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Ranking Law Journals and the Limits of Journal Citation Reports

Theodore Eisenberg & Martin T. Wells*

Abstract

Rankings of schools, scholars, and journals emphasize ordinal rank. Journal rankings published by Journal Citation Reports (JCR) are widely used to assess research quality, which influences important decisions by academic departments, universities, and countries. We study refereed law journal rankings by JCR, Washington and Lee Law Library (W&L), and the Australian Research Council (ARC). Both JCR's and W&L's multiple measures of journals can be represented by a single latent factor. Yet JCR's rankings are uncorrelated with W&L's. The differences appear to be attributable to underrepresentation of law journals in JCR's database. We illustrate the effects of database bias on rankings through case studies of three elite journals, the *Journal of Law & Economics*, *Supreme Court Review*, and the *American Law & Economics Review*. Cluster analysis is a supplement to ordinal ranking and we report the results of a cluster analysis of law journals. The ARC does organize journals into four large groups and provides generally reasonable rankings of journals. But anomalies exist that could be avoided by checking the ARC groups against citation-based measures. Entities that rank should use their data to provide meaningful clusters rather than providing only ordinal ranks.

rankings, journals, research evaluation

JEL: O31, C15, D02, L89

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I. Introduction

Departments, universities, and countries use rankings to inform funding decisions, tenure and promotion decisions, and salaries. School ranks depend in substantial part on their scholars' ranks. Scholar ranks depend on the quality of the journals in which they publish. Independently of rankings' use by third parties, journals use them to self-promote, which can lead to the self-fulfilling prophecy of highly-ranked journals continuing to be highly ranked. "Publishing in journals with a high impact factor as measured by citations, and in journals that are used as source journals by [the Institute for Scientific Information now Journal Citation Reports (JCR)], has become an independent measure of scientific quality." (Wouters 2000). The methodology, validity, and consistency of ranking journals are clearly important.

Efforts to rank journals can be extensive. A country with centralized research funding may have a national list ranking journals to help inform decisionmaking. Australia's 2012 journal list includes 22,414 journals (Australia Research Council (ARC) 2012), though the ARC has abandoned its formal journal ranking system (Moosa 2011). Thomson Reuters ranks journals by citation counts as part of a commercial product, JCR, and other entities rank journals by citation counts for informational purposes (Washington and Lee 2012 (W&L)). Journals may be ranked by peer assessment surveys (Currie & Pandher 2011) in addition to citation counts. This article analyzes citation count rankings of refereed law journals.

The W&L and JCR rankings of refereed law journals are surprisingly inconsistent, with no statistical correlation. The main sources of inconsistency are likely the different representation of journals in the two databases and W&L's greater institutional knowledge of law, law journals, and law schools. JCR over represents economics and other journals compared to law journals and contains hundreds fewer law journals than other sources. JCR evidences less institutional knowledge of law journals and law than does W&L. JCR does not enable users to account easily for the dominance of student-edited journals in the United States and fails to provide measures that account for journals' efforts to address non-academic constituencies, an important function of legal publishing. Aside from statistical inconsistency across many journals, we illustrate the databases' different treatment of journals through case studies of three elite journals, the *Journal of Law & Economics*, *Supreme Court Review*, and the *American Law & Economics Review*. Our analysis suggests that JCR's methods, divorced from the context of the fields it ranks, produce results that should be regarded with extreme caution.

We also suggest clustering as a supplement to ordinal ranking. Clustering tries to identify meaningful differences between groups of journals rather than rely on bare ordinal rankings. The ARC organizes law (and other) journals into four groups. We assess how ARC's cluster-like effort reflects journals' citation-based performance. In general, the ARC provides reasonable rankings of law journals. But anomalies exist that could be avoided by checking the ARC groups against citation-based measures. We provide a more formal clustering analysis of refereed law journals that may inform entities like the ARC.

Although our analysis focuses on ranking law journals, similar considerations apply to ranking universities, departments, and individual scholars. Rather than emphasize ordinality, rankers should report meaningful clusters. Trivial differences in underlying measures should not be exaggerated by emphasizing an ordinal scale. Substantial differences should not be understated merely because entities that perform substantially differently happen to be close in ordinal rank.

Part II of this article discusses the background of rankings and describes the W&L and JCR ranking systems for law journals. Part III addresses the information content of JCR's and W&L's multiple measures, their consistency in ranking journals, and the effect of mapping continuous measures onto ordinal ranks. Part IV explores grouping or clustering journals. Part V discusses the results and Part VI concludes.

II. Background and Data Sources

A. Background

Eugene Garfield, a founder of bibliometrics, was inspired in part by the U.S. legal profession's *Shephard's Citations*, which began in 1873 as a way to track citations to cases. In a legal system that honors and relies on precedent, tracking citations is a core research task. Indeed, Hebrew law-related citation indexes have been in use for about 700 years (Wouters 2000). Garfield proposed a scientific literature citation system that allows similar tracking of scientific findings rather than legal precedents. He wrote in *Science* over 50 years ago:

> . . . I propose a bibliographic system for science literature that can eliminate the uncritical citation of fraudulent, incomplete, or obsolete data by making it possible for the conscientious scholar to be aware of criticisms of earlier papers. It is too much to expect a research worker to spend an inordinate amount of time searching for the bibliographic descendants of antecedent papers. It would not be excessive to demand that the thorough scholar check all papers that have cited or criticized such papers, if they could be located quickly. The citation index makes this check practicable (Garfield 1955).

The ability to track the development of ideas through citations is so widely accepted that Garfield's vision is now likely underappreciated (Cronin and Atkins 2000). Garfield's idea was implemented through the Institute for Scientific Information (ISI) that he founded in 1960, which is now owned by Thomson Reuters.

Garfield's original purpose differed from the ranking function citations now often perform, an expansion fostered by Garfield himself. He recognized that the citations could be used to evaluate journals. He reported in *Science* in 1972 that ISI "decided to undertake a systematic analysis of journal citation patterns across the whole of science and technology." (Garfield 1972, p. 472). He illustrated the methodology, published an impact factor ("average citations per published item" (p. 474)), and offered three applications beyond the "most important"—studying science policy and research evaluation. The applications were to use citation frequency and impact factor to help

manage library collections, to help scientists select journals to read and keep, and to help journal editors evaluate their editorial selection policies. The use of impact factors and other measures to evaluate scholars, departments, universities, and countries came later.

Garfield recognized that problems of journal inclusion existed. He noted that his product was "less likely to cover a journal that presents problems of transliteration . . . and translation than one that does not," which could adversely influence the ranking of foreign journals (Garfield 1972, p. 473). As we shall show, problems of journal inclusion and exclusion beyond those linked to language can produce questionable ranking results.

B. Sources of Data on Citation-Based Rankings

Garfield's concept has expanded to include a system in which JCR ranks thousands of science and social science journals in many disciplines, including the discipline that contained the citation-indexing precedent that inspired Garfield, law. JCR claims to be "the only source of citation data on journals." (JCR, About Journal Citation Reports 2011). With respect to law journals, that claim is incorrect because W&L not only ranks law journals but has much broader journal coverage than does JCR. We now describe the measures that W&L and JCR use to rank journals.

1. Washington and Lee Law Library

W&L contains five journal performance measures: Currency-Factor, Impact-Factor, Journal Citations, Case Citations, and Combined-Score.[1] All are measures of citation counts or a combination of citations counts and the counts are limited to citations to journal volumes published in the preceding eight years.

W&L bases its citation counts on journals that are included in Westlaw's Journals & Law Reviews ("JLR") database. Westlaw is a widely used online research service that includes journals and cases covering U.S. law and materials from a few non-U.S. jurisdictions. Westlaw describes the JLR database as "containing documents from law reviews, CLE [Continuing Legal Education] course materials, and bar journals." (Westlaw Summary 2012). A document is an article, a note, a symposium contribution, or other item published in a periodical in the database. As of March 27, 2012, the JLR database indicates that it included full or part coverage of 985 journals.[2] The JLR description states that it contains documents from U.S. and Canadian based publications but this is not a full description. JLR includes, for example, the *Melbourne University Law Review* and the *Oxford Journal of Legal Studies*. JLR appears to be limited to English language publications. The breadth of JLR is impressive in some respects. It includes 14 journals published by Columbia Law School, 12 journals published by Yale

[1] W&L also includes a cost-performance measure, Cites per Cost, not included in this analysis.

[2] To avoid double counting of journals, the 985 figure excludes journals in JLR that changed names and in which the former name occupies a line in the journal listing. The W&L website lists 1,683 journals, many of which are listed for informational purposes other than ranking. As of March 27, 2012, an online query limited to the Currency Factor for ranked journals listed non-zero values for 1,210 journals. Since the JLR database contains only 985 journals, it is not clear why the W&L search, which uses the JLR database, ranks more than 985 journals. It may be that the JLR database list is incomplete in what it includes (for example, Westlaw erroneously states that it is limited to U.S. and Canadian sources) or that the W&L list of ranked journals treats some as ranked that are not in the JLR database.

Law School, including two online versions of print journals, and 16 journals published by Harvard Law School. It includes journals such as *Wyoming Lawyer*, a journal that presumably is primarily of interest to lawyers in one of the U.S.'s least populous states. Many of the JLR journals are run by temporary student editors with one-year tenures. In the W&L database, one can limit searches to refereed or peer-edited journals.

Currency Factor. W&L's Currency Factor compares journals based on how rapidly their articles become cited. As described on the W&L website, which illustrates the Currency Factor calculation for the 2002-2009 survey period:

> currency-factor is the number of articles added to Westlaw's JLR database in the three-year period of 2002-2004 that cite to volumes of a journal dated during those same three years, divided by the number of items published by the journal during those same years.[3]

So the W&L Currency Factor would equal two for a journal that published 20 articles in the period 2002 to 2004, and 40 articles were added to Westlaw during that period cited those 20 articles. As is the case for all the W&L citation measures, it appears that multiple citations to a journal article within the same document do not increase the citation count because the count is based on the number of articles citing the journal, not the actual number of citations to the journal. For 2011, for refereed journals, the ten most highly ranked journals by Currency Factor had factors ranging from 3.41 to 1.8. The lowest ranked journals had factors of zero. But many of the zero factors are due to foreign journals being ranked based on a database that contains mostly U.S. journals. For 2010, the year we analyze to compare W&L with JCR, the ten most highly ranked journals by Currency Factor had factors ranging from 3.42 to 1.41.

Impact Factor. W&L's Impact Factor is based on the average number of annual citations to articles in a journal. To compute the Impact Factor, W&L conducts journal-specific searches of the Westlaw JLR database articles citing a journal in eight separate years. The same search is conducted for each year, except that each search uses a different year to limit the search. The number of articles citing a journal from the yearly searches are divided by the cumulative number of articles published in the journal that might have been cited. For example, if the survey period is 2002-2009, then the yearly search of 2002 articles added to JLR will be articles added in 2002 that cite the journal; the yearly search of 2003 articles added to JLR will be articles added in 2003 that cite articles published by a journal in 2002 and 2003, and so on, until the 2009 yearly search which will search for articles added to JLR in 2009 that cite articles published by a journal from 2002 through 2009. W&L illustrates this computation as follows:

> Assuming each year that a journal steadily publishes 20 items, then if the number of citing articles from the 2003 [search] is 30 then that year's impact-factor is

[3] Accompanying this description of the Currency Factor is the following statement:

> It would have been desirable to create this index from the final three years of the survey period, but the data on which it's based, being automatically created from annual data collected to calculate impact-factor, is in a form requiring the use of the *first* three years of each survey period. For any journal that began publication after the beginning of the survey period the three years will be the first three years of the journal's existence.

30/40=0.75. Should the number of citing articles in the 2009 [search] be 100 then that year's impact-factor is 100/160=0.62.

This process leads to a measure of impact for each year in the studied period. W&L then uses the median of those yearly factors as the journal's reported Impact Factor.[4] For 2011, for refereed journals, the ten most highly ranked journals by Impact Factor had factors ranging from 2.18 to 1.0. For 2010, the ten most highly ranked journals by Impact Factor had factors ranging from 2.97 to 0.92. The lowest ranked journals had factors of zero.

Both the Currency Factor and the Impact Factor require a denominator to account for the number of articles a journal published in the relevant time period. W&L notes that no fully satisfactory and automated method exists for determining this number. It reports that information about the number of articles was obtained from the WilsonWeb Index to Legal Periodicals[5] when possible and, in other cases, from various sources.[6]

Journal Citations. W&L's Journal Citations measure reports the number of articles that cite to each journal (within a survey period) that were found in the JLR database. Unlike Currency Factor and Impact Factor, Journal Citations has no denominator. So journals that have published the longest and published the most articles are favored by this measure. For 2011, for refereed journals, the ten most highly ranked journals by Journal Citations had citations ranging from 2,817 to 806. A small fraction of journals, 38 out of 579, had a Journals Citations count of zero. For 2010, for refereed journals, the ten most highly ranked journals by Journal Citations had citations ranging from 3,059 to 315. Note that citations can decline over time because of the shifting time period used to assess them.

Case Citations. W&L's Case Citations reports the number of cases that cite to each journal within a search time period in the full-text Westlaw state and federal case database.[7] Westlaw describes the database as including decisions from the "U.S. Supreme Court, courts of appeals, former circuit courts, district courts, bankruptcy courts, former Court of Claims, Court of Federal Claims, Tax Court, related federal and territorial courts, military courts, the state courts of all 50 states and the local courts of the

[4] The W&L website states that the median is used "to throw out the less representative outliers" and that a journal's Impact-Factor usually "for an 8 year publication range . . . will be the average of the two impact-factors closest to mid-range."

[5] Wilson Index to Legal Periodicals and Books, http://www.ebscohost.com/academic/index-to-legal-periodicals-books.

[6] W&L reports that if other sources had to be used, the next preference was Westlaw (if Westlaw comprehensively added articles for the years needed), followed by Lexis, then Legal Resource Index, then Legal Journals Index (UK), and then any other index in which the journal was indexed. W&L also states, "Often a manual count was made by physically examining the tables of contents for the journal years needed. In cases where indexing was not available and a manual count was not feasible, then an extrapolation was made from what was known. As these variant sources undoubtedly have differing definitions as to what is a countable entity this introduces variability into the counts."

[7] Westlaw Summary, All Federal & State Cases Database, http://web2.westlaw.com/scope/default.aspx?db=ALLCASES&RP=/scope/default.wl&RS=WLW12.01&VR=2.0&SV=Split&FN=_top&MT=Westlaw&MST=.

District of Columbia."[8] For 2011, for refereed journals, the ten most highly ranked journals by Case Citations had citations ranging from 318 to 21. A substantial majority of journals, 463 out of 580, had a Case Citations count of zero. For 2010, for refereed journals, the ten most highly ranked journals by Case Citations had citations ranging from 293 to 20 with 104 of 566 having non-zero citations.

Combined Score Ranking. W&L constructs its Combined Score measure of citations from each journal's impact-factor and total citations, where the total citations include Journal Citations and Case Citations.[9] The Combined Score is weighted with approximately one-third of the weight given to Impact Factor and two-thirds given to Total Citations. The resulting score is then normalized. W&L states that the motivation for the Combined Score is that neither ranking by Total Citations nor by Impact Factor are in themselves sufficient.[10] The formula for obtaining the Combined Score is the addition of the weighted and normalized scores for each of Impact Factor and total citations.[11] The default weight for the Impact Factor is 0.33 and for Total Citations is 0.67, but the user may alter that weight.[12] The Combined Score reported is a percentage of the largest score that exists in a retrieved set of journals. The displayed version of the Combined Score is calculated as:

100 x (Combined Score/highest-Combined Score)

Thus the top-ranked journal(s) in a retrieved set of journals will always have a displayed Combined Score of 100 and other journals will have lower numbers based on how much smaller their Combined Score is than the highest Combined Score.

W&L's ranked journals include periodicals that began publication after the survey period began. Citation counts unadjusted by the number of articles and not restricted to a limited time period disadvantage young journals because they have had less time to accumulate citations. The Total Citations component of the Combined Score also disadvantages younger journals W&L therefore applies an adjustment to more fairly compare new journals with established journals.[13] The Combined Score adjustment is made for journals that, at the survey date, existed for less than eight years.

2. Journal Citation Reports

While W&L specializes in law journal metrics, JCR covers a broad range of subject areas. The JCR Social Sciences Edition purports to offer "a systematic, objective means to critically evaluate the world's leading journals, with quantifiable, statistical information based on citation data." (Thomson Reuters 2012). It covers more than 2,600 social science journals, though it is likely that it includes only a small fraction of the

[8] Id.
[9] Email from Stephanie Miller, Electronic Services Librarian, Washington & Lee University School of Law, to Theodore Eisenberg, March 27, 2012.
[10] Ronen Perry, The Relative Value of American Law Reviews: Refinement and Implementation, 39 Conn. L. Rev. 1 (2006).
[11] The formula is: ((IF x weight x 100)/highest-IF) + ((TC x (1-weight) x 100)/highest-TC), where IF is Impact-Factor, TC is total citations, weight is weight assigned to the IF, and highest is highest Combined-Score.
[12] For a discussion of the weighting issue, see W&L website.
[13] Id.

universe of social science journals. Braun et al. (2000) estimate that the associated Science Citation Index includes about 10% of the science and technology journals.

JCR reports five journal influence measures: Total Cites, Impact Factor, Immediacy Index, Eigenfactor Score, and Article Influence Score.[14] JCR organizes it measures by what it terms the "JCR year." Each JCR year contains one year of citation data. JCR searches are year-specific so a search of the 2010 data yields the number of citations to a journal in 2010. As of this writing, 2010 is the most recent year for which JCR citation counts are available. Not all items published in journals are included in JCR calculations. Editorials, letters, news items, and meeting abstracts are not counted "because they are not generally cited." (JCR, Journal Source Data 2011).

Total Cites. JCR states that Total Cites is the total number of citations to a journal in the applicable JCR year. Since JCR is limited in its journal coverage—it includes only about ten percent of the law journals that W&L includes—one can assume that Total Cites should be interpreted as total citations in journals that happen to be included in JCR. Table 1 below shows, for refereed law journals, that Total Cites has a mean of 422.6, with a range of 9 to 2,911. Since Total Cites is not adjusted for the number of years of a journal's existence, or by the number of articles published, older journals should fare better, on average, than younger journals of equal quality.

Impact Factor and Five Year Impact Factor. A journal's Impact Factor is the average number of times articles from the journal published in the past two years have been cited in the JCR year. The number of citations is divided by the number of articles published by the journal in the previous two years. So the 2010 Impact Factor equals the citations in 2010 to articles published in a journal in 2008 or 2009, where the citations are in journals included in JCR, divided by the number of articles published by the journal in 2008 and 2009. For example, an Impact Factor of 1.0 means that the average number of citations to the articles published one or two years prior to the JCR year is one. As Table 1 below shows, for the 54 refereed law journals included in JCR, the average Impact Factor is 0.84, with a range of 0 to 2.27, so the average article is cited less than once per

[14] JCR also reports a journal's Cited Half-Life, which is the median age of the articles that were cited in the JCR year. If a journal has a cited Half-Life of five for JCR year 2010, then articles published in the journal from 2006 through 2010 account for 50% of the citations (in the JCR-included journals) to articles from that journal in JCR year 2010. JCR computes the Cited Half-Life only for journals cited 100 or more times in the JCR year. Since Cited Half-Life is based solely on the timing of citations to a journal, JCR notes that, unlike other measures, cited half-life "does not imply any particular value for a journal." () A journal with a longer Cited Half-Life does not necessarily tend to have more citations than a journal with a short half-life. It merely tends to have more citations to it in the current JCR year that consist of citations to older articles published in the journal. A journal with a longer half-life could have more or fewer citations than a journal with a shorter half-life.

JCR also computes an aggregated half-life for entire subject categories. The category "Law" has an aggregated half-life of greater than 10.0 years. This means that articles published in JCR-included law journals covering a time period that spans an unspecified number of years prior to 2001 account for 50% of all citations to articles in law journals in 2010. Economics and social psychology also had cited half-lives of more than 10.0 years. JCR's political science subject category journals had a cited half-life of 8.6 years in 2010. Perhaps political science evolves more rapidly than the other law-related social science fields or political science articles may have less lasting value on average. As JCR suggests, the Cited Half-Life does not seem directly related to a journal's intellectual value.

year in the period shortly after publication. The citation count includes articles citing other articles in the same journal. The Five Year Impact Factor expands the numerator and denominator of the Impact Factor to cover the five years before the JCR year. The Five Year Impact Factor adds little information to the Impact Factor as the correlation coefficient for the two for refereed journals is over 0.93. But the increased time period does improve the probability of an article being cited; Table 1 shows it to have a mean of 1.14 with a range of 0.20 to 3.39.

Immediacy Index. The Immediacy Index is the average number of times an article is cited in the year it is published. In disciplines with a long publication lead time, one expects the Immediacy Index to be small. In refereed law journals, Table 1 shows it to have a mean of with a range of 0.28 with a range of 0 to 1.38. The timing of publication should be an important influence on the Immediacy Index. A journal that publishes in July and December, for example, is at a disadvantage compared to a journal that publishes in January and June since there are, on average, six fewer months in which to cite the former journal.

Since the Impact Factor, Five Year Impact Factor, and Immediacy Index are article-based measures, they do not ex ante favor older journals. They are thus a useful alternative to Total Cites. As article-based measures, however, they are sensitive to when JCR performs its calculations. JCR indicates that the data for a JCR year must be processed by mid-February and that the number of articles for the most recent year may be lower than the actual number. The calculation is corrected in the subsequent JCR year (JCR, Journal Source Data 2011) but in any given year the measures may be incorrect.

Eigenfactor Score. The Eigenfactor Score combines citation count and a proxy for journal quality. It addresses the concern that citation counts may be poor proxies for what is of interest in ranking journals because authors cite articles for many different reasons (Wouters 2000). The Eigenfactor Score weights citations to a journal by highly cited journals more than citations by lesser cited journals (Eigenfactor.org 2011). It is based in part on the number of times articles from the journal published in the past five years have been cited in the current JCR year. But the Score accounts for which journals a journal is being cited in. In addition the Eigenfactor Score does not include citations in a journal to that same journal. It is therefore not influenced by journal self-citation, though it is influenced by author self-citation in other journals. The Eigenfactor approach has been used to rank authors, institutions, and countries in the Social Science Research Network database (West et al. 2012).

Article Influence Score. The Article Influence Score uses the Eigenfactor Score to measure the average influence of a journal's articles. Like the Five Year Impact Factor and the Eigenfactor Score, it focuses on citations to articles in the five years after their publication and is said to determine "the average influence of a journal's articles over the first five years after publication." JCR calculates the Article Influence Score by dividing a journal's Eigenfactor Score by the number of articles in the journal. This calculation is then normalized as a fraction of all articles in all publications in a category. So the mean Article Influence Score is 1.00, with scores greater than 1.00 indicating that articles in the journal have above average influence and scores less than 1.00 indicating that articles in the journal have below average influence.

Table 1, panel A, summarizes the W&L factors for 2010 for all refereed, ranked law journals. Panel B summarizes these factors for the 54 refereed law journals that also appear in JCR. Panel C reports the JCR factors for the refereed, ranked journals that also appear in W&L.

Table 1. Descriptive Statistics of Measures of Refereed Law Journal Impact

Variable	Obs	Mean	Std. Dev.	Min	Max
A. W&L measures: all refereed law journals					
Currency Factor	562	.139484	.3208243	0	3.42
Impact Factor	571	.0999124	.2144716	0	2.07
Journals	571	98.6725	226.5267	0	3059
Cases	564	1.817376	13.54108	0	293
Combined	571	6.022417	12.32895	0	100
B. W&L measures: refereed law journals that also appear in JCR					
Currency Factor	54	.5196296	.670764	0	3.42
Impact Factor	54	.3566667	.4026094	.01	2.07
Journals	54	436.7963	509.3697	8	3059
Cases	54	12.90741	41.73468	0	293
Combined	54	8.011111	8.075579	.2	34.4
C. JCR measures: refereed law journals					
Total Cites	54	422.5741	572.9704	9	2911
Impact Factor	54	.8399444	.6291462	0	2.268
5 Year Impact Factor	37	1.136081	.8265707	.203	3.387
Immediacy Index	53	.2793774	.361775	0	1.375
Articles	53	26.09434	13.61315	6	73
Cited Half-Life	40	7.39	2.439399	2.7	10
Eigenfactor Score	54	.0012109	.0013721	1.00e-05	.00649
Article Influence	37	.5428108	.574991	.03	2.414

JCR limits citations credited to journals to citations appearing in journals in the JCR database. For law journals as of the time of this analysis, those data are limited to 133 journals, of which 54 are refereed (not edited by students). Because the scope of subject matter category coverage will be shown to have an important influence on JCR factors, Table 2 shows the top 25 subject matter categories (of 56 total categories), by total cites, in JCR's social science database for 2010. Economics is the dominant field in terms of the numbers of citations, journals, and articles, but psychology's many subfields, if aggregated, would exceed the economics numbers.

Table 2. Summary Characteristics of Academic Categories, JCR Data 2010

Rank	Category	Total Cites	Median Impact Factor	Aggregate Impact Factor	Aggregate Immediacy Index	# Journals	Articles
1	Economics	380146	0.75	1.188	0.244	305	14403
2	Psychiatry	352344	1.565	2.918	0.561	110	7887
3	Management	279688	1.22	1.768	0.319	144	5898
4	Psychol., Experimental	220555	1.813	2.465	0.493	81	5629
5	Business	217885	1.365	1.597	0.337	103	4629
6	Psychol., Multidiscipl.	216785	1.065	1.868	0.369	120	5755

7	Psychol., Clinical	209743	1.524	2.27	0.421	104	5517
8	Public, Environ. & Occup. Health	202288	1.286	1.721	0.352	116	9245
9	Psychol., Developmental	154240	1.525	2.352	0.447	66	3675
10	Psychol., Social	144205	1.18	1.686	0.302	58	3141
11	Sociology	112171	0.767	0.923	0.189	132	4159
12	Psychol., Applied	104570	1.326	1.658	0.298	69	2484
13	Educ. & Educ'l Research	99229	0.649	0.906	0.195	184	6862
14	Business Finance	93384	0.758	1.29	0.25	76	3122
15	Health Policy & Servs.	84593	1.397	1.942	0.433	58	3689
16	Environ. Studies	84454	1.11	1.749	0.377	78	4479
17	Soc. Scis., Mathem. Methods	84016	0.9	1.272	0.221	43	1930
18	Law	76290	0.786	1.178	0.434	133	3761
19	Political Science	76087	0.655	0.806	0.221	141	5078
20	Nursing	70584	0.957	1.033	0.153	87	5141
21	Psychol., Educational	67250	1.054	1.416	0.436	50	1669
22	Linguistics	66868	0.565	0.96	0.208	144	3355
23	Gerontology	65901	1.082	2.124	0.349	30	2093
24	Anthropology	60091	0.68	1.228	0.35	76	2756
25	Soc. Sciences Interdiscip.	59906	0.643	1.023	0.257	84	3611

3. The ARC Ranking of Journals

The ARC is a statutory authority that advises the Australian government on research matters, administers the Excellence in Research for Australia (ERA) initiative, and manages grants that constitute a significant portion of Australia's investment in research and development (ARC 2012b). The ERA initiative assesses research quality within Australia's higher education institutions. Part of that assessment requires considering the quality of journals in which Australian researchers publish.

The ARC's national journal rating system grouped journals into four ordered letter categories: A*, A, B, and C. This informal clustering of journals strived for reasonable groupings of journals for purposes of assessing Australian research institutions' performance. The ARC assigned letters to 49 refereed law journals that are ranked in W&L and JCR. Ten journals received the highest rank of A*, 18 receive A, 10 receive B, and 11 receive C.

III. Information Content, Consistency, Mapping Continuous to Ordinal Measures

We use the above three data sources to address questions relating to ordinal ranking and to clustering of journals. This Part addresses three questions relating to journal rankings: (1) whether information content varies across multiple measures of impact, (2) the consistency of journal rankings across ranking systems, and (3) the effect of translating continuous measures of impact into ordinal rankings. Part IV addresses whether ARC's system is consistent with the W&L and JCR measures and provides a new cluster analysis of refereed law journals.

A. Information Content of Multiple Measures

Do multiple measures of journal impact contain unique information or can they be viewed as representing a single latent factor? Part II describes JCR's and W&L's

multiple measures of citations. In many current uses, these measures, particularly JCR's impact factor, can be thought of as trying to measure a latent, unobserved factor, journal quality. Some multiple measures are not expected to vary substantially; they perform more of a checking or consistency function. One expects high correlations among W&L's Currency Factor, Impact Factor, Journal Citations, and Combined Score. The first three are based on citations in journals with varying time periods and adjustments. The Combined Score is a combination of the other measures and so will be correlated with them.

But multiple measures can also capture varying information. Such measures should have noticeably different information content. W&L's Case Citations use a different Westlaw database to count citations to cases than the other measures use. The topics of interest in case law may vary from those of interest to journals and it is therefore not clear what the association between Case Citations and the other W&L measures should be expected to be. Journals more oriented toward legal practice might fare better by the Case Citations measure than journals run by academic institutions.

JCR also has likely overlapping measures of citation performance and of the latent construct, quality. The Eigenfactor Score is of special interest because it addresses quality of citations, not just quantity. Many express reservations about citation-based rankings as a poor measure of quality and JCR provides one measure described below, its Eigenfactor Score, intended to account for the quality as well as quantity of citations. A core concern about citation count rankings is that "the number of citations is a poor proxy of what is really of interest." (Palacios-Huerta & Volij 2004; Wouters 2000). What is usually of interest is some measure of reputation, impact, or quality. Raw citation counts assume that raw counts proxy the qualities of interest. If the concern about citation counts is valid, quality based measures of citations will provide interesting and different information. We expect a quality-based measure to noticeably differ from citation count measures that do not account for quality.

To explore the information content of the ranking systems, we employ factor analysis to evaluate the latent qualities that multiple citation measures may represent. Factor analysis is a statistical method that reduces multidimensional measures of data to fewer dimensions by assessing the structure of the dependencies among the measures (Timm 2002, p. 445).

We begin with separate factor analyses of the multiple measures within each of the two journal ranking systems. For W&L, the measures are: Currency Factor, Impact Factor, Journal Citations, and Case Citations. The Combined Score is itself an aggregate based on other factors and can reasonably be excluded.[15] Factor analysis produces eigenvalues and an eigenvalue equal to 1.0 is the information accounted for by an average single measure. Some analysts drop measurement components with eigenvalues

[15] We use log and square root transformations of the measures to improve the normality of the variables. For about half of the law journals, case citations were zero and the log was therefore undefined. We therefore used a square root transformation for case citations. A Box Cox transformation implies that the log is the best transformation for nonzero values of case citations. As an alternative, we replaced the zero values of cases citations with 0.1 before taking logs and results did not materially differ.

less than 1.0. A scree plot explores the relation between measurement components on the x-axis and eigenvalues on the y-axis.

Figure 1A shows the scree plot resulting from the W&L factor analysis. The figure's sharp drop in eigenvalue as one moves from one to two factors suggests that the W&L measures can be associated with a single latent factor. No single measurement explains a substantial fraction of the variance that is not explained by the other measurements. One factor explains over 90 percent of the variation associated with the multiple measurements. This increases to 96 percent if one excludes the Case Citations measure. Although including Case Citations does not suggest the existence of an important second factor, Case Citations does embody some information not embodied in the other W&L measures. Case Citations explains about 80 percent of the variation in the measures not accounted for by the other measures. We consider this feature of Case Citations in Part V below. Confirmatory factor analysis suggests that using a single latent factor fits the data reasonably well, with measures of goodness of fit, the comparative fit index (CFI) (0.998) and the Tucker Lewis index (TLI) (0.995) both being satisfactory.

Figure 1B shows the scree plot for the JCR measures. The factor analysis underlying the figure includes Total Cites, Impact Factor, Five Year Impact Factor, Eigenfactor Score, and Article Influence Score. As in the case of the W&L measures, the drop in eigenvalues as one moves from one to two factors suggests that JCR measures are associated with a single latent factor. Confirmatory factor analysis using these five JCR factors raises a question about the goodness of fit based on the assumed existence of a single latent factor.[16] The goodness of fit substantially improves if one omits the Five Year Impact Factor, with a CFI of 0.982 and a TLI of 0.945. Thus, one can successfully model four JCR measures as a representing a single latent factor. The measures include a measure of current impact that accounts for journal age (Impact Factor), a measure of current impact that does not adjust for journal age (Total Cites), a measure of citation quality (Eigenfactor Score), and a longer term measure of citations quality (Article Influence Score).

That JCR measures reduce to a single factor is of interest because the Eigenfactor Score purports to measure something unique and important: the quality of citations to a journal rather than merely the number of citations. Despite two JCR measures that seek to measure quality, a single latent factor suffices to represent four JCR measures. And the factor analysis suggests that the Eigenfactor Score's uniqueness is only 0.056, suggesting that it adds little to the information content of the other JCR measures.[17] The limited goodness of fit for the fuller set of JCR measures is not a substantial concern with respect to this issue because one can directly observe the association between Eigenfactor Score and other JCR measures. Figure 1D shows the relation between JCR's Eigenfactor scores and its Impact Factor, which is strong and suggests why the Eigenfactor Score

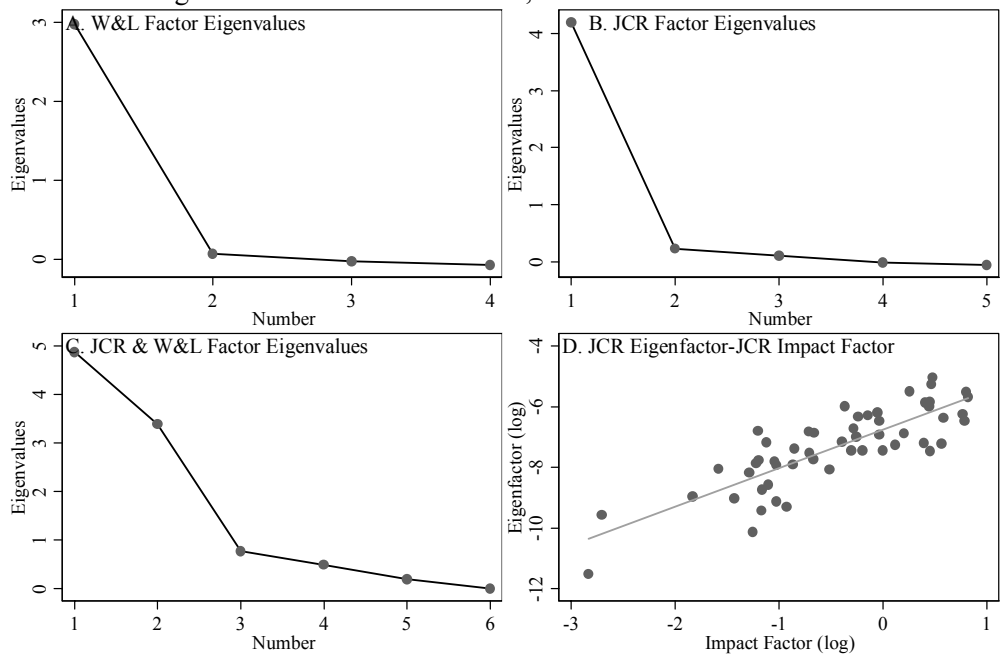
[16] The five factor model yields a CFI of 0.829 and a TLI of 0.657,

[17] The two JCR measures that require five years of data reduce the sample of journals to 37. If one excludes these two measures, 53 journals can be included and the Eigenfactor Score's uniqueness increases to 0.116. A single latent factor persists in fitting the data well.

contributes little additional information. A similar association has been shown with respect to medical journals for total citations and Eigenfactor Score (Davis 2008).[18]

Whatever the contribution of JCR's Eigenfactor Score, are the two measurement systems measuring the same latent factor? Figure 1C's scree plot is based on a factor analysis that includes both the W&L and JCR measures. This figure suggests that the two systems are measuring different latent variables, as the scree plot now shows two substantial factors for the combined measurements. The eigenvalues do not deteriorate below one until two or three factors are included. Whatever latent construct might represent journal quality, it appears that the two ranking systems, despite overlapping methodology, are not capturing the same construct. If one limits the JCR measures to those that do not require five years of data, thereby maximizing the sample of journals, a two latent factor model fits the data reasonably well, with a CFI of 0.958 and a TLI of 0.932.

Figure 1. Scree Plots of JCR and W&L Eigenvalues & Eigenfactor-Total Cites Relation, Refereed Law Journals 2010



B. Consistency of Rankings

Do the different systems for ranking journals based on impact provide consistent results? One expects to observe consistency, but a major difference between W&L and

[18] Davis's analysis of the Eigenfactor Score has been criticized by West et al. (2010). They show that, notwithstanding high correlations across measures, the Eigenfactor Score importantly influences ordinal rankings. This may not be due to the information content of the Eigenfactor Score, as is suggested by our factor analysis, but rather due to mapping a closely packed continuous measure onto an ordinal ranking scale that is indifferent to spacing within the continuous measure. See Part III.C infra.

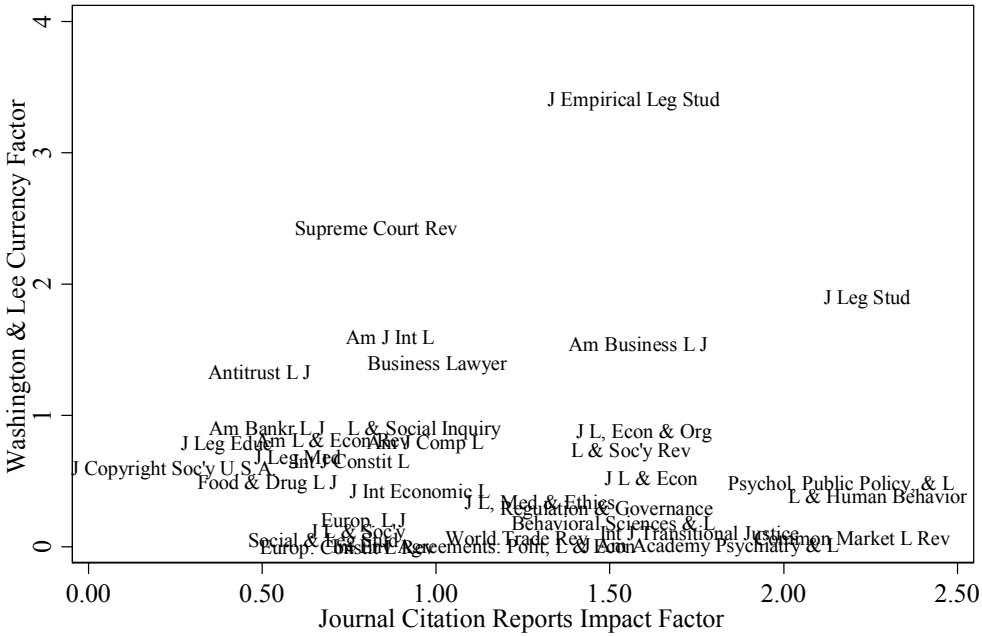
JCR is the groups of journals they count in computing impact measures. W&L specializes in law journals; JCR's journal pool spans many fields. Bao et al. (2010; p. 352) provide evidence that combining articles in all research fields to generate rankings can introduce bias into rankings. They construct a new journal ranking using econometrics articles as a group of specialty articles. They find that the intellectual influence of an article as measured by citations to it using the new ranking is much higher than if it were published in higher-ranked general interest economics journals such as *American Economic Review*. "[U]sing the existing economics journal rankings to evaluate econometricians' research productivity is an error-ridden system because it imposes a substantial downward bias against them." They observe that the prevailing practice by academic institutions of judging article quality by where articles are published, in contrast to their impact as measured by citations, is problematic.

JCR's inclusion of many disciplines but an incomplete sample of law journals may introduce an analogous problem with the reliability of its rankings. If citations to law-related articles can be reasonably expected to occur in law journals, then a database that emphasizes non-law journals may understate the impact of law journals in their core field of interest, law. It may also provide a noisy signal of quality based on the makeup of JCR's non-law sample of journals. JCR's consistency with W&L can provide some insight into this issue.

Given that one latent factor seems to be at work in W&L and JCR when their measures are analyzed separately, but two factors are at work for their combined measures, a natural question is how correlated the two factors are. Figure 2 shows the relation between the W&L and JCR measures for 34 refereed law journals appearing in both systems. It shows two measures that one might expect to be highly correlated, W&L's Currency Factor and JCR's Impact Factor.[19] These 34 journals include those with an Impact Factor or Currency Factor of at least 0.5. Figure 2 does not show a strong association between the two measures.

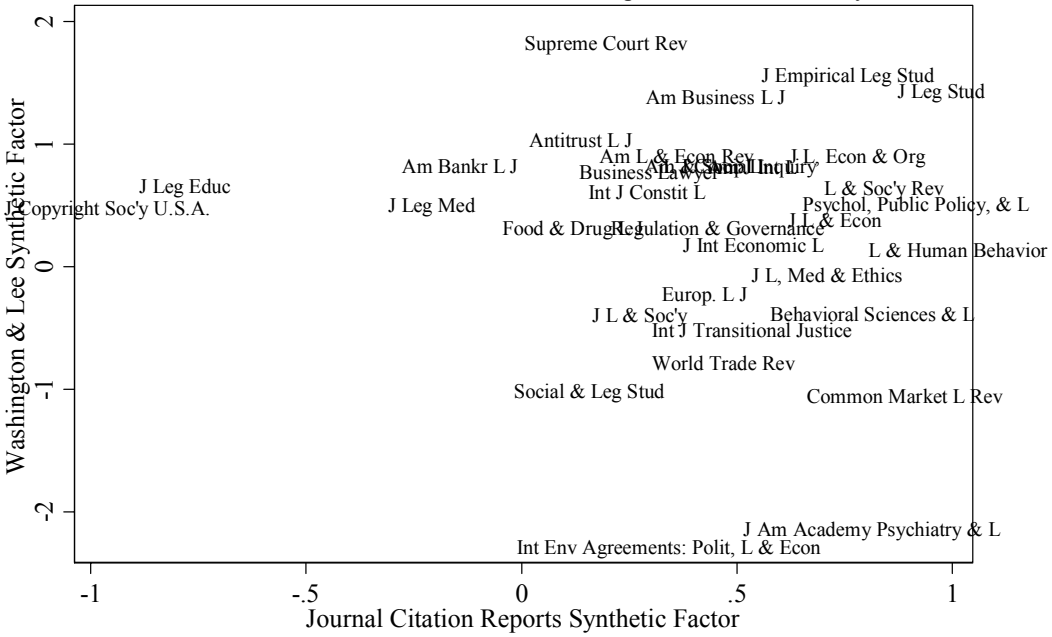
[19] Note that W&L's Currency Factor is not analogous to JCR's similarly named Immediacy Factor.

Figure 2. Correlation Between W&L & JCR Systems Ranking Refereed Law Journals
34 Refereed Law Journals 2010, with JCR Impact or W&L Currency>.5



The figure suggests a weak association between the ranking systems. The two measures have a correlation coefficient of -0.18 (using log transformations) that is significant at p=0.33. Since both ranking systems use multiple measures, perhaps a more composite measure of the two ranking systems would improve the correlation. We use the factor analysis results to construct a single measure for each ranking system and show that relation in Figure 3. The correlation coefficient remains low, 0.20, with p=0.15. It is as if the two systems, albeit both nominally based on citations, are ranking different universes of journals. We defer exploring the absence of correlation between W&L and JCR to the discussion section.

Figure 3. Correlation Between W&L & JCR Synthetic Factors
33 Refereed Law Journals 2010, with JCR Impact or W&L Currency>.5



C. Mapping from Continuous Measures to Ordinal Rank

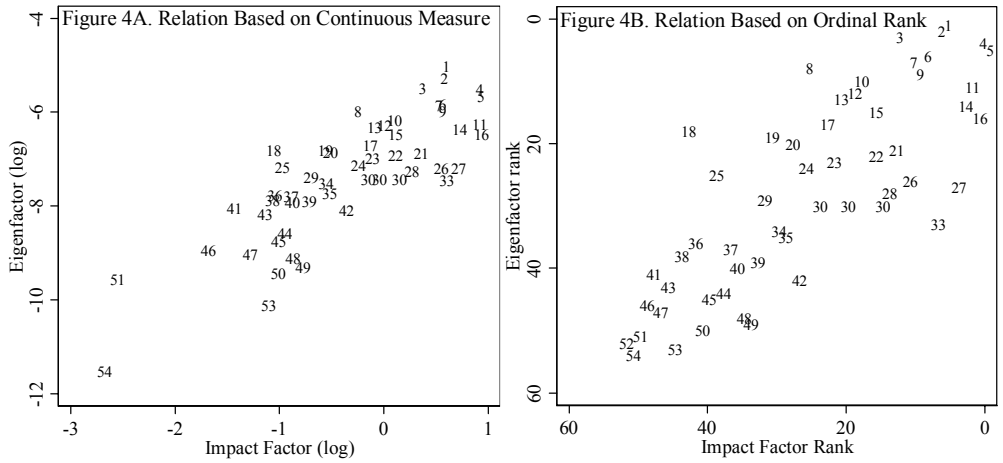
What is the effect of translating continuous measures of citations or impact into ordinal rankings? A concern is that the move from continuous measures to ordinal ranks based on the continuous measures can both exaggerate and understate differences in the underlying information content of the continuous measures. We demonstrate this by analyzing the relation between two continuous measures and how that relation changes when the continuous measures are transformed to ordinal ranks.

Figure 4 shows the relation between Eigenfactor Score and Impact Factor, both JCR measures, in two ways. Figure 4A shows the relation using the continuous measure of each. The two measures are highly correlated with a correlation coefficient of 0.82. Figure 4B shows the relation after translating the continuous measures into ordinal ranks. Each data point in both portions of the figure is labeled with a journal's rank based on the Eigenfactor Score. Moving from a continuous measure to ordinal rank can both compress and expand differences. For example, Figure 4A shows that the gap in Eigenfactor Score between the 51st and 54th ranked journals is relatively large. When that gap is transformed to an ordinal rank, as in Figure 4B, the difference is the same as for all other Eigenfactor Score differences.

But the expansion of difference is more prevalent than the compression. Many data points in Figure 4B are more separated than in Figure 4A. This is because ranking maps the continuous measure onto an ordinal measure and the distance between the ordinal measure data points is by definition fixed. The ordinal measure is impervious to distance between adjacent points in the continuous measure. Two nearly equally cited

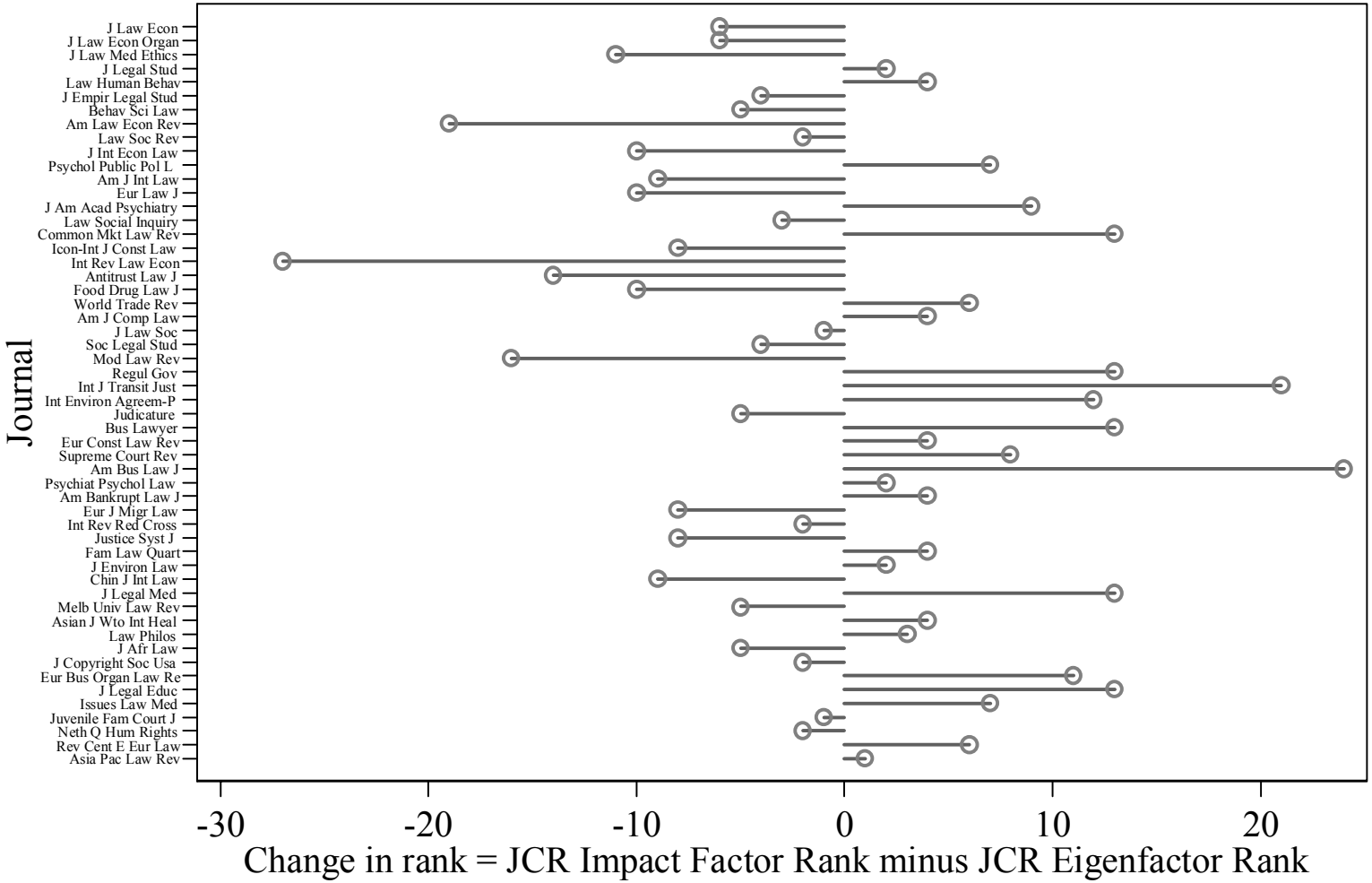
journals will have a distinctive rank. If many journals are in a narrow interval of the continuous measure, the mapping will substantially expand their apparent differences from one another.

Figure 4. Relation Eigenfactor Score and Impact Factor
Continuous vs. Ordinal Measures



The mapping from highly correlated continuous measures to ordinal measures can have great impact despite high correlation between the continuous measures. Figure 5 shows the change in the relation between Impact Factor and Eigenfactor Score attributable to moving from a relation based on their continuous measures to one based on their ordinal rank. Many journals show nontrivial change in rank. Substantial change occurs even though the continuous measures are highly correlated and represented by a single synthetic factor, as shown above. The *American Business Law Journal* moves over 20 places worse (higher difference on the x-axis corresponds to worse ranking) in rank and the *International Review of Lawanda Economics* moves over 25 places better in rank. The magnitude of the rank changes is extraordinary given that only about 50 journals are being ranked.

Figure 5. Effect on Rank of Moving from
Highly Correlated Continuous Measures to Ordinal Measures



IV. Cluster Analysis

ARC provided a type of clustering to try and organize journals in meaningful groups rather than rely on volatile ordinal ranks. It bears a real-world responsibility that pure ranking services lack. With such responsibility, the ARC understandably did not employ ordinal journal ranks that might distinguish between journals based on trivial variations. We suggest elsewhere that, in ranking the scholarly impact of law schools (in contrast to law journals), it is useful to identify clusters of schools rather than overemphasize ordinal rank (Eisenberg & Wells 1998).

Clustering can identify meaningful breakpoints in measures and reduce the impact of insubstantial differences that arise when ordinal rankings force separation onto a group of nearly identical ranked identities. Overemphasis on ordinal rank creates incentives to cheat to work one's way up the ordinal rank ladder (Pérez-Peña & Slotnik 2012). Clustering into meaningful groups reduces that incentive. Ordinal rankings give no information about where breakpoints in continuous measures might occur. It also takes more cheating, and therefore increases the risk of detection, to try and cheat one's way out of a cluster rather than to sneak up a few slots in an ordinal ranking that distinguishes based on largely indistinguishable differences. Identifying clusters, like ranking, requires having criteria by which to measure journals. But rather than highlighting ordinal rank, clustering attempts to organize them into meaningful groups by the measures used. For observers making decisions about journals, whether it be to buy them, read them, or respect them, clustering can provide more pertinent information than ordinal ranking.

We first asses the relation between ARC's informal clustering and the W&L and JCR measures. We then provide a more formal ranking of journals based on clustering.

A. Evaluating ARC's Clusters

ARC use of a journal rating system analogous to clustering in which journals are grouped into larger categories[20] raises the question whether such grouping provides more useful results compared to the inconsistent W&L-JCR results. Since two rankings of law journals are available, it is of interest how Australia's groupings of journals correspond with rankings.

Table 3 shows the relation between the ARC grade clusters and the means and medians for those clusters of: (1) the JCR Impact Factor, and (2) the W&L Currency Factor. For example, the table's first numerical column shows that law journals graded A* had a mean Impact Factor of 1.24 and law journals graded C has a mean Impact Factor of 0.66.

[20] ERA states that it considered research quality on the basis of ranked outlets, citation analyses, ERA peer review, and peer-reviewed Australian and international research income (ARC 2010, p.2).

Table 3. ARC Clusters Compared to Continuous Measures of Journal Performance

Cluster rank	Impact Factor mean	Currency Factor mean	Impact Factor median	Currency Factor Median	Number of journals
A*	1.24	0.71	1.26	0.63	10
A	1.02	0.72	0.89	0.34	18
B	0.54	0.40	0.46	0.29	10
C	0.66	0.19	0.31	0.04	11

The ARC's groupings partially align with the continuous measures but with some anomalies. The mean A* journal group mean Currency Factor is slightly lower than the mean A journal group Currency Factor and the mean B journal group Impact Factor is lower than the mean C journal group Impact Factor. This suggests that some journals were inappropriately grouped in A rather than A* and in C rather than B. The anomalies likely are attributable to a few journals because they do not persist in the medians, which are ordered as expected. So ARC achieves reasonable grouping but its ranking may be anomalous with respect to individual journals.

B. Cluster Analysis of Refereed Law Journals

The questionable effects of translating continuous measures onto ordinal ranks warrant exploring an effort similar to ARC's effort to group journals. The goal is to organize journals by logical groups rather than by ordinal ranks. Cluster analysis allows such organization. Cluster analysis classifies objects into groups that are internally cohesive yet externally isolated (Everitt et al. 2011; Gordon 1999).[21] In performing the cluster analysis, we use the two synthetic variables produced by the factor analysis above that summarize the multiple W&L and JCR measures.

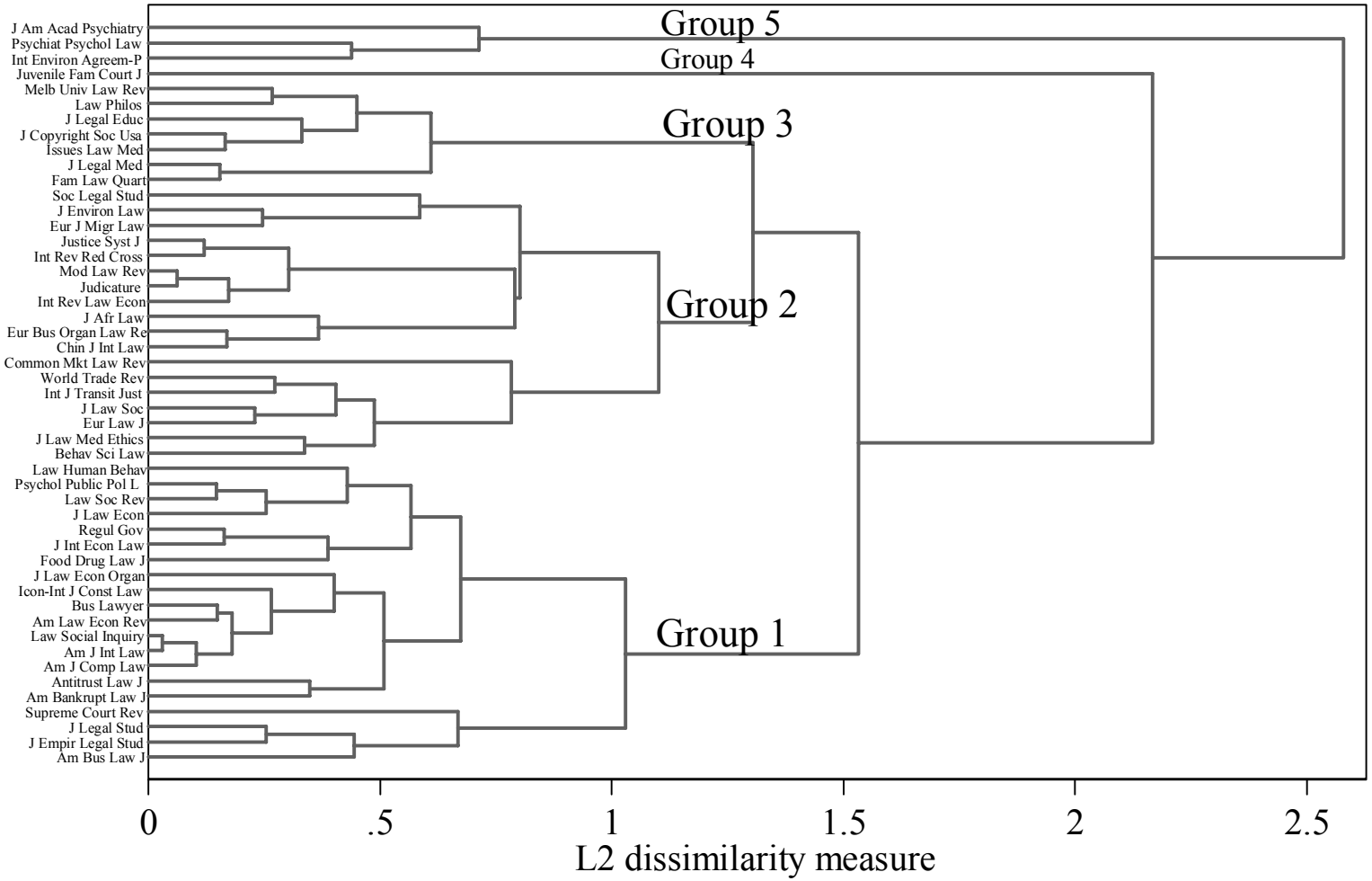
Figure 6's classification tree graphically depicts the intergroup separation. The groups are naturally defined by the pruning of the classification tree. The tree represents the entire clustering process graphically and shows which objects and groups are merged at the different stages of the algorithm. The leaves represent the objects, and the numerical scale on the x-axis is a measure of the dissimilarity within the clusters. The magnitude of dissimilarity within a cluster is unimportant relative to the membership of the cluster itself. The lengths of the horizontal lines provide information about the strength of the clustering. Long lines indicate more distinct separation between the groups. The order of appearance of journals in the diagram is not a ranking; it is based on graphical considerations. The diagram portrays differences and dissimilarity of clusters, not ordinal rankings. We have labeled five groups (Group 1, Group 2, etc.) in the diagram as an indication that the dissimilarity measure likely becomes too small below that level in the tree to meaningfully distinguish among some journal groups.

One can see, for example, that the first cluster at the bottom of the figure (*Supreme Court Review*, *Journal of Empirical Legal Studies* (*JELS*), *Journal of Legal*

[21] The hierarchical agglomeration algorithm we use starts with each object in a group of its own. At each iteration it merges two groups to form a new group; the merger chosen is the one that leads to the smallest increase in the within-group sum of squares dissimilarity measure. The number of iterations is equal to the number of objects minus one, and at the end, all of the objects are together in a single group.

Studies (*JLS*), and *American Business Law Journal* (*AILJ*), is not dramatically separate from other journals we include in the first group, and only separates from it at the fourth node down (from the right of the figure) in the classification tree where the dissimilarity measure is about one. Within the first group, *Supreme Court Review* is isolated from the other three journals due to its very high performance in W&L and its lower performance in JCR, as seen in Figure 3 above. An interesting group of excellent journals in a subgroup of Group 1 is the cluster of *Law and Human Behavior*, *Journal of Law and Economics*, *Psychology, Public Policy and Law*, and *Law and Society Review*. They are interdisciplinary journals with strong ties to psychology, economics, and sociology that obtain higher rankings in JCR than in W&L, also as seen in Figure 3. This is likely due to JCR's greater inclusion of other journals from their associated disciplines and W&L's greater emphasis on law journals, a difference we now proceed to explore in more detail.

Figure 6. Cluster Analysis of Refereed Law Journals
Based on Combined W&L and JCR Measures

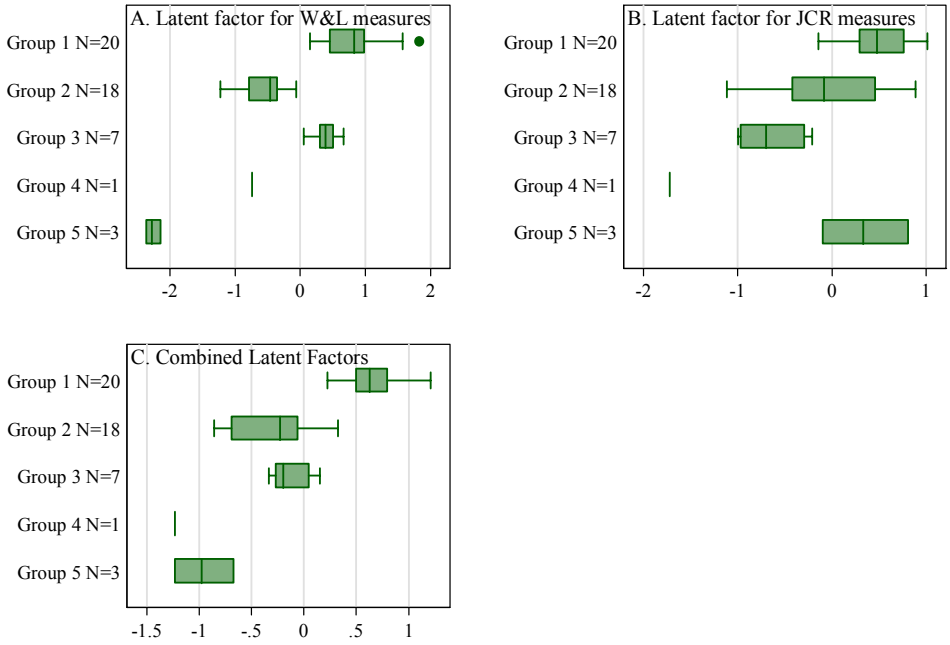


We first assess whether clustering provides meaningful groups by inspecting the distributions of the latent factor values for the cluster-generated groups. Figure 7A shows the distribution of the W&L latent factor for each of the five journal groups labeled in Figure 6's cluster analysis. Figure 7B shows the distribution of the JCR latent factor for the same groups. Figure 7C shows the distribution for the groups for the average of the combined W&L and JCR latent factors. The vertical line within each box is the median value for the group's latent factor. The values encompassed by the box represent 25th to 75th percentiles, the interquartile range (IQR). The "whiskers" extending from the boxes are the lower and upper adjacent values, as defined by Tukey (1977). We find that the Group 1 cluster is quite robust for four to seven clusters. The other groups are less stable. Five seems to be the smallest number of stable clusters.

The figure shows that, with one exception, the cluster analysis provides reasonable separation of the five groups for both measures. Figure 7A shows reasonable separation for the five groups using the W&L latent factor. The median value for each group's latent factor overlaps at most slightly with the IQR of any other group. Figure 7B shows a similar absence of overlap except for Group 5, whose median substantially overlaps with Group 2's IRQ. This is because, as shown in Figure 3, the *Journal of the American Academy of Psychiatry and Law*, ranks highly as measured by JCR and it is one of the three journals comprising Group 5. Due to the small number of group members, that journal substantially influences the Group 5 distribution, leading to the overlap. Figure 7C shows the distribution of the average value of the combined W&L and JCR latent factors. It shows excellent separation between the two largest Groups, 1 and 2, but Group 3 substantially overlaps with Group 2. As can be seen from Figures 7A and 7B, W&L and JCR assess Group 3 quite differently though each latent factor separately provides reasonable separation between Group 3 and the other groups. When the W&L and JCR latent factors are combined, the different assessments lead to a lack of separation of Group 3 from Group 2.

Regression models of the latent factors as dependent variables and dummy variables for the groups as the explanatory variables confirm the separation of groups suggested by Figure 7. We used both ordinary least squares models of mean values and quantile regression models of the latent factors' median values. Due to the small size of some groups, we used bias corrected bootstrapped standard errors. For the W&L mean values, the coefficients for all ten possible pairs of group dummy variable coefficients were statistically significantly different ($p<0.03$). For the W&L median values, nine coefficient pairs were highly significantly different ($p<0.001$) and one pair, the Group 2-Group 4 pair, differed significantly at $p=0.09$. For the JCR mean values, eight coefficient pairs were highly statistically significantly different ($p<0.001$) and the Group 1-Group 5 and Group 2-Group 5 pairs did not significantly differ. For the JCR median values, eight coefficient pairs were highly significantly different ($p<0.03$) and the Group 1-Group 5 and Group 2-Group 5 pairs did not differ significantly. Nonbootstrap models yielded similar results. In a W&L OLS latent factor model using robust standard errors, all ten coefficient pairs significantly differed ($p<0.04$). In a JCR OLS latent factor model using robust standard errors, eight coefficient pairs significantly differed ($p<0.002$) and the Group 1-Group 5 and Group 2-Group 5 pairs did not differ significantly.

Figure 7. Distributions of W&L & JCR Factors by Cluster-Generated Journal Groups



One can vary the decision to organize the journals into five groups. For example, Figure 6 provides visual information allowing reasonable subdivision of our Group 1 into two subgroups, consisting of four and 16 journals, and allowing reasonable subdivision of our Group 2 into two subgroups consisting of seven and 11 journals. In bootstrap models of the mean W&L latent factor as a function of seven group dummy variables, 19 of 21 coefficient pairs differed significantly and in models of the median latent factor 18 of 21 coefficient pairs differed significantly. Models of the JCR latent factor yielded significant differences for 14 of 21 coefficient pairs. The important point is that reasonable clusters can be identified; serious efforts to differentiate among journals could reasonably be expected to use clustering to help inform evaluation of journals.

V. Discussion

The uncorrelated W&L-JCR rankings could be explained by many factors but one seems to stand out. We show here that the different makeup of their journal databases is a likely source of the inconsistent rankings. We then illustrate this database effect by its specific effect on the rankings of three elite journals.

Consideration of the ARC ranking system highlights the need for considering context in designing and evaluating ranking systems. Ranking is done for a purpose and the more contextually-based the ranking the more likely it serves that purpose. ARC has the mandated purpose of evaluating Australian research performance and its system

reflects that goal. W&L seeks to evaluate law journals along several dimensions and focuses on that goal by emphasizing law-related journals. JCR's goal is much broader; its seeks to evaluate a vast body of scholarship that includes many disciplines. In the course of doing so, it may not perform well with respect to disciplines that it under represents or does not fully apprehend (Neuhaus et al. 2009).

A. Explaining the Differences in Rankings

Insight into the sources of ranking difference emerges by examining the JCR database in more detail. Table 2 above shows that economics has by far the most articles and journals in the database, though the multiple psychology categories if combined would outrank economics. Since the basic citation unit in JCR is an article, Table 2 shows that economics articles had 14,402 opportunities to be cited in JCR. Law articles had about one-fourth that amount yet law has many journals not included in JCR. A concern about using a more limited set of journals is that citations based on that set provide no credit for articles citing a work that do not appear in the journal list included in the study (Bao et al. 2010, p. 348 n.5). So the more law-oriented the content of a journal, the lower its baseline JCR expected citations compared to economics.

JCR's underrepresentation of law journals is substantial. The ARC journal list contains 1,060 journals with the word "law" or the word "legal" in the title and lists 1,167 journals as law journals (and five more as law and legal studies).[22] It contains 563 journals with the letters "econom" in the title. If ARC reasonably proxies the number of journals in a category, then JCR contains 12.5 percent of law journals and 54.2 percent of economics journals. As a check on the total number of economics journals, the EconLit database on EBSCO lists 657 journals.[23] As a check on the total number of law journals, recall that Westlaw includes 985 journals. So while ARC undoubtedly omits many journals, it is not dramatically far off as a proxy for a subject category's journals and has the attractive feature of presumed consistent methodology in locating and classifying journals. JCR's selection of journals for inclusion is proprietary. Whatever the precise measure, JCR vastly over represents economics journals compared to law journals. The more the law emphasis in a journal the greater the bias against law-focused journals in JCR's database.[24]

Although economics articles had the most opportunities to be cited in JCR, economics as a category performed poorly by other measures. The larger number of articles in a field provides more opportunities to be cited. But it also increases the denominator used to compute impact factors for a field as a whole. So the ex ante relation between the number of articles in a category and impact is not obvious.

Figure 8 shows the relation between a category's number of articles and its median impact factor. The relation is clearly a positive one. Articles in larger fields, as

[22] Even ARC's impressive database of about 22,000 journals is likely a substantial undercount. One estimate is that there were 71,000 scientific journal titles as of 1987 (Meadows 2000; p.92), a figure that does not include social science journals.

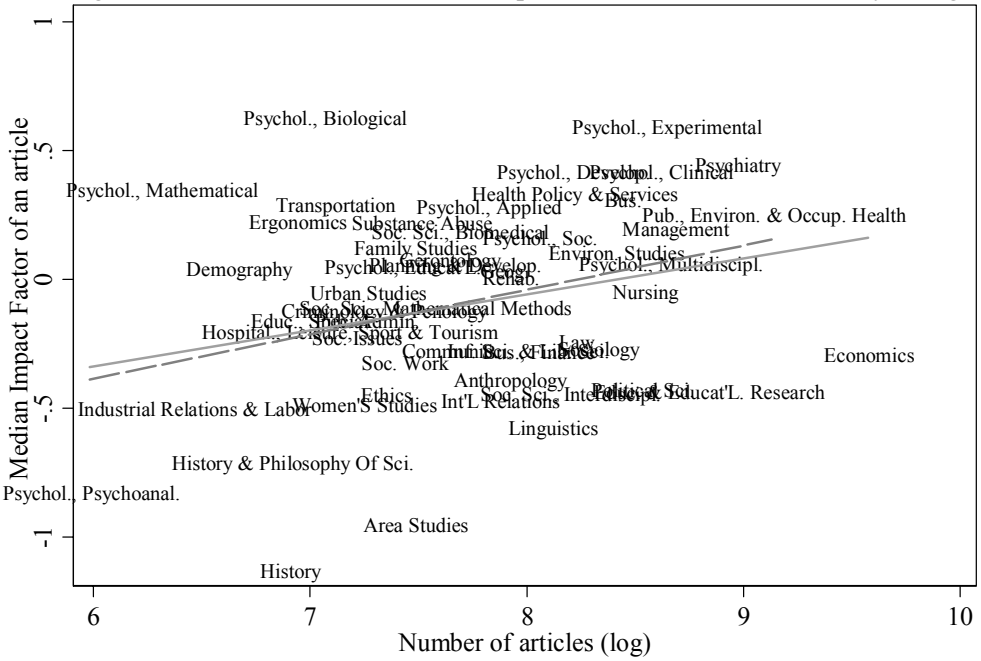
[23] One source refers to there being 300 economics journals in 2000 (Bergstrom and Bergstrom 2006).

[24] A similar concern about database content exists when using the SSRN system to rank law schools (Eisenberg 2006, pp. 289-290).

measured by total articles in JCR, tend to have more impact. But economics is an outlier. The solid line in the figure shows the predicted values from a regression of a category's median journal impact as the dependent variable and number of articles as the explanatory variable. Economics is distant from the line. The dashed line in the figure shows the predicted values if one excludes economics. That single category noticeably pulls down the relation.

What might lead to a category's outlier performance in the figure? The figure says nothing about the absolute quality of a field. It may say something about the citation norms in a field. Perhaps economists tend to cite articles less than others. More likely, however, is that the figure informs about JCR's selection of the journals it includes. The high representation of economics journals suggests that JCR is dipping deeper into that field's pool of journals than it is dipping in other fields. This is consistent with the number of economics journals and the number of law journals in other sources, discussed above. This greater inclusion may lead to relatively lower quality journals being included and those journals may tend to be cited less frequently than would the more filtered set of journals JCR includes in most other fields.

Figure 8. Relation Between Median Impact and Number of Articles, by Category



How does the overrepresentation of economics journals or the selection of journals for inclusion in JCR and Westlaw influence law journal rankings? Table 4 shows the refereed law journals that are included in both W&L and JCR's rankings. The journals are ordered by W&L's Currency Factor for 2010, as shown in the first numerical

column. The table also shows each journal's Eigenfactor Score and Impact Factor and the journal's rank by those measures. One need not read far down the list to observe startling effects. By the W&L's Currency Factor measure, *Supreme Court Review* (*SCR*) is the second-ranked refereed law journal, just after the *Journal of Empirical Legal Studies*. By JCR's Eigenfactor measure, *SCR* ranked 30th among refereed law journals and by JCR's Impact Factor measure it ranked 22nd. If one ordered the list by JCR measures, similar effects emerge. The *Journal of Law and Economics* (*JLE*) ranks first of all refereed law journals based on JCR's Eigenfactor Score. It ranks 18th based on W&L's Currency Factor.

Table 4. Refereed Law Journal Ranks by W&L and JCR Measures, 2010

Journal	Currency Factor (W&L)	Eigenfactor Score (JCR)	Impact Factor (JCR)	Currency Factor rank	Eigenfactor rank	Impact factor rank
J Empirical Leg Stud	3.42	.00289	1.565	1	6	10
Supreme Court Rev	2.44	.00059	.824	2	30	22
J Leg Stud	1.91	.00402	2.239	3	4	2
Am J Int L	1.61	.00184	.865	4	12	21
Am Business L J	1.55	.00058	1.576	5	33	9
Business Lawyer	1.41	.00059	1	6	30	17
Antitrust L J	1.34	.00109	.49	7	19	33
L & Social Inquiry	.91	.00155	.965	8	15	18
Am Bankr L J	.91	.00044	.513	8	35	31
J L, Econ & Org	.89	.00513	1.595	10	2	8
Am L & Econ Rev	.82	.00253	.696	11	8	27
Am J Comp L	.81	.00098	.965	12	22	18
J Leg Educ	.8	.00009	.396	13	49	36
L & Soc'y Rev	.74	.00251	1.558	14	9	11
J Leg Med	.69	.00031	.6	15	42	29
Int J Constit L	.66	.00121	.754	16	17	25
J Copyright Soc'y U.S.A.	.61	.00012	.239	17	47	49
J L & Econ	.53	.00649	1.617	18	1	7
Food & Drug L J	.5	.00104	.514	19	20	30
Psychol, Public Policy, & L	.49	.00193	2.16	20	11	4
Family L Quarterly	.46	.00037	.42	21	39	35
J Int Economic L	.43	.00207	.95	22	10	20
L & Human Behavior	.39	.00343	2.268	23	5	1
J L, Med & Ethics	.35	.00413	1.294	24	3	14
Issues in L & Med	.31	.00008	.312	25	50	43
Regulation & Governance	.3	.00075	1.488	26	26	13
L & Philosophy	.29	.00016	.314	27	45	42
Melbourne U L Rev	.24	.00028	.276	28	43	48
Judicature	.24	.00062	.429	28	29	34
Europ. L J	.21	.00177	.789	30	13	23
Int Rev L & Econ	.2	.0011	.3	31	18	45
Int Rev Red Cross	.19	.00041	.354	32	37	39
Behavioral Sciences & L	.19	.00287	1.505	32	7	12
Modern L Rev	.18	.00077	.326	34	25	41
J L & Soc'y	.13	.00093	.772	35	23	24
Int J Transitional Justice	.11	.00074	1.756	36	27	6
Justice System J	.1	.00038	.295	37	38	46
J African L	.09	.00013	.16	38	46	51
Chinese J Int L	.08	.00032	.206	39	41	50
Common Market L Rev	.08	.00154	2.194	39	16	3
World Trade Rev	.08	.00103	1.231	39	21	15
Juvenile & Family Court J	.07	.00007	.067	42	51	52
Europ. Business Org L Rev	.07	.00011	.36	42	48	37
Social & Leg Stud	.06	.00079	.673	44	24	28

Netherlands Quarterly Human Rights	.05	.00006	0	45	52	54
Europ. J Migration & L	.04	.00042	.303	46	36	44
J Env L	.04	.00036	.359	46	40	38
J Am Academy Psychiatry & L	.02	.0017	1.785	48	14	5
Int Env Agreements: Polit, L & Econ	.01	.0007	1.128	49	28	16
Psychiatry, Psychol & L	.01	.00054	.494	49	34	32
Asian J WTO & Int Health L & Policy	0	.00019	.333	51	44	40
Asia Pacific L Rev	0	1.00e-05	.059	51	54	53
Europ. Constit L Rev	0	.00059	.74	51	30	26
Rev Central & East Europ. L	0	.00004	.286	51	53	47

Further evidence about the source of W&L-JCR inconsistency comes from considering the student journals that our analysis thus far excludes. Student law journals are rarely interdisciplinary because the student editors tend to lack expertise outside of law and because the supply of pure law articles is sufficient to populate the many existing journals. Indeed, the reason for many refereed journals' existence is the lack of student expertise in other fields, such as economics, psychology, and statistics. So rankings of student law journals are likely to be less influenced by the selection of journals by JCR with respect to its nonlaw databases.

The rankings of the student-dominated non-refereed journals are much more consistent across the two ranking systems. The correlation coefficient between W&L's Impact Factor and JCR's Currency Factor for the 90 law journals (now adding 56 student journals) with impact factors greater than 0.5 is 0.27, significant at p=0.01. Remove the 34 refereed journals (shown above to have low correlation) in that sample and the correlation coefficient for the remaining 56 student journals increases to 0.43, significant at p=0.001.

B. Further Probing the Difference in Rankings: Two Case Studies

A case study of why *SCR* and *JLE* perform so differently in the two ranking systems, as shown in Figures 3 and 6, and by Table 4, helps illuminate the limitations of JCR for law journals. The *SCR-JLE* comparison is not randomly chosen. Rather it is chosen based on some appealing features. Both journals are highly respected faculty-edited journals controlled by the same elite institution, the University of Chicago, and founded within a few years of each other. Chicago's law school and economics department are unquestionably elite.

The journals' more detailed pedigree also suggests that they are both excellent journals. *SCR* is edited by University of Chicago law professors, is one of the first faculty-edited law journals (founded in 1960), and its articles over the years have been written by a Who's Who of constitutional law professors. Constitutional law, its central topic, is of course a central topic in U.S. law schools, especially elite ones, and some schools likely owe much of their contemporary prestige in large part to the visibility of their constitutional law scholars (Eisenberg and Wells 1998, pp. 407-409). Constitutional scholars tend to be cited more than other legal scholars (Eisenberg and Wells 1998, pp. 408, 410). *JLE* also has unquestioned pedigree and historical importance. *JLE*'s creation

was at the core of activity that attracted Ronald Coase and Judge Richard Posner to the University of Chicago.[25]

So some level of subjective quality control exists; we are comparing two elite law-related journals. Yet the two citation systems produce startlingly different and, in the case of JCR's ranking of *SCR*, ludicrous, results. The objective measure of *SCR*'s impact by W&L is consistent with its reputation and pedigree. JCR's measure is not. How can it perform so much more poorly in JCR than in W&L?

We probe further by examining the journals that JCR reports cite to *SCR* and *JLE*. Table 5 shows, for JCR year 2010, the journals citing to *SCR* and *JLE*. These citing journals are the ones counted in JCR's measures. For JCR year 2010, the citing journals must have been published in 2010 and must have cited articles in *SCR* and *JLE* published in 2008 or 2009. We combine those two years.

The table establishes that *JLE*'s prominence in JCR is due to its being cited in many economics, finance, and accounting journals, the vast majority of which are not in the Westlaw journals database used by W&L. We estimate that only 18 of the 70 citations to *JLE* in Table 5 are in journals included in Westlaw. JCR reports that its Impact Factor ranking of *JLE* in 2010 is based on 60 articles[26] and that its ranking of *SCR* in 2010 is based on 17 articles.[27] Since JCR divides the number of citations by the number of articles, the 14 citations in Table 5 to *SCR* means that *SCR* would far outperform *JLE if JCR were limited to journals in Westlaw*. So the dominance of economics journals in JCR's data contributes to the relative performance of *JLE* compared to *SCR*.

JCR's inclusion criteria are part of the explanation but so are Westlaw's exclusion criteria since it does not include most of the non-law journals in Table 5 that cite to *JLE* articles. Similarly, Westlaw's inclusion of many more law journals than JCR must contribute to *SCR*'s better performance in the W&L system. As noted above, Westlaw includes approximately 1,000 law journals and JCR includes only 133 law journals, a surprisingly low number since another citation system, Scopus, includes nearly 400 law journals. *JLE* should of course receive credit for the many economics journals in which it is cited. But it is highly questionable to include *JLE* and *SCR* in a category in which they are purportedly ranked against one another on a methodologically rigorous basis yet in a system that vastly over represents economics journals and vastly under represents law journals.

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[25] Judge Posner, the most visible law and economics scholar, was the first recipient of the American Law and Economics Association Coase medal. See http://aler.oxfordjournals.org/cgi/content/full/ahq009v1 (accessed 8/29/2010). He was preceded at Chicago by Nobel prize-winning economist Ronald Coase, who was preceded by Aaron Director. Director played a central role in developing law and economics at Chicago and his influence increased with *JLE*'s creation in 1958 (Teles 2008, p. 95), just two years before *SCR* first published. Coase doubted that he would have gone to Chicago absent *JLE* (Teles 2008, p. 96). Coase and Director, in turn, were instrumental in attracting Posner to Chicago from Stanford (Teles 2008, pp. 97-98).

[26] http://admin-apps.webofknowledge.com.proxy.library.cornell.edu/JCR/JCR?RQ=RECORD&rank=71&journal=J+LAW+ECON.

[27] http://admin-apps.webofknowledge.com.proxy.library.cornell.edu/JCR/JCR?RQ=RECORD&rank=115&journal=SUPREME+COURT+REV.

SCR's poorer performance in JCR is thus not likely attributable to actual lower impact. It rests instead in the databases used to compute measures. How else can *Regulation and Governance* or the *Journal of the American Academy of Psychiatry and Law* outperform *SCR*, as they do in JCR? These are fine journals but that they have more legal scholarly impact than *Supreme Court Review* is not credible. *Regulation and Governance* likely benefits from the many economics journals in JCR and *Journal of the American Academy of Psychiatry and Law* likely benefits from JCR's strong social science content. A similar effect may favor psychology journals in JCR. As Table 2 shows, psychology is highly represented in the JCR data. A similar effect helps explain the prominence of *Supreme Court Review* in W&L. W&L uses Westlaw, which is a law-centered database and U.S law-centered to a large degree. Journals with more purely law-related content ought to fare better in it than in the JCR database.

Table 5. Journals that Cite Articles in the *Journal of Law & Economics* and in *Supreme Court Review*, JCR 2010

Citing journal	# of cites to *J. Law & Econ.*	# of cites to *Supreme Ct. Rev.*	Citing journal	# of cites to *J. Law & Econ.s*	# of cites to *Supreme Ct. Rev.*
Account Rev	1		J Econ Manage Strat	1	
Admin Law Rev	1		J Econ Perspect	1	
Am Bus Law J	2		J Empir Financ	2	
Am Econ J-Econ Poli	1		J Empir Legal Stud	2	
Am Econ Rev	1		J Environ Econ Mana	2	
Am Law Econ Rev	2		J Finance	2	
Be J Econ Anal Poli	2		J Financ Econ	2	
Brit J Ind Relat	1		J Health Econ	3	
Columbia L Rev		1	J Public Econ	2	
Cornell L Rev		1	J Regul Econ	1	
Duke Law J		2	Land Econ	2	
Econ Lett	1		Michigan L Rev		2
Energ Econ	1		New York U L Rev		4
Environ Manage	1		Northwest U Law Rev	2	3
Explor Econ Hist	3		Public Choice	1	
Financ Manage	2		Regul Gov	1	
Inf Econ Policy	1		Res Policy	1	
Innov-Manag Policy	1		Rev Econ Stat	1	
Int J Ind Organ	1		Rev Ind Organ	1	
J Account Econ	4		Stanford Law Rev	2	
J Account Public Po	2		U Chicago Law Rev	2	
J Account Res	1		U Illinois Law Rev	2	
J Bank Financ	1		Va Law Rev	2	
J Consum Aff	1		Wisc Law Rev	1	
J Corp Financ	2		Yale Law J		1
J Econ Lit	1		Total	70	14

This concern is generalizable to many law journals JCR ranks. Returning to Table 4, we see that law and economics journals fare disproportionately well in JCR compared to W&L. The *Journal of Legal Studies,* the *Journal of Law, Economics & Organization*, the *American Law and Economics Review* (*ALER*), the *Journal of International Economic Law*, and the *International Review of Law & Economics* all rank

in JCR's top 20 as measured by Eigenfactor Score. All of them fare noticeably worse in W&L. A similar effect applies to psychology journals, which are also much better represented in JCR than in Westlaw. *Law and Human Behavior* is at the top of JCR rankings but not W&L rankings. JCR has many more psychology journals than law journals. And Westlaw has many more law journals than psychology journals.

JLE and *SCR* focus on such different areas of law that direct comparison of them may not fully resolve an issue. As a second case study, we compare the rankings for *ALER* and *JLE*, two excellent journals in the same joint discipline, law and economics. No journal is more historically important than *JLE* in promoting social science in legal academia (Eisenberg 2011). *ALER*, as of this article's writing, was edited by two prominent law school professors, Steven Shavell at Harvard and John Donohue at Stanford, and is the official journal of the American Law and Economics Association (ALEA), which is administered out of Yale Law School. *JLE* is a joint publication of Chicago's business and law schools and not directly associated with ALEA. *JLE* and *ALER* are thus two journals that both emphasize law economics and that are connected to elite institutions. They differ, however, in their connections to legal academia.

Table 6, based in part on a table in Eisenberg (2011), compares *ALER* and *JLE* performance in recent years in the W&L database. Table 6 shows the W&L rankings of the two journals for the four most recent available years. Both are sufficiently highly ranked in W&L to be in the top 10 percent of refereed journals. Despite *JLE*'s excellence and prominence in the history of law and economics, however, *JLE* has been passed by *ALER* in quantitatively measurable impact among legal academics. *ALER*'s stronger centering in law schools likely has contributed to its growing relative ascendancy in a law journal dominated database relative to *JLE*. Centering in law schools likely leads to less technical articles on average and to topics likely of greater interest to legal academics and attorneys. *JLE*, however, continues to outperform *ALER* in *JCR*, as shown in Table 4, although both journals do substantially better there than in W&L.

Table 6. *Journal of Law & Economics* and *American Law & Economics Review* Rank Among Refereed Law Journals, W&L 2010

	2011 (567)		2010 (563)		2009		2008	
	JLE	*ALER*	*JLE*	*ALER*	*JLE*	*ALER*	*JLE*	*ALER*
Currency Factor	53	25	40	23	46	16	21	16
Impact Factor	51	25	40	19	40	19	28	16
Combined	45	32	35	26	34	24	25	22

C. Context in the ARC Rankings

So context matters. Revisiting the ARC rankings to look at particular journals confirms this. We construct a combined W&L-JCR score based on a factor analysis of the Currency Factor (W&L) and the Impact Factor (JCR). Journals in the Australia ARC database are then ranked by the combined score. Table 7 shows the combined score, the ARC rank, and the two components of the combined score. The journals are ordered within the table based on their Currency Factor. Journals without a combined score due to missing data are at the bottom of the table.

Table 7. Combined score, ARC Rank, Impact Factor, Currency Factor

Journal	Rank ARC	Combined W&L-JCR score	Impact Factor	Currency Factor
J Empirical Legal Stud	A	0.94	1.57	3.42
Supreme Court Rev	A	0.60	0.82	2.44
J Legal Stud	A*	0.95	2.24	1.91
Am J Int Law	A*	0.52	0.87	1.61
Am Bus Law J	A	0.75	1.58	1.55
Bus Lawyer	C	0.54	1.00	1.41
Antitrust Law J	A	0.24	0.49	1.34
Am Bankruptcy Law J	B	0.17	0.51	.91
Law Social Inquiry	A	0.43	0.96	.91
J Law Econ Organ	A*	0.63	1.60	.89
Am Law Econ Rev	B	0.27	0.70	.82
Am J Comp Law	A*	0.40	0.96	.81
J Legal Educ	B	0.03	0.40	.8
Law Soc Rev	A*	0.57	1.56	.74
Icon-Int J Const Law	A	0.25	0.75	.66
J Law Econ	A*	0.51	1.62	.53
Psychol Public Pol L	A	0.61	2.16	.49
Fam Law Quart	B	-0.08	0.42	.46
J Int Econ Law	A	0.24	0.95	.43
Law Human Behav	A	0.57	2.27	.39
J Law Med Ethics	B	0.32	1.29	.35
Issues Law Med	C	-0.29	0.31	.31
Regul Gov	A	0.34	1.49	.3
Law Philos	A	-0.31	0.31	.29
Melb Univ Law Rev	A*	-0.40	0.28	.24
Judicature	B	-0.22	0.43	.24
Eur Law J	B	-0.01	0.79	.21
Int Rev Law Econ	A	-0.41	0.30	.2
Behav Sci Law	A	0.23	1.50	.19
Mod Law Rev	A*	-0.40	0.33	.18
J Law Soc	A*	-0.13	0.77	.13
Int J Transit Just	A	0.17	1.76	.11
Justice Syst J	C	-0.58	0.29	.1
J Afr Law	B	-0.86	0.16	.09
Chin J Int Law	B	-0.78	0.21	.08
World Trade Rev	C	-0.06	1.23	.08
Common Mkt Law Rev	A*	0.18	2.19	.08
Eur Bus Organ Law Re	A	-0.59	0.36	.07
Juvenile Fam Court J	C	-1.27	0.07	.07
Soc Legal Stud	A	-0.37	0.67	.06
Neth Q Hum Rights	A	.	0.00	.05
J Environ Law	A	-0.72	0.36	.04
Eur J Migr Law	C	-0.79	0.30	.04
J Am Acad Psychiatry	C	-0.23	1.78	.02
Int Environ Agreem-P	C	-0.59	1.13	.01
Psychiat Psychol Law	B	-0.92	0.49	.01
Rev Cent E Eur Law	C	.	0.29	0
Asia Pac Law Rev	C	.	0.06	0
Eur Const Law Rev	C	.	0.74	0

The ARC designation of some journals initially seems unrelated to their quantitative measures in W&L and JCR. But those journals may be very important and elite in the Australian context. For example, the highest (A*) rankings of the *Melbourne University Law Review* and the *Modern Law Review* initially seem anomalous. They rank highly by neither the W&L nor the JCR nor the combined measures. Yet their A* ranking in the ARC system may be appropriate. Neither the W&L nor JCR databases of journals contain enough journals that might regularly cite to these journals to allow them to perform well in systems dominated by U.S. and, to a lesser extent, European journals. For ARC's purposes in evaluating Australian research, however, it would be unacceptable to treat leading Australian and Commonwealth journals as poor performers. The subject matter of articles in them relate more to Australia than do other journals. These journals are of obvious interest and importance to ARC's constituency.

Beyond the obvious country-specific contextual considerations of the ARC, some other rankings seem questionable. It is difficult to treat *ALER* as a B ranked journal when *JLS* and *JLE* are ranked as A* journals and the *International Review of Law and Economics* (*IRLE*) is ranked as an A journal. In the U.S. law school context, *ALER* has passed *JLE* in recent years and no ranking system puts *IRLE* higher than *ALER*. It seems that fewer anomalies in the ARC rankings might result if something like the groupings resulting from our cluster analysis above were used.

D. Context More Generally

JCR's inclusion of so many disciplines precludes it from accounting for important within- and across-discipline context. Legal scholarship has distinctive features inapplicable to most disciplines. It is characterized by the presence of many student-edited law journals. Within academically-oriented law journals, it is questionable whether student journals should be included in the same category as refereed journals. Refereed journals arise because of perceived weaknesses in student journals, primarily the lack of expertise of student editors in specialized or technical fields. Refereed journals thus tend to publish different classes of articles than student journals and the articles tend to be much shorter. These characteristics have unknown effects on citation patterns. At a minimum, one should do what W&L does, which allows the user to isolate refereed journals if they so desire.

Legal scholarship can also have a wider than usual array of target audiences. The target audience can vary from the practitioners of law, to judges, to academia, to policymakers. W&L's system reflects this diversity in part by tracking citations to legal scholarship by cases as well as by journals. A journal with a strong presence in case law receives no credit for that in JCR. This helps explain the poorer performance of the *American Bankruptcy Law Journal* (*ABLJ*) in JCR than in W&L, as shown, for example, in Figure 3. Yet *ABLJ* is the most-cited law journal in cases. A ranking system purporting to assess law journals should allow users to understand this. *The Business Lawyer*, the journal of the Business Law Section of the American Bar Association, is also frequently cited by courts yet fares poorly in *JCR*. A journal's rank perhaps ought not suffer because it succeeds in reaching non-academic audiences in a discipline in which those audiences are essential. This seems particularly misguided with respect to law or other journals of professions.

VI. Conclusion

We use data from W&L, JCR, and ARC to evaluate the treatment of refereed law journals. The W&L and JCR systems employ multiple measures that can reasonably be represented by a single factor for each system. Despite this unidimensionality, our analysis suggests that they do not rank the same latent factor. This raises a question about the sources of their lack of correlation. We identify a source as JCR's underrepresentation of law journals compared to other subject areas.

Although all ranking methods have limitations, JCR's treatment of law journals is troublesome. JCR originated as part of a citation-tracking system intended to enable scholars to track the history and promulgation of scientific ideas. But it is now also used to rank journals and thus scholars in many fields.[28] The original conception was largely immune to lack of institutional knowledge about the ranked disciplines and had little downside because the goal was to trace the development of ideas. Gaps in development due to journal database limitations were simply gaps and were unlikely to be affirmatively harmful or misleading or even to persist.

JCR's newer journal ranking function is more vulnerable to the makeup of its journal database. Biases in JCR's database that distort rankings can have obvious harmful effects on scholars who publish in inappropriately ranked journals and on the journals themselves. The concern is not purely abstract and our results echo Neuhaus et al.'s (2009) findings with respect to multidisciplinary journals. As interdisciplinary scholarship grows, JCR's varying coverage of subject categories becomes of greater concern. The original Garfield concept, still of value in many contexts through JCR's continuing efforts, has become a process that cannot account for the nuances of the many disciplines it ranks. Most fundamentally, it can produce unreasonable ranking results.

As a separate matter, both JCR and W&L should consider adding cluster analysis to their published information. Both systems have done the hard work of gathering citation information about each journal. It should take little additional effort to publish useful information about journal clusters. Other ranking endeavors, such as the U.S. News & World Report rankings of many educational institutions, should also place greater emphasis on clustering to avoid the questionable inflation of small differences that ordinal rankings can produce.

[28] The shift in intended use has been noted in, for example Davis (2009).

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