The two senior associate editors, located at Illinois, are directly involved in handling manuscripts in their respective subject matter

**Table 1. AJAE Editor Timeline, with Each Editor's Tenure of Service Indicated in Columns**

Editor	Institution	Vol.	Year	Editor	Institution	Vol.	Year
L.A. Moorhouse	Office of Farm Management,	1	1919	Leo Polopolus	U Florida	54	1972
		2	1920			55	1973
		3	1921			56	1974
O.C. Stine	Bureau of Agricultural	4	1922	William G. Tomek	Cornell	57	1975
		5	1923			58	1976
		6	1924			59	1977
E.G. Nourse	Brookings Institute	7	1925	V. James Rhodes	U Missouri	60	1978
		8	1926			61	1979
H.R. Tolley	Bureau of Agricultural	9	1927	James P. Houck	U Minnesota	62	1980
		10	1928			63	1981
		11	1929			64	1982
H.E. Erdman	UC Berkeley	12	1930	Richard E. Just	UC Berkeley	65	1983
		13	1931			66	1984
		14	1932			67	1985
O.B. Jesness	U Minnesota	15	1933	Gordon C. Rausser	UC Berkeley	68	1986
		16	1934			69	1987
H.C.M. Case	U Illinois	17	1935	Peter J. Barry	U Illinois	70	1988
		18	1936			71	1989
		19	1937			72	1990
T.W. Schultz	Iowa State	20	1938	Richard M. Adams	Oregon State	73	1991
		21	1939			74	1992
		22	1940			75	1993
H.B. Price	U Kentucky	23	1941	Steven T. Buccola	Oregon State	76	1994
		24	1942			77	1995
		25	1943			78	1996
Warren C. Waite	U Minnesota	26	1944	Michael K. Wohlgenant	NC State	79	1997
		27	1945			80	1998
		28	1946			81	1999
Richard J. Sexton	UC Davis	29	1947	Giancarlo Moschini	Iowa State	82	2000
		30	1948			83	2001
		31	1949			84	2002
Walter W. Wilcox	Library of Congress	32	1950	Kathleen Segerson	U Connecticut	85	2003
		33	1951			86	2004
		34	1952			87	2005
Lawrence W. Witt	Michigan State	35	1953	Richard E. Wetzstein	U Georgia	88	2006
		36	1954			89	2007
		37	1955			90	2008
Harold G. Halcrow	U Connecticut	38	1956	B. Wade Brorsen	Oklahoma State	91	2009
		39	1957			92	2010
		40	1958			93	2011
Robert L. Clodius	U Wisconsin	41	1959	Ilan M. Sheldon	Ohio State	94	2012
		42	1960			95	2013
		43	1961			96	2014
Herman M. Southworth	Penn State	44	1962	Christopher B. Barrett	Cornell	97	2015
		45	1963			98	2016
		46	1964			99	2017
James Nielson	Michigan State	47	1965	Stephen Swallow	U Rhode Island	100	2018
		48	1966			101	2019
		49	1967			102	2020
Earl R. Swanson	U Illinois	50	1968	Paul V. Preckel	Purdue U	103	2021
		51	1969				
		52	1970				
Varden Fuller	UC Berkeley (1969)	53	1971				
	UC Davis (1970-71)						

Note: Alphabetical order left-to-right within sets of editors initiating their service at that same time. Neither Senior Associate Editors nor Associated Editors are depicted.

areas. The members of the board of associate editors were selected on the basis of diversity in subject matter areas and their depth of experience. They are assisting significantly in the review process, in selecting the outstanding AJAE article each

year, and in other matters involving the execution of Journal policy,” (1987 Editor Report).

This structure remains largely intact today, albeit with a cohort of Associate Editors that has tripled in size in the past 30 years.

### Peer Review

One of the through lines of the history of the Journal is the rise of peer review. The first issues of the Journal were filled with papers presented (“read”) at the annual meetings of the association and were largely published as read. In relatively short order, authors began submitting papers to the journal that had not been read at the meetings. The first discussion of rejection occurs in 1927 where H.R. Tolley wrote in his Editor’s report, “A few articles were however returned to authors.” The first mention of external reviews occurs in 1941, “This year, more than ever before, the editors had assistance from many individuals in colleges and universities and in the federal service who have performed as ‘readers’ of manuscripts. Their advice and recommendations have been a strong feature in handling the editorial work.”

It seems that reviews were signed and manuscripts were not blinded for early decades of the Journal. Much of the reviewing was done by members of the editorial council: “Each manuscript in each of the four regular issues of the Journal is normally reviewed by at least two Council members in addition to the Editor,” Halcrow (1956). Since the 1950s, editors have asked for two or three referee reports for manuscripts sent out for review. By the 1960s, external peer review seems fairly well established, though manuscripts are not blinded before review until 1975 under the editorship of Tomek (1975 Annual Report). While proposals for signed reports were discussed at this time, they were never implemented.

Over the history of the Journal, revising manuscripts in response to editorial or referee comments became common. In 1927, Tolley writes that several articles “were printed only after revision by authors and editors.” By the 1960s, most articles underwent some revision, and we see the increased role of referees in shaping articles: “about 30% were published with minor revision, 20% with major revision—some after several revisions that changed them into substantially different papers than the authors had in mind in their original submissions,” (1962 Annual Report). By 1971, multiple rounds of revision had become common: “An intensive review and revision process undoubtedly has some effect on our productivity. Publication without substantial revision has seldom occurred. Second and even third revisions are not unusual,” (1971 Annual Report).

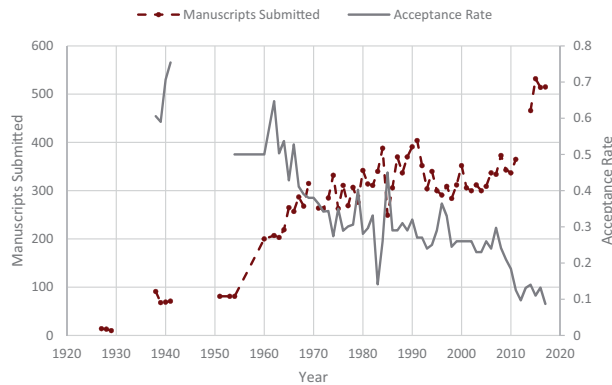
### Conference Proceedings & Direct Submissions

Over the years, the share of submissions subject to editorial control went from 0 to nearly 100%. A consistent theme of the Editor’s reports over the years is an effort to limit the share of journal pages devoted to publishing annual meeting papers—typically published with little or no editorial oversight. In 1930, there is the first discussion of moving the proceedings into a separate issue. By 1939 (at least) all of the proceedings papers were in their own issue and generally all papers presented at the meetings were published in that dedicated issue. Page limits on proceedings papers were imposed by 1960. Concerns about crowding out peer-reviewed manuscripts are a recurring theme in the Journal’s Annual Report. Two such examples follow: “Specifically, the directors may want to consider devoting more pages to refereed manuscripts and fewer to invited proceedings papers,” (1975 Annual Report); “This underscores importance of containing the size of December issues by limiting the number of invited paper sessions at the annual meeting,” (1985 Annual Report). Beginning in 1998, proceedings papers bear a lead footnote that indicates that the paper “was not subjected to the Journal’s standard referee review procedures.” Finally, in 2012, the Association board agreed to subject proceedings papers to peer review.

In terms of total articles and pages published in the Journal, growth was rapid in the early years. The earliest volumes of the journal were budgeted at two hundred pages, but the Journal quickly expanded to over 463 pages by 1927, 704 by 1929, and 749 by 1932. In these early volumes, there appears to be an attempt to print virtually every paper “read” at the annual meetings. This growth continued for two more decades, with total published pages per year more than doubling by 1956, a clear trend we revisit in the bibliometric analysis in the next section.

### Submissions and Acceptance Rate

Based on the annual Editor Report published in the Journal, we assembled data on total number of submissions per year along with the share of these submissions that were published. Although these data are not complete in the earlier years and the nature of what is



**Figure 1. Total number of submission and acceptance rate extracted from annual Editor Reports**

*Note:* The acceptance rate prior to 1938 was nearly 100% (the first mention of an editor rejecting an article was in 1927).

published has changed, even this incomplete record shows a dramatic rise in submissions and a decline in the acceptance rate (figure 1).

### Bibliometric Analysis & Results

Volumes 1–99 of the Journal include 15,369 research articles and provide a rich corpus of material with which to characterize the evolution of research at the frontiers of the profession. Since the Journal has been the flagship publication of the Association since its inaugural 1919 volume, the Journal has also published various items of interest to Association members that were not peer-reviewed (e.g., editors reports, book reviews, etc.). Our bibliometric and text mining analyses exclude these other published items and focus exclusively on the 15,369 research articles and conference proceedings that have appeared in the Journal.

Using this sub-set of material, which constitutes the vast majority of the published pages, we take five distinct angles to explore the evolution of the structure and organization of the frontier research showcased in the Journal over the past century:

1. **Article structure:** We assembled the full corpus of peer-reviewed articles that have appeared in the Journal in PDF format. After structuring these digital files to ensure consistency across all volumes, we then used text-mining techniques to characterize each article along

several dimensions, including number of words, numbers, equations, tables, and figures.

2. **Citations:** We use citations to articles published in the Journal from the Scopus database and, where needed to provide greater coverage (especially in more recent decades), Web of Science. While this database includes articles from all volumes of the Journal, citations data prior to the 1960s are notoriously incomplete. As a result, we focus our analysis of these citations data primarily on relative citation counts within volume decade.<sup>2</sup>
3. **Topical coverage:** In 1990, the American Economic Association (AEA) launched its Journal of Economic Literature (JEL) code classification of topics in economics. The Journal only began systematically reporting JEL codes for each article in 2010 when Oxford University Press took over as publisher. Since these JEL codes are useful descriptions to topics in economics and widely used in the broader economics profession, we used all recent AJAE articles with JEL codes along with related journals publishing JEL codes to train an algorithm to classify pre-2010

<sup>2</sup> Throughout this article we refer to volume decade (i.e., set of 10 volumes (1–10, 11–20, etc.)) as “decades”. Since volume 1 of the Journal appeared in 1919, these volume decades align roughly with decades by year.

articles in the Journal by JEL code. This back-casting of JEL codes allows us to track the evolution of topics featured in peer-reviewed articles in the Journal. In addition to these JEL codes, we analyze keywords as reported explicitly by authors (since 1974), and as they appeared in the abstract (since the mid 1960s) and text of the articles.

4. **Geography of research focus and application:** We extract geographic keywords from key portions of published articles in order to track the changing geographic focus of research in the Journal. We aggregate these keywords to U.S. States and countries of the world. While imperfect, these mined location keywords provide some indication of the changing geographic focus of the research published in the Journal.
5. **Authors and collaborations:** The Scopus and Web of Science database includes author names on each article. We use these data to document trends in co-authorship and collaboration over the life of the Journal. Using standard network measures, we examine these data to identify central authors in the collaboration networks of each volume decade, and to construct complete network maps.

### Results: Article Structure

We accessed all published materials in the Journal's history in PDF format. To conduct text analysis on this digital archive, we first converted the articles into searchable texts using PDF extraction packages PyPDF2 and pdminer in Python. We then extracted features (e.g., number of words, number of tables, number of figures, number of equations, geographic coverage, etc.) from each article. These extracted features for research articles (i.e., excluding other publications and reports) form the basis of our analysis of the evolving structure of articles published in the Journal. Note that the Journal began to offer authors the option of using (online) supplementary materials for appendices, data, code, and additional tables and figures in 2010. We did not include these supplementary materials in our text analysis.<sup>3</sup>

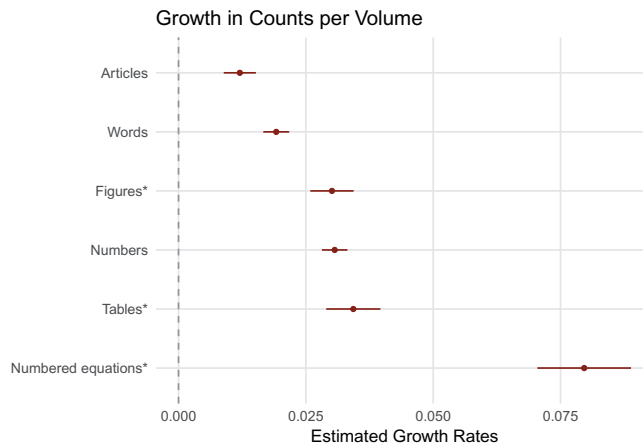
Before depicting these features of articles published in the Journal graphically, we

report growth rates in per volume articles, words, numbers, tables, figures, and equations obtained from a simple log-linear regression of the frequency of these different article features on a linear time trend over the 99 volumes. As shown in figure 2, the number of articles per volume has grown at an average rate of 1.2%. This article growth rate provides a benchmark for other article features since growth rates higher than this indicate that the number of features per article increased over time, on average. We see three tiers of article features by growth rate. First, the word length of articles has increased just under twice as fast as the number of articles per volume. The growing article length is a trend seen (and lamented) in the broader economics literature.<sup>4</sup> As a second tier, figures, numbers and tables have grown at more than twice the rate of articles. This average annual growth rate likely underestimates the rise of empirical sophistication of research published in the Journal since tables and figures have clearly become longer and more complex (especially in recent decades). The highest growth rate by far—almost seven times faster than articles—belongs to numbered equations.<sup>5</sup> As a summary measure, this is consistent with the dramatic expansion in formal mathematical modeling and representations in published research, which is again a reflection of trends in the broader economics field.

<sup>3</sup> We used abstracts written by authors as a source of data. For articles published without abstracts, we used the first two pages as a surrogate abstract. We extracted number of words by splitting published text by whitespace. We further refined this word count by removing all numbers and symbols. Because the majority of the tables in the archive are separated by whitespace, it is difficult to identify them systematically using the layout of columns and rows. Instead, we searched for regular exposition expressions such as "Table 1", "Table 2", "Table 3" or "TABLE I", "TABLE II", "TABLE III" in the body. Since the Journal has a convention of numbering tables, figures, and equations from the earliest volumes, we found it reliable to count tables and figures by searching for words like "Figure", "CHART", "FIG.", "Table" and the associated numbers in the captions. To tally equations that appear in articles, we identified author-numbered equations by extracting numbers that appear in parentheses, ranked the numbers in ascending order and discarded all the outliers. Since authors frequently chose to number only a subset of the equations in an article, this likely underestimates the number of equations printed in an article. As an alternative and more comprehensive approach to tracking the use of equations, we count the number of equal signs in each article.

<sup>4</sup> For a recent take on and complaint of the growing length of economics articles in general, see [www.wsj.com/articles/economists-cant-write-economically-driving-demand-for-brevity-1532373648?mod=flipboard](http://www.wsj.com/articles/economists-cant-write-economically-driving-demand-for-brevity-1532373648?mod=flipboard).

<sup>5</sup> Online supplementary materials were introduced to the Journal in 2010. If we restrict this growth rate estimates to pre-2010, numbered equations have increased nearly 10% annually.



**Figure 2. Estimated growth rates over first 99 volumes with 95% confidence intervals**

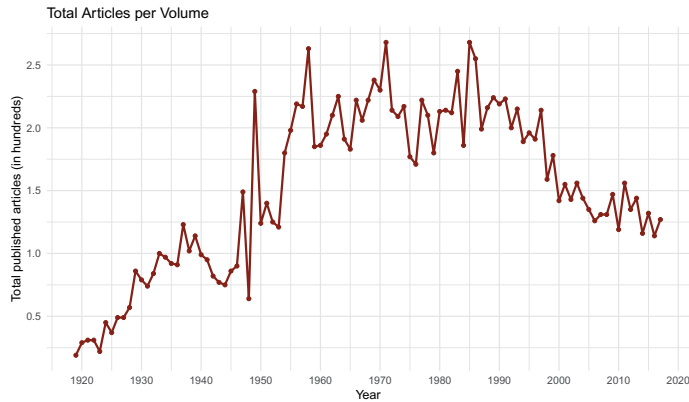
Note: Asterisk \* denotes inverse-hyperbolic sine transformation as alternative to logarithmic transformation of variables with zero values.

Figures 3–6 plot these article features for each volume. Compared to average annual growth rates, which offer a simple summary of changes in article structure, these graphical depictions unveil more nuance in how and when professional communication through the Journal has evolved over time. The number of articles published per volume grew steadily through most of its first half century (figure 3). Through the next three decades, articles published per volume found a steady state around 225. Alternatively, articles per volume declined steadily over the past three decades, with only 125 articles published in Volume 99—a more than 50% decline relative to 1985 and on par with the number of articles published in 1954.

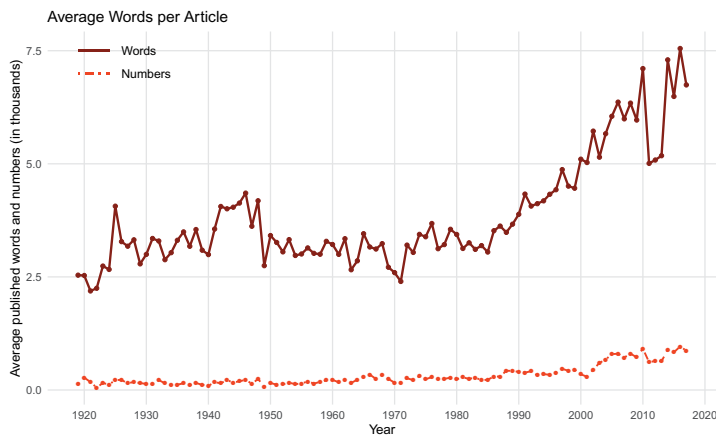
The number of words per volume trended upward through the first eight decades of the Journal (figure 4). This trend leveled out over the past two decades as the number of articles per volume declined. Alternatively, the words per article showed little trend prior to 1990, after which it began a rapid ascent, as the number of articles per volume declined. The steady increase in the use of numbers, figures, and tables is clear, with much of this increase occurring after 1980 (figures 5 and 6). The use of numbered equations and equal signs also exhibits an accelerating trend up to 2010, when the Journal first introduced supplementary material online to accompany print articles (figure 5). Since the introduction of these online supplementary materials, the article average of numbered equations and equal signs has fallen precipitously.

The nuance offered in these figures suggests that the trends toward longer, more mathematical and more quantitative articles occurred on distinct time scales. Increasing article length is relatively new. While increasingly mathematical and quantitative subject matter is more of a consistent trend throughout the Journal's history, the type of mathematical and quantitative material emphasized in articles continues to shift. The acceleration of equations per article seen prior to 2010 marks an increase in the use of mathematical models to prove general applied results and motivate hypotheses for further empirical scrutiny. Since the contribution of these articles is more about what the mathematical model can tell the reader about an applied question rather than the mathematical model and analysis in and of itself, editors, reviewers, and authors have let tedious mathematical derivations drift out of printed (and online) articles and into separate online supplementary material. Continued growth in the numbers, tables, and figures per article seems likely given the increased demand for robustness checks with empirical analyses over the past two decades. However, editors, reviewers, and authors may alternatively start reversing this trend by relegating this quantitative material to online supplements in order to avoid crowding out more substantive material. A potentially even more important trend that is likely to disrupt what a typical article in the Journal looks like a decade or two from now is the increasing pressure for it to move to a solely online format, which would make it possible for





**Figure 3. Number of articles published per volume**



**Figure 4. Average number of words and numbers per published article**

authors to communicate research results with a much richer and dynamic set of media.

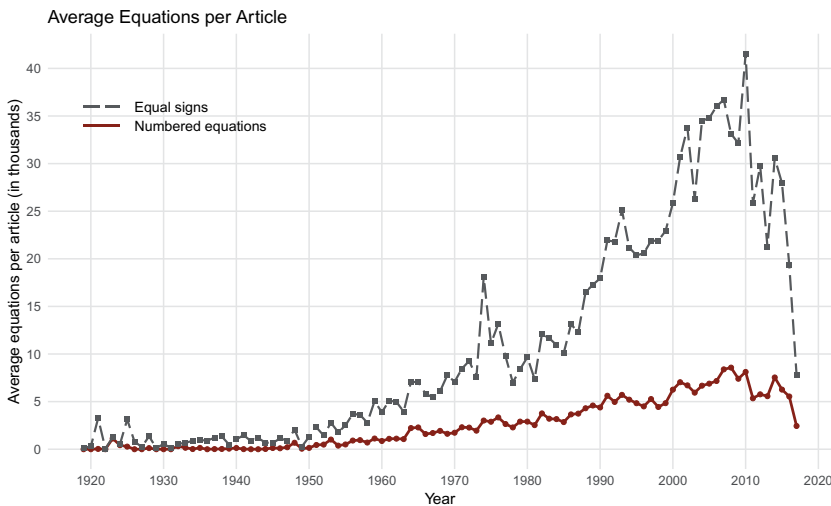
#### *Results: Citations*

Citation data is drawn from Scopus and Web of Science (WoS). Scopus, which forms our primary data source, features better coverage throughout the life of the Journal, in particular prior to 1968. However, some gaps exist in this dataset from 1969 onward. We use WoS to fill in the gaps in the Scopus data in recent decades. In particular, this improves coverage in the mid to late 1970s and early 1980s. To achieve this mix of data sources, we match Scopus to WoS data on Digital Object Identifier, Volume, and Issue. We then drop the articles in the WoS dataset where we find a match, and append the remaining articles to the Scopus dataset to form the citations

dataset.<sup>6</sup> In the online [supplementary material](#), appendix B, we provide a figure that maps the median and percentiles of citations by volume. We focus here on the most highly-cited articles and authors by volume decade, which are shown in [tables 2 and 3](#). Since the total number of citations per volume decade has changed dramatically (see the online [supplementary material](#), appendix B), we also report the share of total citations for each decade that were garnered by these highly-cited articles and authors.

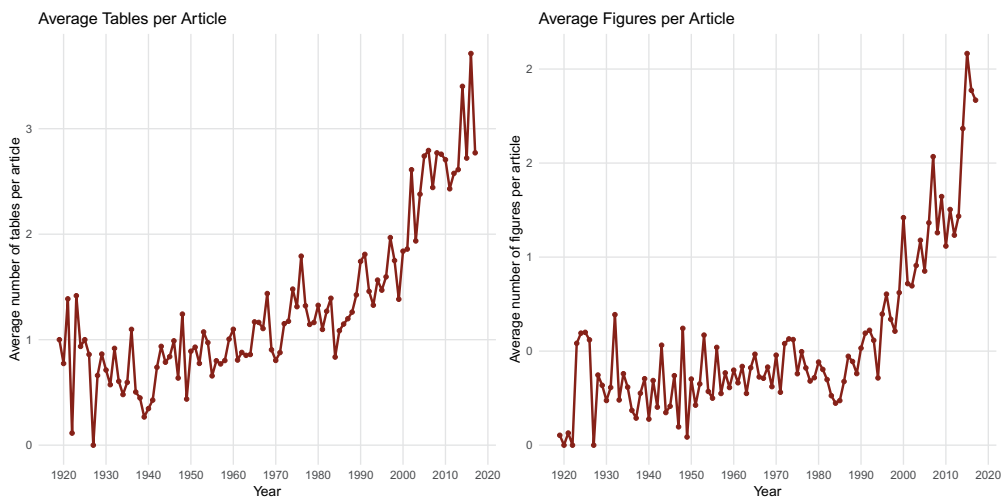
The five most-cited articles in the Journal's first half century fell squarely within the traditional agricultural economics sub-

<sup>6</sup> These two sources feature similar but different citation counts for articles that occur in both datasets. To be sure, we default to the entry in the Scopus dataset for citation counts in cases where these datasets overlap.



**Figure 5. Average number of equations per article**

*Note:* Supplementary materials began being posted to AgEcon Search in 2005 and were posted directly on the Oxford University Press website from 2010 onwards. These supplementary materials are not included in the analysis here.



**Figure 6. Average number of tables and figures per article**

disciplines of production, marketing, finance, rural development, and policy. The first environmental and natural resource, and international trade articles to be among a decade's top five emerged as the Journal entered its second half century. Indeed, the five most-highly-cited articles during the fifth through eighth decades of the Journal were dominated by environmental and natural resource topics. The last half century was also marked by the consistent appearance of international development articles among the most cited. While the topics of the top cited articles has shifted

over time from more traditional agricultural economics sub-disciplines to environmental, energy, international development, consumption, and food economics, the links of these articles back to the Journal's agricultural roots remains visible in most.

Unsurprisingly, the Journal's most highly-cited authors over the decades offer a mirror image of these trends. In the first half century, four authors were among the five most highly-cited in multiple decades: F.V. Waugh, H. Working, E.O. Heady, and Z. Griliches. All four of these authors' research

**Table 2. Most Highly-cited Articles in the Journal by Decade, with Share of Total Citations in the Decade**

Decade	Authors	Pub. Year	Title	Share
1919–1928	Waugh, F.V.	1928	Quality Factors Influencing Vegetable Prices	0.421
1919–1928	Spillman, W.J.	1923	Application Of The Law Of Diminishing Returns To Some Fertilizer And Feed Data	0.049
1919–1928	Elliott, F.F.	1928	The “Representative Firm” Idea Applied To Research And Extension In Agricultural Economics	0.026
1919–1928	Ely, R.T.	1920	Land Speculation	0.026
1919–1928	Krzyszowski, R., Minneman, P.G.	1928	Graphical Presentation Of Thuenen’s Theory Of Intensity	0.023
1929–1938	Peterson, G.M., Galbraith, J.K.	1932	The Concept Of Marginal Land	0.076
1929–1938	Sauer, C.O.	1938	Theme Of Plant And Animal Destruction In Economic History	0.054
1929–1938	Bean, L.H.	1929	The Farmers’ Response To Price	0.029
1929–1938	Wilson, M.L.	1934	The Place Of Subsistence Homesteads In Our National Economy	0.029
1929–1938	Davis, J.S.	1938	The Economics Of The Ever-Normal Granary	0.022
1939–1948	Working, H.	1948	Theory Of The Inverse Carrying Charge In Futures Markets	0.209
1939–1948	Stigler, G.J.	1945	The Cost Of Subsistence	0.191
1939–1948	Ciriacy-Wantrup, S.V.	1947	Capital Returns From Soil-Conservation Practices	0.143
1939–1948	Southworth, H.M.	1945	The Economics Of Public Measures To Subsidize Food Consumption	0.035
1939–1948	Heady, E.O.	1947	Economics Of Farm Leasing Systems	0.029
1949–1958	Nerlove, M.	1956	Estimates Of The Elasticities Of Supply Of Selected Agricultural Commodities	0.084
1949–1958	Griliches, Z.	1957	Specification Bias In Estimates Of Production Functions	0.056
1949–1958	Nerlove, M.	1958	Distributed Lags And Estimation Of Long-Run Supply And Demand Elasticities: Theoretical Considerations	0.055
1949–1958	Working, H.	1953	Hedging Reconsidered	0.033
1949–1958	Griliches, Z.	1958	The Demand For Fertilizer: An Economic Interpretation Of A Technical Change	0.031
1959–1968	Mundlak, Y.	1961	Empirical Production Function Free Of Management Bias	0.039
1959–1968	Day, R.H.	1965	Probability Distributions Of Field Crop Yields	0.024
1959–1968	Takayama, T., Judge, G.g.	1964	Spatial Equilibrium And Quadratic Programming	0.019
1959–1968	Hopper, W.D.	1965	Allocation Efficiency In A Traditional Indian Agriculture	0.015
1959–1968	Nerlove, M., Waugh, F.v.	1961	Advertising Without Supply Control: Some Implications Of A Study Of The Advertising Of Oranges	0.015
1969–1978	Gardner, B.L.	1975	The Farm-Retail Price Spread In A Competitive Food Industry	0.019
1969–1978	Hazell, P.	1971	A Linear Alternative To Quadratic And Semivariance Programming For Farm Planning Under Uncertainty	0.019
1969–1978	Bishop, R.C.	1978	Endangered Species And Uncertainty - Economics Of A Safe Minimum Standard	0.019

Continued

**Table 2.** continued

Decade	Authors	Pub. Year	Title	Share
1969–1978	Binswanger, H.P.	1974	A Cost Function Approach To The Measurement Of Elasticities Of Factor Demand And Elasticities Of Substitution	0.016
1969–1978	Edward Schuh, G.	1974	The Exchange Rate And U. S. Agriculture	0.012
1979–1988	Hanemann, W.M.	1984	Welfare Evaluations In Contingent Valuation Experiments With Discrete Responses	0.050
1979–1988	Bishop, R.C., Heberlein, T.A.	1979	Measuring Values Of Extramarket Goods: Are Indirect Measures Biased?	0.023
1979–1988	Binswanger, H.P.	1980	Attitudes Toward Risk - Experimental-Measurement In Rural India	0.020
1979–1988	Ravallion, M.	1986	Testing Market Integration	0.009
1979–1988	Lichtenberg, E., Zilberman, D.	1986	The Econometrics Of Damage Control Why Specification Matters	0.008
1989–1998	Hanemann, W.M., Loomis, J.B., Kanninen, B.J.	1991	Statistical Efficiency Of Double-Bounded Dichotomous Choice Contingent Valuation	0.019
1989–1998	Adamowicz, W., Boxall, P., Williams, M., Louviere, J.	1998	Stated Preference Approaches For Measuring Passive Use Values: Choice Experiments And Contingent Valuation	0.015
1989–1998	Howitt, R.E.	1995	Positive Mathematical Programming	0.010
1989–1998	Bockstael, N.E.	1996	Modeling Economics And Ecology: The Importance Of A Spatial Perspective	0.008
1989–1998	Caswell, J.A., Mojduszka, E.M.	1996	Using Informational Labeling To Influence The Market For Quality In Food Products	0.008
1999–2008	Reardon, T., Timmer, C.P., Barrett, C.B., Berdegue, J.	2003	The Rise Of Supermarkets In Africa, Asia, And Latin America	0.015
1999–2008	Deller, S.C., Tsai, T.- H.S., Marcouiller, D.W., English, D.B.K.	2001	The Role Of Amenities And Quality Of Life In Rural Economic Growth	0.010
1999–2008	Lusk, J.L., Schroeder, T.C.	2004	Are Choice Experiments Incentive Compatible? A Test With Quality Differentiated Beef Steaks	0.008
1999–2008	Lusk, J.L., Roosen, J., Fox, J.A.	2003	Demand For Beef From Cattle Administered Growth Hormones Or Fed Genetically Modified Corn: A Comparison Of Consumers In France, Germany, The United Kingdom, And The United States	0.008
1999–2008	Hailu, A., Veeman, T.S.	2001	Non-Parametric Productivity Analysis With Undesirable Outputs: An Application To The Canadian Pulp And Paper Industry	0.007
2009–2018	Lusk, J.L., Briggeman, B.C.	2009	Food Values	0.020
2009–2018	Di Falco, S., Veronesi, M., Yesuf, M.	2011	Does Adaptation To Climate Change Provide Food Security? A Micro-Perspective From Ethiopia	0.015
2009–2018	Onozaka, Y., Mcfadden, D.T.	2011	Does Local Labeling Complement Or Compete With Other Sustainable Labels? A Conjoint Analysis Of Direct And Joint Values For Fresh Produce Claim	0.011
2009–2018	De Gorter, H., Just, D.R.	2009	The Economics Of A Blend Mandate For Biofuels	0.011
2009–2018	Di Falco, S., Chavas, J.-P.	2009	On Crop Biodiversity, Risk Exposure, And Food Security In The Highlands Of Ethiopia	0.010

**Table 3. Most Highly-cited Authors in the Journal by Decade, with Share of Total Citations by Decade**

Decade	Author	Total Citations	Decade Share	Decade	Author	Total Citations	Decade Share
1919–1928	Waugh, F.V.	256	0.421	1969–1978	Gardner, B.L.	682	0.028
1919–1928	Spillman, W.J.	42	0.069	1969–1978	Hazell, P.	542	0.022
1919–1928	Ely, R.T.	22	0.036	1969–1978	Hayami, Y.	439	0.018
1919–1928	Taylor, H.C.	18	0.030	1969–1978	Just, R.E.	423	0.018
1919–1928	Working, H.	18	0.030	1969–1978	Bishop, R.C.	420	0.017
1929–1938	Galbraith, J.K.	42	0.066	1979–1988	Hanemann, W.M.	2,630	0.049
1929–1938	Sauer, C.O.	34	0.054	1979–1988	Binswanger, H.P.	1,067	0.020
1929–1938	Wilson, M.L.	34	0.054	1979–1988	Bishop, R.C.	909	0.017
1929–1938	Peterson, G.M.	30	0.047	1979–1988	Antle, J.M.	761	0.014
1929–1938	Bean, L.H.	24	0.038	1979–1988	Zilberman, D.	645	0.012
1939–1948	Working, H.	390	0.208	1989–1998	Hanemann, W.M.	1,336	0.015
1939–1948	Stigler, G.J.	356	0.190	1989–1998	Loomis, J.B.	1,073	0.012
1939–1948	Ciriacy-Wantrup, S.V.	276	0.147	1989–1998	Howitt, R.E.	971	0.011
1939–1948	Heady, E.O.	116	0.062	1989–1998	Moschini, G.	737	0.008
1939–1948	Southworth, H.H.	66	0.035	1989–1998	Kanninen, B.J.	724	0.008
1949–1958	Nerlove, M.	492	0.149	1999–2008	Lusk, J.L.	1,780	0.020
1949–1958	Griliches, Z.	282	0.086	1999–2008	Barrett, C.B.	925	0.010
1949–1958	Heady, E.O.	237	0.072	1999–2008	Goodwin, B.K.	875	0.010
1949–1958	Working, H.	124	0.038	1999–2008	Fox, J.A.	735	0.008
1949–1958	Waugh, F.V.	104	0.032	1999–2008	Roosen, J.	675	0.008
1959–1968	Mundlak, Y.	406	0.040	2009–2018	Lusk, J.L.	555	0.020
1959–1968	Day, R.H.	368	0.036	2009–2018	Just, D.R.	336	0.012
1959–1968	Griliches, Z.	238	0.024	2009–2018	Briggeman, B.C.	301	0.011
1959–1968	Burt, O.R.	196	0.019	2009–2018	Hertel, T.W.	280	0.010
1959–1968	Judge, G.G.	192	0.019	2009–2018	Di Falco, S.	254	0.009

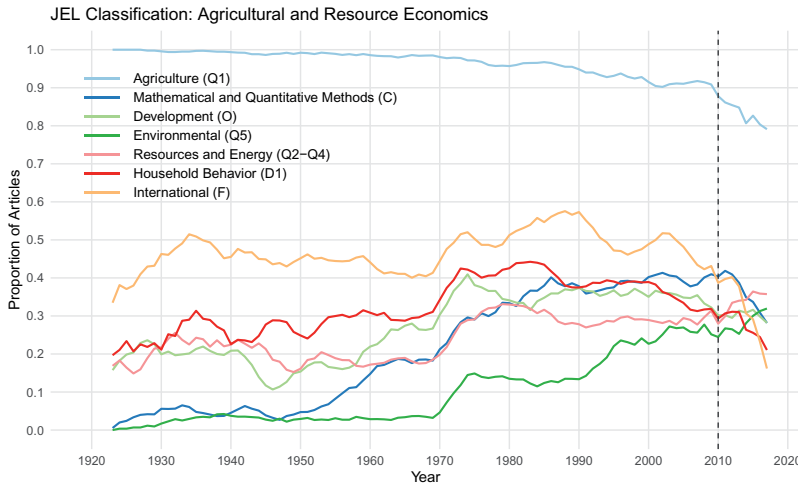
emphasized the core agricultural economics sub-disciplines. For the Journal's three decades spanning 1969 to 1998, two authors appear among the top five in multiple decades—R.C. Bishop and W.M. Hanemann—both leading environmental and natural resource economists. Only one author is among the most highly-cited in the most recent two decades—J.L. Lusk—who is widely known for research on consumption and food economics policy.

### Results: Topical Coverage

To track the evolution of topical coverage in the Journal, we use the JEL classification system. Since the Journal only adopted author-reported JEL codes in 2010, we must “back-cast” the JEL classification on earlier pre-2010 articles, which we structure as a multi-label classification problem such that each article can be classified into more than one category. Additional details are available in the online [supplementary material](#), appendix C.

Figure 7 reports the proportion of articles classified in seven core JEL classification groups.<sup>7</sup> The predominant classification of the Journal's articles is Agriculture (Q), though the proportion classified as Agriculture has fallen from essentially 100% in 1919 to under 90% in 2010, and under 80% in 2017. Up to the last decade, the International (F) classification followed Agriculture as the most common. Over the last decade, the International classification has fallen from the second-most to the least common among the seven core classes. Results from analyzing the structure of the Journal's articles over the past 100 years suggest that the subject matter has become more mathematical and quantitative. This inference is corroborated by the classification analysis. The Mathematical and Quantitative Methods

<sup>7</sup> To depict the larger trends in research topics, both figure 7 and figure 8 show the three-week moving average proportion of articles affiliated with a given JEL code. Because a single article can be (and often is) assigned to multiple JEL codes, these proportions do not sum to one in any given year.



**Figure 7. The proportion of articles published each year from the core JEL classes currently represented in the Journal**

Note: The JEL code classification prior to 2010 is predicted using a machine learning algorithm; from 2010 onwards, the JEL classification is provided by the authors.

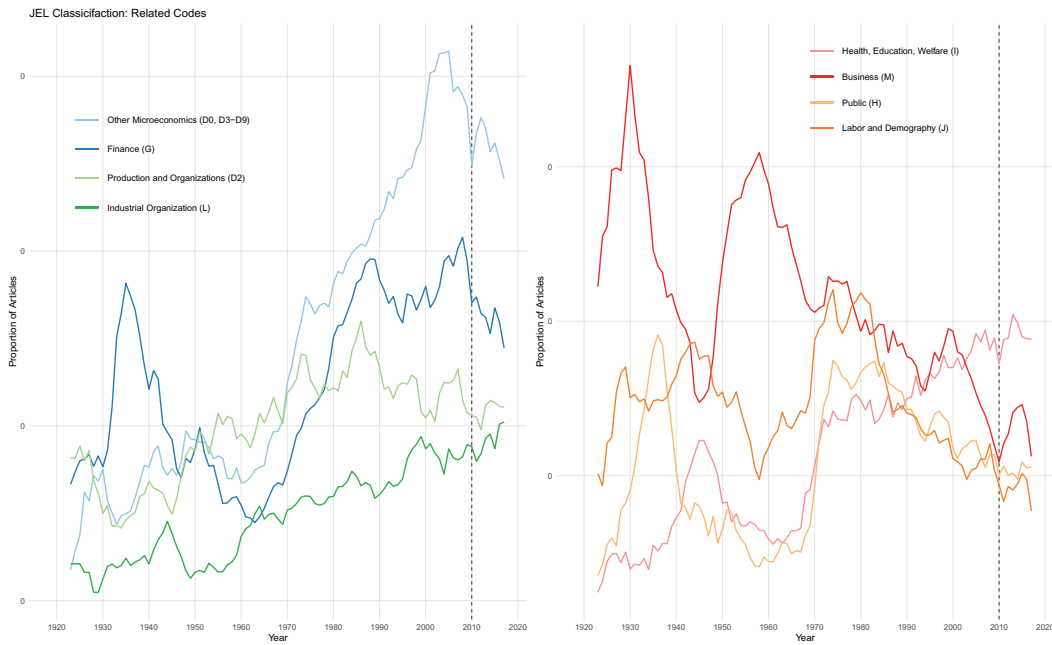
(C) class was assigned to fewer than 10% of articles before 1955. Since 1955, the proportion of articles classified as Mathematical and Quantitative Methods grew rapidly, reaching the second most common by 2010. The Development (O), Resource and Energy (Q2-Q4), and Household Behavior (D1) classifications follow similar irregular patterns of growth up to 2010. From 2010 on, the Resource and Energy class continues to grow, the Development class remains relatively flat, and the Household Behavior class increases briefly before declining. The Environmental classification remained low (below 5%) until 1970, when it began its steady rise. By 2010, it almost caught up to the six other core classes, and by 2017 it was the third most common of the seven core classes reported by the Journal's authors. A final notable trend in the figure is a simultaneous bump up in all but the Agricultural class between the late-1960s and mid-1970s. Reviewing 100 years of editorial reports reveals that this occurred while the Journal began implementing peer review of its articles.

Next, in figure 8, we explore trends in JEL codes that are closely related to these seven core codes. Articles with a Business (M) classification surged during the 1920s, declined, and surged again from the mid 1940s to the mid 1950s. Since 1960, articles classified as Business have been mostly declining in representation in the Journal. Finance (G) articles

surged in the early 1930s, and mostly receded through 1965 before surging again to 1990. Since 1990, the proportion of articles classified as Finance has been flat at just under 20%. Production and Organizations (D2) and Industrial Organization (L) articles grew in representation slowly until around 1985. Since 1985, the representation of Production and Organizations articles has leveled off at just over 10%, while the representation of Industrial Organization continued to grow slowly toward 10%. Before the late-1960s to the mid 1970 bump mentioned above, the trends for Health, Education, and Welfare (I), Public (H), and Labor and Demography (J) were irregular. After these classes also experienced the bump, the trend in Public, and Labor and Demography moved mostly down, approaching 10% representation, while the trend in Health, Education, and Welfare moved mostly up, approaching 20% representation. The Other Microeconomic (D0, D3-D9) classification saw accelerating growth to over 30% in 2005. Since 2005, the representation of the Other Microeconomic class fell back to 25%.

#### *Results: Geography of Research and Application*

We next use natural language processing techniques to extract geographic locations from the digital archive of published research



**Figure 8. The proportion of articles published each year from other JEL classes relevant to the work currently published in the Journal**

Note: JEL code classification prior to 2010 is predicted using a machine learning algorithm; from 2010 onwards, classification is provided by authors.

articles.<sup>8</sup> We then narrowed the extracted locations down to countries and U.S. States for each article and aggregated these by volume to provide a measure of geographic coverage of the Journal. Specifically, we compute an intensity measure for countries and U.S. States that captures the frequency of mentions in each volume decade.<sup>9</sup> Since these maps and the changes they depict are easier to see in electronic format, we provide a series of U.S. maps and world maps depicting the mention intensity of different

locations in the online [supplementary material](#), appendix D.

New York dominated U.S. state mentions for the Journal's first half century, while California dominated for the last half century. For the first half century, Washington was also frequently mentioned. While Washington has continued to receive frequent mentions in the last half century, the relative frequency of these mentions has declined. During the Journal's first three decades, Iowa and Illinois dominated mentions in the North Central United States. Over time, these mentions have become more disperse, with Iowa, Illinois, and Wisconsin receiving relatively more mentions between 1949 and 1958; Illinois, Minnesota, and Wisconsin receiving relatively more mentions between 1979 and 1988; and Illinois and Minnesota receiving relatively more mentions in the latest decade. A similar shift in geographic interest from Texas to Florida and Georgia is also apparent in the South and Southeastern United States.

Looking beyond the United States to the rest of the world, the United Kingdom and Canada dominated Journal mentions for the first three decades. While Canada remained widely mentioned throughout the Journal's history, the significance of the United

<sup>8</sup> Specifically, we use Python Natural Language Toolkit to conduct this analysis. For volumes 1 to 47, we scraped the location keywords from the whole text. For all other volumes, we scraped these locations from the abstracts. After parsing sentences into words and phrases, this toolkit identifies geographic locations and affiliation locations separately. Thus, an author's name and affiliation (e.g., Michigan State University) is identified as personal information rather than geographic information. While we are not technically able to distinguish references to the research focus of a given study (e.g., "We use data from Illinois in this study.") from a passing mention of geographic locations, analyzing abstracts where available ensures that the majority of geographic references are indeed the research focus of the article.

<sup>9</sup> Specifically, we use an inverse hyperbolic sine transformation of the number of mentions as our intensity measures. Because the most highly mentioned locations are strong outliers in these data, this transformation ensures that modestly mentioned locations are also detectable in the resulting maps.

Kingdom and the rest of Europe faded. As the United Kingdom and the rest of Europe faded, attention first drifted toward Russia, China, and Japan, and then toward India with the culmination of the Green Revolution in the late 1960s. Interest in Central and South America, particularly in Mexico and Brazil, also grew from the late 1930s. While interest in Brazil began to slip in the 1980s, interest in Mexico remained relatively strong until more recently. African countries were most intensively mentioned in the Journal in the 1970s and 1980s, again corresponding to the wake of the Green Revolution, and faded in subsequent decades. Interest in India and China also moderated over the last half century, more so for India than China, which joined Canada as one of two countries outside of the United States drawing most of the Journal's authors' attention in the past decade.

### Results: Authors and Collaborators

Finally, we evaluate the evolution of authorship and collaboration across the 100 volumes of the Journal. This analysis was conducted concurrently with a similar evaluation of authorship patterns in *REStat* (Khwaja and Mangal 2018b). Specifically, we use author information to elucidate trends in co-authoring, and then construct network maps based on collaboration relationships between authors publishing in the Journal. While there are deeper dimensions of such author analysis that may be worthwhile (e.g., author gender, institutional affiliation, etc.), these are beyond the scope of this analysis.

The dramatic rise in co-author collaborations in the Journal is evident in figure 9, which is strikingly similar to the *REStat* analysis in Khwaja and Mangal (2018b). We extend this analysis by using these data to construct a (unweighted, undirected) co-authorship network over the history of the Journal, recording an edge between authors whenever they have collaborated on an article. We simplify these networks so that only one edge exists between each set of collaborating authors, even if they have co-authored many articles together.

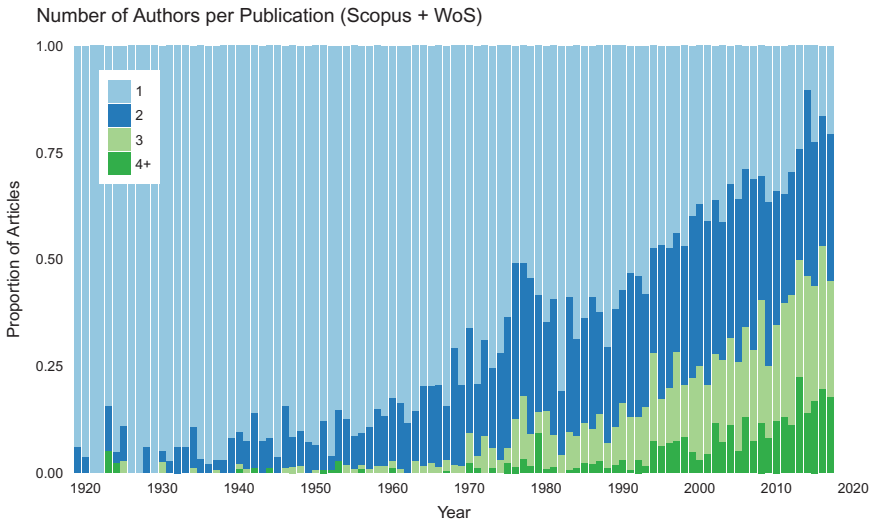
In addition to tabulating the share of articles with different sized co-author teams by volume (figure 9) and the number of distinct co-authors by author (table 4), we can exploit the collaboration networks represented by co-authoring relationships to provide a much richer perspective on the

evolution of collaborative work published in the Journal. We begin by summarizing the authorship structure and collaboration networks by decade (table 5).

As a summary measure of the collaboration networks represented in the Journal each decade, we use Harmonic Closeness Centrality (HCC), which is a measure of how closely connected the nodes are in a network graph. HCC for a given author based on a co-authorship network indicates how closely connected the author is with all other authors in the network, where a co-author is a distance of one away from a given author, a co-author of a co-author is a distance of two away from this author, etc. HCC is inversely proportional to these distances, so higher HCC implies that authors are more closely connected in general (i.e., there is a shorter distance on average between authors). In table 5, we average the HCC measure for all authors publishing in the Journal in each decade to provide a network-level summary of how closely connected collaboration networks are in the Journal in that decade. Over a century of publishing frontier research, the co-authorship network has become roughly 100 times more closely connected as measured by HCC. While this increase in collaborations is also apparent in figure 9, once we link co-authors into a complete collaboration network, we see a far more dramatic increase in collaborative interactions across the 100 volumes of the Journal.

Using this same HCC measure at the author-level, we rank all authors publishing in the Journal by decade in table 6. At the author level, the HCC captures how closely connected a given author is to the other authors publishing in the *AJAE*. To be more concrete, an author with a high HCC can more easily connect with potential collaborators through current co-authors than one with a low HCC (assuming a shorter distance through the network to another author makes it easier to connect or communicate with that author). In other words, an author with a high HCC is likely to have a good sense of what is being published in the Journal and by whom by virtue of their more central position in the collaboration network. As with all other analysis in this paper, we have restricted our focus exclusively to the Journal. While these networks are consequently not necessarily representative to the full field of agricultural and applied economics, the fact that the Journal has been the top field journal for a century suggests that





**Figure 9.** The proportion of articles in the Journal each year written by solo authors and co-author teams of different sizes

**Table 4.** Authors with the Most Distinct Co-Authors Publishing in the Journal by Decade

Decade	Author	Number of Co-authors	Decade	Author	Number of Co-authors
1919–1928	Benedict, M.R.	6	1969–1978	Heady, E.O.	16
1919–1928	Arnold, C.R.	4	1969–1978	Mather, L.L.	16
1919–1928	Dixon, H.M.	4	1969–1978	Hill, L.D.	14
1919–1928	Robertson, L.	4	1969–1978	Hathaway, D.E.	13
1919–1928	Ladd, C.E.	4	1969–1978	Hildreth, R.J.	13
1929–1938	Black, J.D.	3	1969–1978	Redman, J.C.	13
1929–1938	Galbraith, J.K.	3	1979–1988	McCarl, B.A.	21
1929–1938	Malenbaum, W.	3	1979–1988	Schmitz, A.	17
1929–1938	(15 Authors)	2	1979–1988	Garcia, P.	15
1939–1948	Bachman, K.L.	5	1979–1988	Just, R.E.	14
1939–1948	Mighell, R.L.	5	1979–1988	Marion, B.W.	14
1939–1948	Taeuber, C.	5	1989–1998	Zilberman, D.	21
1939–1948	Benedict, M.R.	4	1989–1998	Carter, C.A.	20
1939–1948	Goodsell, W.D.	4	1989–1998	Just, R.E.	17
1939–1948	Wilcox, W.W.	4	1989–1998	Mjelde, J.W.	17
1949–1958	Heady, E.O.	13	1989–1998	Alston, J.M.	16
1949–1958	Bressler, R.G.	6	1989–1998	Hertel, T.W.	16
1949–1958	Mcnall, P.E.	6	1999–2008	Zilberman, D.	19
1949–1958	Pond, G.A.	6	1999–2008	Shogren, J.F.	16
1949–1958	Wells, O.V.	6	1999–2008	Barrett, C.B.	15
1959–1968	Heady, E.O.	15	1999–2008	Goodwin, B.K.	15
1959–1968	Cochrane, W.W.	12	1999–2008	Lusk, J.L.	15
1959–1968	French, C.E.	10	2009–2018	Lusk, J.L.	29
1959–1968	Southworth, H.M.	10	2009–2018	Nayga, R.M.	26
1959–1968	Ebling, W.H.	9	2009–2018	Just, D.R.	15
			2009–2018	Richards, T.J.	15
			2009–2018	Goodwin, B.K.	14

Note: This Tabulation, as throughout this analysis, is restricted to publications and therefore co-authors in the Journal.

**Table 5. Summary of Authors, Collaborations (Edges in Network Map), and Average HCC of Collaboration Networks by Decade**

	Authors	Collaborations	Solo authors	Harmony Closeness Centrality
1919–1928	192	30	160	0.359
1929–1938	475	44	408	0.213
1939–1948	532	103	396	0.213
1949–1958	1,027	262	719	0.681
1959–1968	1,234	421	728	1.774
1969–1978	1,674	1,014	667	3.572
1979–1988	1,946	1,433	671	13.744
1989–1998	1,977	1,854	486	29.929
1999–2008	1,759	1,976	237	18.145
2009–2018	1,646	2,135	154	29.158

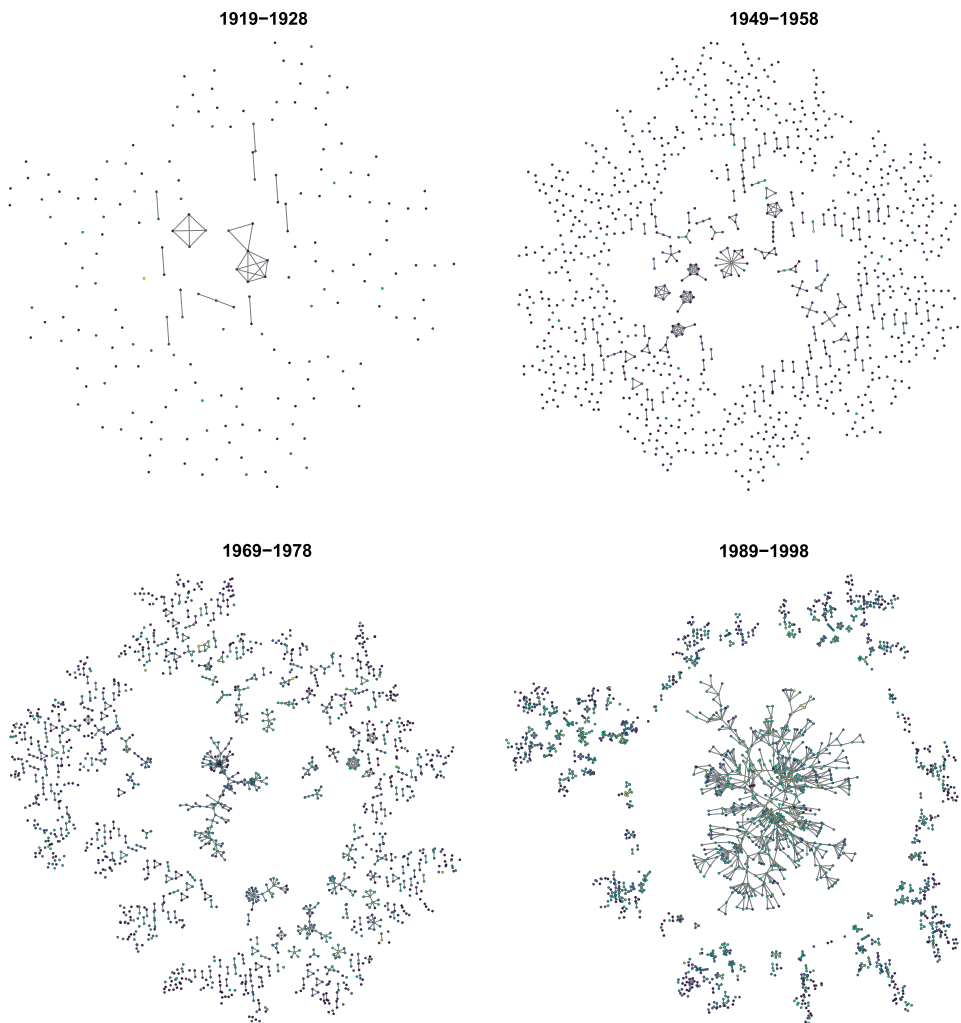
Note: Solo authors are authors who only published in the Journal as sole authors in a given decade.

**Table 6. Authors with the Highest HCC Measure (Most Closely Linked to All Other Authors Publishing in the Journal) by Decade**

Decade	Author	Harmonic Closeness Centrality	Decade	Author	Harmonic Closeness Centrality
1919–1928	Benedict, M.R.	6	1969–1978	Mather, L.L.	40.2
1919–1928	Arnold, C.R.	5	1969–1978	Hill, L.D.	37.3
1919–1928	Dixon, H.M.	5	1969–1978	Redman, J.C.	37.3
1919–1928	Robertson, L.	5	1969–1978	Hildreth, R.J.	37.3
1919–1928	Ladd, C.E.	5	1969–1978	Hathaway, D.E.	37.2
1929–1938	Galbraith, J.K.	3.5	1979–1988	Rister, M.E.	95.3
1929–1938	Malenbaum, W.	3.5	1979–1988	Pope, R.D.	94.1
1929–1938	Black, J.D.	3	1979–1988	Richardson, J.W.	91.8
1929–1938	Macy, R.M.	3	1979–1988	Bessler, D.A.	91.3
1929–1938	Cox, R.W.	2.5	1979–1988	Chavas, J.-P.	89.6
1929–1938	Moore A.N.	2.5	1989–1998	Just, R.E.	144.4
1929–1938	Richards, H.I.	2.5	1989–1998	Zilberman, D.	141.6
1929–1938	Waite, W.C.	2.5	1989–1998	Chambers, R.G.	136.4
1939–1948	Bachman, K.L.	8.3	1989–1998	Alston, J.M.	135.3
1939–1948	Mighell, R.L.	8	1989–1998	Pope, R.D.	131.3
1939–1948	Goodsell, W.D.	7.7	1999–2008	Zilberman, D.	110.4
1939–1948	Taeuber, C.	7.2	1999–2008	Goodwin, B.K.	102.8
1939–1948	Wilcox, W.W.	6.9	1999–2008	Just, D.R.	98.6
1949–1958	Heady, E.O.	13	1999–2008	Shogren, J.F.	98.5
1949–1958	Bloom, S.	8	1999–2008	Wu, S.	97.4
1949–1958	Catron, D.	8	2009–2018	Holt, M.T.	111.2
1949–1958	Schnittker, J.	8	2009–2018	Sumner, D.A.	109.1
1949–1958	Woodworth, R.C.	8	2009–2018	Goodwin, B.K.	106.7
1949–1958	Jacobsen, N.L.	8	2009–2018	Dorfman, J.H.	105.4
1949–1958	Ashton, G.C.	8	2009–2018	Balagtas, J.V.	104.5
1959–1968	Heady, E.O.	27.4			
1959–1968	Carter, H.O.	22.8			
1959–1968	Dean, G.W.	21.9			
1959–1968	Halter, AN.	20.5			
1959–1968	Cochrane, W.W.	19.9			

this is a relevant and important professional network to understand. Interestingly, the most connected authors in the 1990s had higher

HCC measures than those in the 2010s—a pattern that is also evident in the fact that the 1990s had the highest average HCC of any



**Figure 10. Sample of collaboration network maps for four volume decades.**

Note: Maps for each volume decade with author labels are available in the online [supplementary materials](#), appendix F.

volume decade (table 5). For “Betweenness” as an alternative and complementary network measure and a list of authors ranked according to this measure, see the online [supplementary material](#), appendix E.

Although we do not provide HCC measures for all authors in the Journal’s collaboration network, we do construct complete collaboration network maps by volume decade. Figure 10 presents a sample of these network maps and shows striking patterns in collaborations in Journal publications over time. Co-author collaboration was very sparse in the initial decade. Denser and more complex networks begin to form in the 1960s and 1970s. The collaboration network of the 1990s (lower right panel in figure 10) were more dense by the average centrality

measure than any other decade in the Journal’s history (table 5).

We offer complete network maps by decade in the online [supplementary material](#), appendix F. In these maps, we label each node (author) and color each node according to the total number of citations received by this author in that decade (the greater the share of citations received by a given author, the brighter their node is colored with the bright yellow node, indicating the most-cited author that decade). Scrolling through these ten network graphs provides an unmistakable and striking view of the steady increase in the density of the collaboration network of the Journal. These graphs also capture distinct collaboration sub-networks defined by advisor-student, institution, and/or field.

Although a detailed interpretation of these evolving collaboration networks is beyond the scope of this article, a few patterns are worth flagging. Increasing specialization and complexity of peer-reviewed research published in the Journal may be a cause or consequence of the rise of co-authorship as the basis for conducting frontier research. The fact that the average centrality measure peaks in the 1990s may suggest the emergence of distinct sub-networks by field in place of the more unified single linked network of the 1980s and 1990s. We encourage readers to explore the complete maps in the online [supplementary material](#), appendix F, and form their own working hypotheses of these important changes in the structure of research collaborations.

## Conclusion

“If this JOURNAL is to accomplish its mission, it will deal frankly in current issues, with the things which are of vital importance not only from the standpoint of the producer, but also from the viewpoint of the consumer,” October 1919 (“The Editorial Page”).

For 100 years, economists publishing in the Journal seem to have been guided by this editorial charge—even if they were never actually aware of this directive in the inaugural issue. As a result, and thanks to the joint effort of generations of authors, reviewers, and editors, the Journal has established its ability to “deal frankly in current issues.” In its first century, the focus of the Journal has moved from primarily farm management to a diverse array of “current issues” that the early editors would hardly recognize. While the majority of articles continue to link to agriculture broadly defined, the rising share of publications in economic development, environmental economics, resources and energy, nutrition and health, and quantitative methods is clear. The changing scope of the Journal is a testament to the flexibility and adaptability of research economists in the Association and, increasingly, beyond and to their ability to respond to emerging and important issues of the day. In contrast to the increasing diversity of topics, the Journal has narrowed with regards to the type of papers it publishes. Over time, book reviews, case

studies, proceedings papers, comments and replies, and literature reviews have largely been replaced by peer-reviewed research. The articles that now make it through stringent peer review advance the frontiers of economic analysis, but also risk training our gaze on technical issues that appeal to a narrow audience of specialists. While other economics journals face this same risk, editors of the Journal—the flagship outlet for a diverse professional association—bear a unique responsibility to manage increasing diversity while balancing technical or methodological contributions with the broader relevance of the research for current issues.

The results in this article document the evolution of a remarkable research record, but also raise important forward-looking considerations for those of us who are the current torchbearers of the Journal as active research economists. As we build on the Journal’s distinct legacy of research driven by “an alert, informed concern with problems and their solution,” (Galbraith 1993) one overarching question seems especially critical: *What can the Journal do in the coming decades to reinforce its prominence among researchers and its influence more generally?* The patterns, trends, and historical detail provided herein cannot directly answer this important question, but these reflections on the Journal’s past can offer a point of departure for discussion and debate about its future.

First, editorial structure has evolved in response to the ever-expanding diversity and sheer volume of submissions to the Journal. One factor leading to the adoption of a four-editor team beginning with volume 80 was workload—the number of submissions had become difficult to manage for a single editor, or even a smaller editorial team. At the time, submissions averaged about 300 per year. The Journal now receives over twice that many. Beyond workload, increased diversity of submissions and the need for specialization in editorial expertise also motivated the move to the current structure. Decisions about the direction of the Journal and its relationship to the Association’s expanded research portfolio, in addition to ongoing concerns about workload, set the stage for assessing the viability of this editorial structure going forward.

Second, the Journal’s scope has steadily broadened to encompass new research topics and methods over its history. Fifty years ago, this prompted a name change to the

*American Journal of Agricultural Economics*. After five more decades of accelerating change, the vast diversity of articles in the Journal—staggering in comparison to its first 50 volumes as the *Journal of Farm Economics*—begs the questions: Is the Journal the leading outlet in the field of agricultural economics? Or is it one of many general journals for a broader group in the economics profession? Is it time to consider renaming the Journal once again? A half century removed from the 1968 name change, perhaps revisiting the question makes sense. Such discussion might also entertain the prospect of the Association launching a new journal (or journals) that would allow the interests of its current members to continue to broaden and attract new members, while making it possible for the Journal to focus on maintaining its identity as the leading field journal in agricultural economics.

Third, many of the changes in the Journal we document were driven by competitive forces in the broader economics profession. Editors in the early years of the Journal did not have to worry about its competitiveness, whether with respect to other journals in the agricultural economics field, general economics journals, or other leading field journals. Those days are clearly gone. Publishers, editors, and researchers face a complex and competitive landscape for scholarly output. What is the proper measure of the Journal's stature in agricultural economics and economics more broadly? How do members, particularly junior researchers, choose where to send their best manuscripts? These are important questions that deserve attention as we address the Journal's continued prominence and our place in the broader competitive landscape of academic research outlets.

In this more competitive space and over the past decade, the Journal appears to be holding its own: since 2008, the impact factor ranking of the Journal among all economics journals has risen from 78th to 56th, albeit with considerable variation in between. Over the same period, a basket of five comparator journals (*Food Policy*, *European Review of Agricultural Economics*, *Journal of Agricultural Economics*, *Agricultural Economics*, and *Australian Journal of Agricultural and Resource Economics*) has declined in average ranking from 87th to 89th. While our impact factor rose over this period from 0.967 to 2.457, it is not clear that

a focus on impact factor reflects the true status of the Journal. The 2013 Editors Report included an analysis of the “market share of citations” in agricultural economics that, arguably, more accurately captures the importance of the Journal in the field. Our look back at the most-cited articles in the Journal's history points to two common (and reassuring) features of the articles that garnered the most citations over time—quality and originality. A theme that echoes through Editor's reports over the years is that Editors have relatively limited scope to influence either of these factors, but some influence nonetheless: the quality of manuscripts that flow to the Journal depend on how authors believe they will be read and cited, as well as their perceptions of whether their work will be reviewed in a timely, careful, and thoughtful way. Maintaining quality throughout the process and continuing to attract the best articles in the field is imperative to maintain the competitive stature of the Journal.

Finally, we document dramatic changes in the structure of the articles and the nature and extent of co-author collaboration. Consistent with a trend in the broader economics field, articles have grown longer, are more technical, and authors are communicating with more graphical images and tables. With greater specialization and sophistication and easier and faster forms of professional communication, collaboration networks have expanded rapidly. These trends will surely continue and shape the coming decades of research communication. Although the demand for more comprehensive analytical and empirical analysis (e.g., seemingly endless robustness tests) is more feature than bug, there is scope for greater creativity in presentation and for expanded use of [online appendices](#) to keep articles concise and accessible to a broader audience. Blending traditional research exposition with potent electronic visualizations of results and even animations is especially promising for big data applications. While these modest forms of innovation to research communication are important, we are also witnessing more fundamental shifts in the ways researchers communicate, collaborate, and share their work.

The decline of the physical incarnation of the Journal—along with all other journals—has changed the way research is disseminated and consumed. Accepted articles are available online well before they appear in print and only later collected into an issue. The

very notion of an issue is, for better or worse, becoming an anachronism. Receiving a new issue of the Journal by mail and delving in to discover the newest contributions to the frontiers is a dwindling professional routine. Even the ways people access the electronic pages of the Journal are changing, with a growing majority accessing articles in HTML rather than PDF format. These radical and recent changes are not the exclusive domain of publishers: they may shape substance. In the words of McLuhan, “The medium is the message.” When strictly electronic, readers may be less likely to read articles not directly related to their research interests and, in turn, authors may be less likely to cater to a broad audience. These technological changes alter not only the research process and content, but professional communication writ large. Much of the scholarly back and forth that dominated the early pages of the Journal in the form of book reviews, comments, and responses has migrated to online venues such as blogs and other social media (e.g., Twitter). These have become the primary platform by which young scholars track the research frontiers. In this lively and (sometimes) rigorous virtual engagement among researchers, articles are often available as working papers many years before they are accepted for publication; a published article is often the end of a debate rather than the beginning. Understanding the value-added of the Journal to the scholarly community in this new landscape and leveraging complementarities with new forms of communication, collaboration, and debate will be key to ensuring the Journal’s relevance among the rising and future generations of applied economists dealing “frankly in current issues.”

## Supplementary Material

Supplementary material are available at *American Journal of Agricultural Economics* online.

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