



Article

E-Journal Metrics for Collection Management: Exploring Disciplinary Usage Differences in Scopus and Web of Science

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Abstract

Objective – The purpose was to determine whether a relationship exists between journal downloads and either faculty authoring venue or citations to these faculty, or whether a relationship exists between journal rankings and local authoring venues or citations. A related purpose was to determine if any such relationship varied between or within disciplines. A final purpose was to determine if specific tools for ranking journals or indexing authorship and citation were demonstrably better than alternatives.

Methods – Multiple years of journal usage, ranking, and citation data for twelve disciplines were combined in Excel, and the strength of relationships were determined using rank correlation coefficients.

Results – The results illustrated marked disciplinary variation as to the degree that faculty decisions to download a journal article can be used as a proxy to predict which journals they will publish in or which journals will cite faculty's work. While journal access requests show moderate to strong relationships with the journals in which faculty publish, as well as journals whose articles cite local faculty, the data suggest that Scopus may be the better resource to find such information for these journals in the health sciences and Web of Science may be the better resource for all other disciplines analyzed. The same can be said for the ability of external ranking mechanisms to predict faculty publishing behaviours. Eigenfactor is more predictive for both authoring and citing-by-others across most of the representative disciplines in the social sciences as well as the physical and natural sciences. With the health sciences, no clear pattern emerges.

Conclusion – Collecting and correlating authorship and citation data allows patterns of use to emerge, resulting in a more accurate picture of use activity than the commonly used cost-per-use method. To find the best information on authoring activity by local faculty for subscribed journals, use Scopus. To find the best information on citing activity by faculty peers for subscribed titles use Thomson Reuters' customized Local Journal Use Reports (LJUR), or limit a Web of Science search to local institution. The Eigenfactor and SNIP journal quality metrics results can better inform selection decisions, and are publicly available. Given the trend toward more centralized collection development, it is still critical to obtain liaison input no matter what datasets are used for decision making. This evidence of value can be used to defend any local library "tax" that academic departments pay as well as promote services to help faculty demonstrate their research impact.

Introduction

For years, academic librarians faced with static or reduced collection budgets have searched for e-journal usage metrics that would best inform difficult retention decisions. Download statistics do not tell the whole story; an article download does not indicate whether it is later read or cited. The cost-per-use figures derived from them rarely resonate with faculty when it is "their"

journal on the chopping block. Further, each usage metric has unique limitations. Login data from OpenURL link resolvers lose track of the user when the user reaches the publisher site, and thus may not capture all of the eventual downloads. COUNTER-compliant download data is not available from all publishers, especially small societies. Journal rankings such as impact factor are based on a short time interval that does not necessarily reflect the

citation or publishing patterns of all disciplines. Such rankings are also not available for many social sciences or arts and humanities journals, and can be manipulated to some extent. Ideally, librarians would like to connect available usage measures to research outcomes in a valid and meaningful way.

The authors sought to compare the available metrics and determine the value users assign to a collection through their decisions about the journal articles they download and the journals they publish in, as well as the value inherent in their peers' decisions to cite faculty journal articles.

Literature Review

The Centre for Information Behaviour and the Evaluation of Research (CIBER) at University College London studied publishing patterns of researchers in six disciplines at eight UK universities. They found a strong positive correlation between the use of e-journals and successful research performance. Institutions varied in use more than disciplines but they discovered that the journals accounting for the top five percent of use could vary by as much as 20% between the six disciplines (Jubb, Rowlands, & Nicholas, 2010). Regardless of disciplinary and institutional variance, electronic journal usage had positive outcomes.

An ongoing issue in collection analysis is knowing which metrics to use to evaluate electronic journal usage and value. The California Digital Library's Weighted Value Algorithm (CDL-WVA) put into practice the ideals underlying the results of their white paper (University of California Libraries' Collection Development Committee, 2007). Anderson (2011) demonstrated a tool in which the selector can determine which publishers offer the highest value for money to the academic department, and also how that publisher's demonstrated value changes on the value scale. This kind of dashboard gives selectors a tool customized to their subject areas.

Customized, easily used tools such as this are increasingly important to ensure broad adoption of metrics evaluations.

The University of Memphis adapted California Digital Library's journal value metrics and compared them with faculty decisions on which journals to cancel. Knowlton, Sales, and Merriman (2014) found that faculty selection of journals differed significantly from bibliometric valuation, and that "higher CDL-WVA scores are highly associated with faculty decisions to retain a title, but lower CDL-WVA scores are not highly associated with decisions to cancel" (p. 35). To explain the difference, they suggested that special faculty research needs, institutional pressure to retain titles for accreditation, and a focus on teaching over research by faculty all lead to certain journals selected for retention while not frequently being downloaded or cited. These findings echo the authors' findings here in that the metrics valued by faculty are not always those used by librarians.

Are metrics different when assessing consortial package deals? Do limitations surface when assessing the value of "big deals"? The Canadian Research Knowledge Network (CRKN) also adapted the CDL approach. CRKN assessed whether the value of a consortial package of journals stayed the same despite variation in institutional characteristics. They found the top quartile was largely composed of the same journals, regardless of the individual characteristics of the institutions. The overlap of journal titles was around 90%. Similarly, the bottom quartile for each school had an overlap of titles around 90%. Consortia could move from a big deal to a smaller core package and still meet the needs of most members (Jurczyk & Jacobs, 2014). Appavoo (2013) also found that when comparing traditional cost-per-use against the CDL approach for the top 100 journals, "The journal value metric method returned a wider variety of disciplines in the results, while the use-based metric returned primarily journals in the STM disciplines" (slide 11, notes). Schools using cost-per-use to reduce costs of journal

packages need to be careful not to disadvantage users in the social sciences and humanities.

The Carolina Consortium also analyzed its big deals, and found that the utility of cost-per-use metrics is mitigated by the fluid nature of the industry (e.g., title changes, publisher mergers, etc.). This should be just one of a suite of decision tools (Bucknall, Bernhardt, & Johnson, 2014). This reinforces our findings that various metric analyses must be employed for meaningful results.

Several studies document differences among subject disciplines as to how closely download and citation behaviours are related. The University of Mississippi examined publications by the business school faculty to see what they cited. The conclusion was that local citation patterns vary widely, even among departments in one discipline, thus necessitating analysis at the local level (Dewland, 2011). Variations exist among departments, let alone disciplines.

In the health sciences, a comparison of vendor, link resolver, and local citation statistics revealed a high positive correlation between the three data sets (De Groote, Bleic & Martin, 2013). In another study, physicians from Norway examined the 50 most viewed articles from five open access oncology journals, and concluded that more downloads do not always lead to more citations (Neider, Dalhaug & Aandahl, 2013).

Fields in which faculty publish in multidisciplinary journals, such as public administration and public policy, provide additional challenges. In these cases, how are “good journals” defined? The authors discuss measuring and ranking article output in the discipline and the effect on analysis (Van de Walle & Van Delft, 2015). The complexity of arrangements, e.g., single purchase electronic journals, big deal packages, and interdisciplinary journals and fields, necessitate a more thorough approach and point to a

variety of metric analysis methods being more useful than a simple cost-per-use model.

Another complicating factor for this endeavour is open access. The University of Illinois at Chicago noted that a focus on article downloads is indeed complicated by open access. Subject repositories such as ArXiv, PubMed Central, RePEc, and SSRN can draw users without leaving a COUNTER trail (Bleic, Wiberley, Fiscella, Bahnmaier-Blaszczak & Lowery, 2013), skewing analysis results. In the future, other metrics may become more significant. A 2012 study sampled 24,331 articles published by the Public Library of Science (PLoS) and tracked their appearance in tools such as Web of Science citation counts, Mendeley saves, and HTML page views. As an indicator of how open access is not only changing how researchers read and cite but how they share articles, the authors found that 20% of the articles were both read and cited, while 21% were read, saved, and shared (Priem, Piwowar, & Hemminger, 2012).

The Pareto Principle is often mentioned in journal usage studies. This is also known as the 80/20 rule, and states that, for many events, roughly 80% of the effects come from 20% of the causes (Nisonger, 2008). An example is a citation analysis of atmospheric science faculty publications at Texas A&M University. It found 80% of cited journal articles were from just 8% of the journal titles (Kimball, Stephens, Hubbard & Pickett, 2013). Ten years earlier, one of the authors of this study and a colleague found a larger percentage of titles, roughly 30%, comprising 80% of downloads when analyzing use of all subjects in five large journal publishers (Stemper & Jaguszewski, 2004). A small percentage of the total journals were most heavily cited and downloaded in both instances. Taken together, one could conclude that online journals lead users to read more but not necessarily to cite more journals. The variety of metrics cited here reflect our findings that collecting and correlating authorship and citation data allows patterns of use to emerge, resulting in a more accurate picture of activity.

The development of more complex analysis will inform collection development in meaningful ways in the future of academic libraries.

Aims

The authors had collected traditional link resolver and publisher statistics for years, and to facilitate a study on e-journal metrics they created a comprehensive “uber file”, one which combined all selected subjects and publishers and allowed sorting by title or subject fund number. They purchased and included a customized dataset from Thomson Reuters’ Web of Science, the Local Journal Use Reports (LJUR), that showed which journals were cited by University of Minnesota (U-MN) authors, the

journals in which they published, and which journal venues with U-MN authors were cited by others. The authors felt they could no longer rely solely on download statistics, which while convenient and comprehensive, are unfavourable to disciplines that do not depend heavily on journal articles and are much more favourable to disciplines that do, as shown in Table 1. Plus, as noted, there was a wish to focus more on user outcomes, which made citation data attractive.

The jumping-off point was an unpublished study by the Wendt Engineering Library at the University of Wisconsin-Madison, a peer institution, which surveyed faculty to gauge the importance of various criteria in journal

Table 1
Top Twenty Journals Accessed by University of Minnesota Students, Staff and Faculty 20092012

Journal Title	Number of Downloads
Science	44,114
Nature	39,407
Jama	33,126
The New England Journal of Medicine	32,467
The Lancet	22,676
Harvard Business Review	21,275
Journal of The American Chemical Society	16,838
Proceedings of The National Academy of Sciences of the United States of America	14,666
Pediatrics	12,485
Scientific American	12,213
Health Affairs	10,897
Annals of Internal Medicine	10,757
Neurology	10,406
American Journal of Public Health	8,937
Journal of Personality And Social Psychology	8,515
Child Development	8,011
Critical Care Medicine	7,622
Ecology	7,534
Medicine And Science In Sports And Exercise	7,263
Journal of Clinical Oncology	7,153

cancellations. The journals that engineering faculty cited the most in their articles were ranked as most important, followed by journals that they published in, then in decreasing order, usage statistics, impact factors, citation by peers, ending with the metric of cost-per-use, the one most used by librarians (Helman, 2008). Due to perceived survey fatigue by U-MN faculty, a different approach was developed using University of Wisconsin-Madison's findings to guide the investigation. The first phase of the authors' investigation addressed U-MN faculty's citation patterns (Chew, Stemper, Lilyard, & Schoenborn, 2013). This second phase addresses their choice of publication venue and external citations to their articles in these journals.

Methods

The design of the study was heavily based on the California Digital Library's (CDL) Weighted Value Algorithm framework project, which assesses user value in three overall categories:

1. Utility: usage statistics and citations
2. Quality: represented by impact factor and Source Normalized Impact Per Paper (SNIP)
3. Cost effectiveness: cost-per-use and the cost-per-SNIP

The weighted value algorithm combines these aspects of use when assessing the journal's value in the institutional context while also factoring in disciplinary differences (Wilson & Li, 2012). Adapting this approach, each journal's value would be assessed by a) local author decisions to publish there, b) external citations to institutional authors, and c) cost effectiveness (via downloads and citations). In addition to CDL's categories of user-defined value-based metrics, data was added on U-MN users' departmental affiliations to assess any disciplinary differences. These "affinity strings," attached to a user's resource login, are generated by U-MN University's Office of Information Technology with information from the

University's human resources management system. All U-MN students, staff, and faculty are assigned affinity strings that are based on his or her area of work or study.

The study framed the following questions to try to ascertain what faculty actually value with regards to the journal collection:

1. Utility or reading value: Does locally-gathered OpenURL click data combined with affinity string data provide a "good enough" departmental view of user activities, such that COUNTER-compliant publisher download data is expendable?
2. Quality or citing value: Is Eigenfactor or SNIP an adequate substitute for impact factor as a measure of faculty citation patterns?
3. Cost effectiveness or cost value: How should these reading and citing values be combined with cost data to create a "cost-per-activity" metric that meaningfully informs collection management decisions?
4. Lastly, to what extent could unique local usage data be leveraged: Do departments vary greatly in their journal downloading, and do any of the measures predict which journals U-MN faculty publish in and which of these articles will get cited by their peers?

The Data

The data for the project was collected from nearly 700 e-journals that were licensed for system-wide use, owned by, or accessible to the U-MN Libraries users. In order to discover whether or not there may be any disciplinary differences in local faculty download or authorship behaviours, or patterns of external citing by their peers, 12 subjects were chosen from four major disciplinary areas as defined by U-MN Libraries' organizational structure. In all

Table 2
Subjects Included in Study

Major Discipline	Department/School	Number of Subscribed Titles
Arts & Humanities	History	48
Social Sciences	Accounting	14
	Finance	22
	Management	29
	Marketing	15
	Public Affairs	40
Physical Sciences	Chemistry	160
Life Sciences	Forestry	51
Health Sciences	Hematology	34
	Pediatrics	64
	Pharmacy	99
	Nursing	115

but three cases, the authors were either departmental liaisons or the previous subject coordinator. Table 2 lists the subjects and the number of subscribed titles that were funded for that subject. Subject relevant titles that were excluded from this project included those that were part of consortia purchases or centrally-funded full-text databases such as EBSCO's Academic Search Premier, where resource costs could not be parsed out to individual titles.

To gain an understanding into a journal's usage patterns, researchers used four years of usage data spanning from 2009 through 2012, along with 2-4 years of citation data, and journal impact metrics from 2012. These were and analyzed by individual subject, and then combined in a single spreadsheet for comparative analysis. The data variables collected, sorted into CDL-WVA categories, are shown in Table 3.

The median figures were calculated for each metric in order to reduce the influence of outlier results, except for impact factor where 5-year scores that were available for the project titles

were used. Data could not be collected for all of the variables for every title, as not every publisher is COUNTER-compliant, nor are there impact factor, Eigenfactor, LJUR, or SNIP data available for every title. For the sciences (with the exception of nursing) at least three-quarters of the titles had journal ranking metrics available; Eigenfactor scores were available for 84-94% of the titles, SNIP scores for 92-100% and impact factor for 78-94% of the titles, where the 5-year impact factor was the least available. The difference was only significant in nursing, where the gap was counted across 13 titles. Conversely, the social sciences had a much lower comparative journal ranking metrics. Eigenfactor scores were available for only 36-64% of the titles and impact factor for 31-55% of the titles. On the other hand, the social sciences did well with SNIP, ranging from 70-95% of the titles available (Table 4).

A Pearson's correlation analysis was chosen to examine if there was any relationship, positive or negative, between selected journal metrics, whether or not there were any disciplinary differences between the various metrics, and the

Table 3
E-Journal Metrics Collected

CDL-WVA Category	Metric	Years
Utility: Usage	Article view requests, as reported by the library's OpenLink Resolver SFX	2009-2012
Utility: Usage	Article Downloads, as reported by publisher COUNTER-compliant reports	2009-2012
Utility: Citation	University of Minnesota a) authorship and b) citations to these locally authored articles, from Thomson Reuter's Local Journal Use Reports (LJUR)	2009-2010
Utility: Citation	University of Minnesota a) authorship and b) citations to these locally authored articles, Elsevier's SciVal/Scopus (2009-2012)	2009-2012
Quality	<ul style="list-style-type: none"> • Journal Citation Reports (JCR) Five Year Impact Factor (IF) • Eigenfactor Scores • Elsevier's Source Normalized Impact per Paper (SNIP) 	2012
Cost Effectiveness	<ul style="list-style-type: none"> • Via Cost Per Download • Via Cost Per Ranking (EBSCO subscription price divided by SFX /COUNTER and Impact Factor/Eigenfactor/SNIP as appropriate for each subject) 	2013

Note. Due to the significant yearly cost of a purchase of the LJUR dataset only the 2009-2010 dataset was available. Elsevier's SciVal is an institutional level research tool that provides a snapshot of institutional research performance at the institutional and departmental level. Information provided by SciVal is drawn from the Scopus dataset.

potential significance or strength of those relationships. The goal was to find which correlations, and thus which metrics, provided the best "goodness of fit," i.e., which best explained past patron use of e-journals as well as best predicted their future use.

Data analysis was done using Excel's CORREL function. In conjunction with the correlation coefficient, "r", the coefficient of determination, which is the square of r and is reported as r-squared, was calculated. All of the correlations' F-test p-values were less than 2.2e-16 (2 x 10-16), therefore statistically significant. R-squared is

often expressed as a percentage when discussing the proportion variance explained by the correlation. Though there can be a range of interpretation depending on the discipline, it is generally accepted that within the social sciences, or when looking at correlations based on human behaviour, an $r < 0.3$ is considered a low or weak correlation, 0.3-0.5 modest or moderate, 0.5-1.0 strong or high correlations, with anything over 0.90 a very high correlation (Table 5), and R^2 values anywhere between 30-50% are considered meaningful (Meyer, et. al., 2001). A wide variety of correlations were run to provide comparison data points.

Table 4

Percentage of Subscribed Journal Titles That Have Impact Factors, Eigenfactors or SNIP

Department / School	No. of subscribed titles	% 5-year impact factor	% Eigenfactor	% SNIP
Hematology	34	94%	94%	100%
Pharmacy	99	91%	92%	95%
Pediatrics	64	80%	86%	92%
Nursing	115	44%	56%	86%
Chemistry	160	91%	91%	94%
Forestry	51	78%	84%	96%
History	48	31%	38%	83%
Marketing	15	40%	53%	80%
Management	29	55%	55%	93%
Finance	22	45%	64%	95%
Accounting	14	36%	36%	93%
Public Affairs	40	55%	60%	70%

Table 5

Range of Pearson Values for Study

Correlation	Negative	Positive
None	-0.09 to 0.00	0.0 to 0.09
Low or Weak	-0.3 to -0.1	0.1 to 0.3
Moderate or Modest	-0.5 to -0.3	0.3 to 0.5
Strong	-1.0 to -0.5	0.5 to 1.0

Table 6

Comparison of Indexing of Locally-Held Titles in Web of Science and Scopus

Department / School	No. of subscribed titles	No. of titles indexed in Scopus	% of titles indexed in Scopus	No. of titles indexed in Web of Science	% of titles indexed in Web of Science
Nursing	115	111	97%	54	47%
Pharmacy	99	98	99%	92	93%
Pediatrics	64	64	100%	56	86%
Hematology	34	34	100%	31	91%
Chemistry	160	156	98%	154	96%
Forestry	51	49	96%	49	96%
History	48	44	92%	41	85%
Finance	22	19	86%	13	59%
Accounting	14	13	93%	4	29%
Public Affairs	40	31	78%	22	55%
Marketing	15	13	87%	5	33%
Management	29	28	97%	17	59%

Table 7

Comparison of Citing of U of M Authors in Locally-Held Titles in Web of Science and Scopus

Department / School	No. of subscribed titles	Scopus: U of M authors cited	% of titles cited in Scopus	Web of Science: U of M authors cited	% of titles cited in Web of Science
Nursing	115	26	23%	66	57%
Pharmacy	99	71	72%	94	95%
Pediatrics	64	45	69%	55	85%
Hematology	34	21	62%	33	97%
Chemistry	160	87	54%	144	90%
Forestry	51	22	43%	43	84%
History	48	4	8%	23	48%
Finance	22	7	32%	15	68%
Accounting	14	3	21%	4	29%
Public Affairs	40	15	38%	23	58%
Marketing	15	6	40%	7	47%
Management	29	8	28%	21	72%

In order to determine “utility”, SFX link resolver and COUNTER data were correlated with both the LJUR for local authorship and local citing patterns and SciVal/Scopus data for local authorship and local citing patterns. For “quality”, LJUR authoring/citing and SciVal/Scopus authoring/citing data were correlated with impact factors, Eigenfactors, and SNIP. The R² values that resulted from the correlations were then inserted into bar charts for subject comparisons.

Indexing Selections by Publishers.

The two primary indexes used as a basis for the “utility” and “quality” analysis, Web of Science and Scopus, were also analyzed. The question was whether Web of Science or Scopus fared better in tracking the publishing activity of U-MN faculty. The surprising discovery was that neither Scopus nor Web of Science could function as a single data source (Harzing, 2010). In answering the question of which database was the better metric data source, it turned out that Scopus provided better authoring data, because it indexed more of U-MN subscribed titles than Web of Science, ranging from a low of

78% for public affairs titles to a high of 100% of pediatrics titles, compared to Web of Science, with a low of 47% for nursing titles to a high of 95% for chemistry titles (Table 6). On the other hand, Web of Science provided better citing data, because it contains citation data dating back to the 1900s and includes citation data from journals that they do not regularly index, whereas the majority of Scopus citing data only goes back to 1996 and only includes titles that they index. Web of Science ranged from a low of 29% for accounting titles to a high of 97% for hematology titles, compared to Scopus, with a very low 8% for history titles and a modest highest 72% for pharmacy titles (Table 7).

Results

Authorship Decisions by U of Minnesota Authors, or, “Where do I publish my article?”

The first question to answer was whether the journals in which U-MN faculty choose to publish are also the journals that are most downloaded by U-MN users. Overall, the social sciences and humanities had several moderate to strong positive correlations between

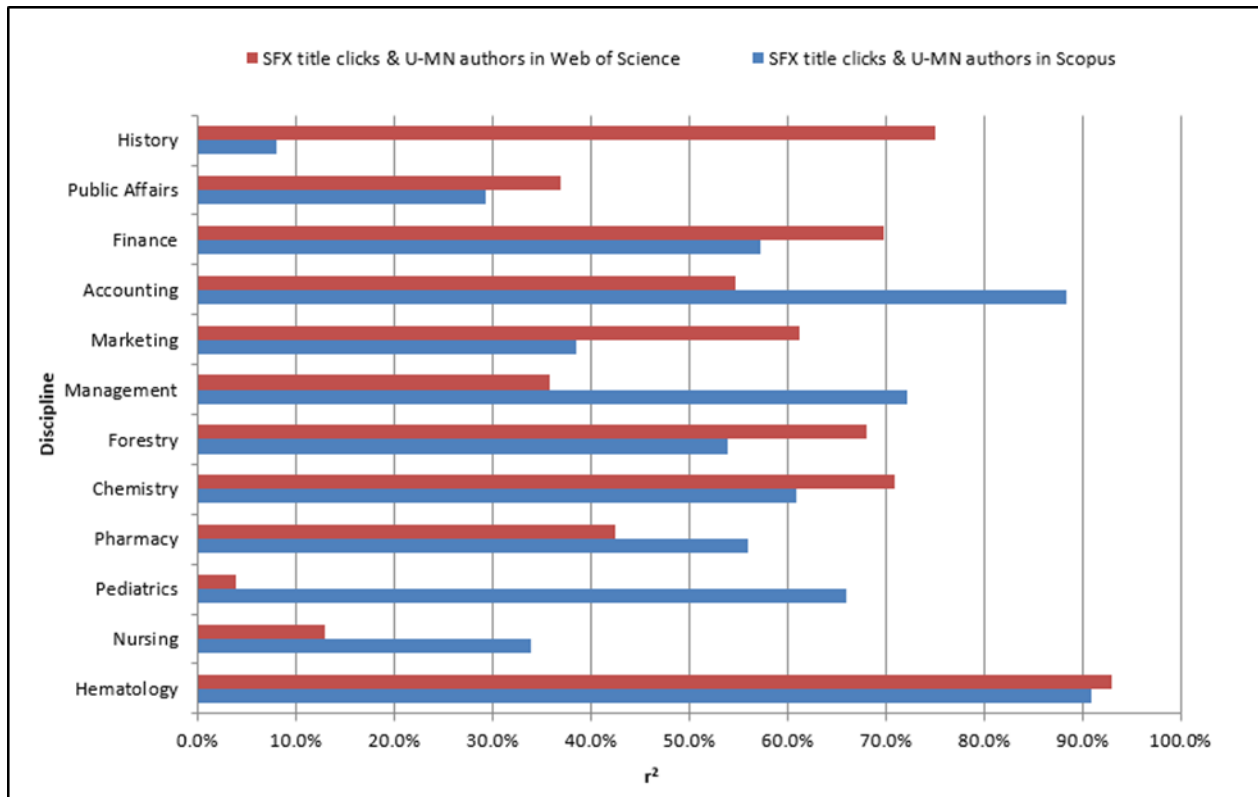


Figure 1
Downloads and authorship choice based on SFX title clicks correlated with U-MN authors titles in Web of Science or Scopus.

downloads and where faculty chose to publish. Journals for Finance and Accounting were found to have a strong relationship in both Web of Science and Scopus. History shows the greatest variation between downloads and choice of authoring venue, with Web of Science at about 75%, compared to Scopus at 8% predictive (see Figure 1). Pediatrics shows the greatest variation in the Health Sciences between downloads and choice of authoring venue, with Scopus at about 65% and Web of Science at about 5% predictive.

The next question to answer was whether the journals in which U-MN faculty chose to publish are also the journals that external rating services consider being of the highest quality. Using Scopus authoring, Figure 2 illustrates initial results. In the Social Sciences and Humanities

subjects, the data show that no one impact measure stood out as most predictive overall. Accounting and Management both show strong correlations for all three measures, while, interestingly, a weak negative relationship was found for Marketing.

In the Physical and Health Sciences, multiple weak or negative relationships are evident. The negative correlations, while low, may suggest there is close to no correlation between those journals that faculty in Nursing, Hematology and Pharmacy chose to publish in and their value rankings. On the other hand, in Pediatrics all of the value metrics correlations are either moderate or strong, suggesting that impact factors or similar value measures may play a role in faculty publishing decisions.

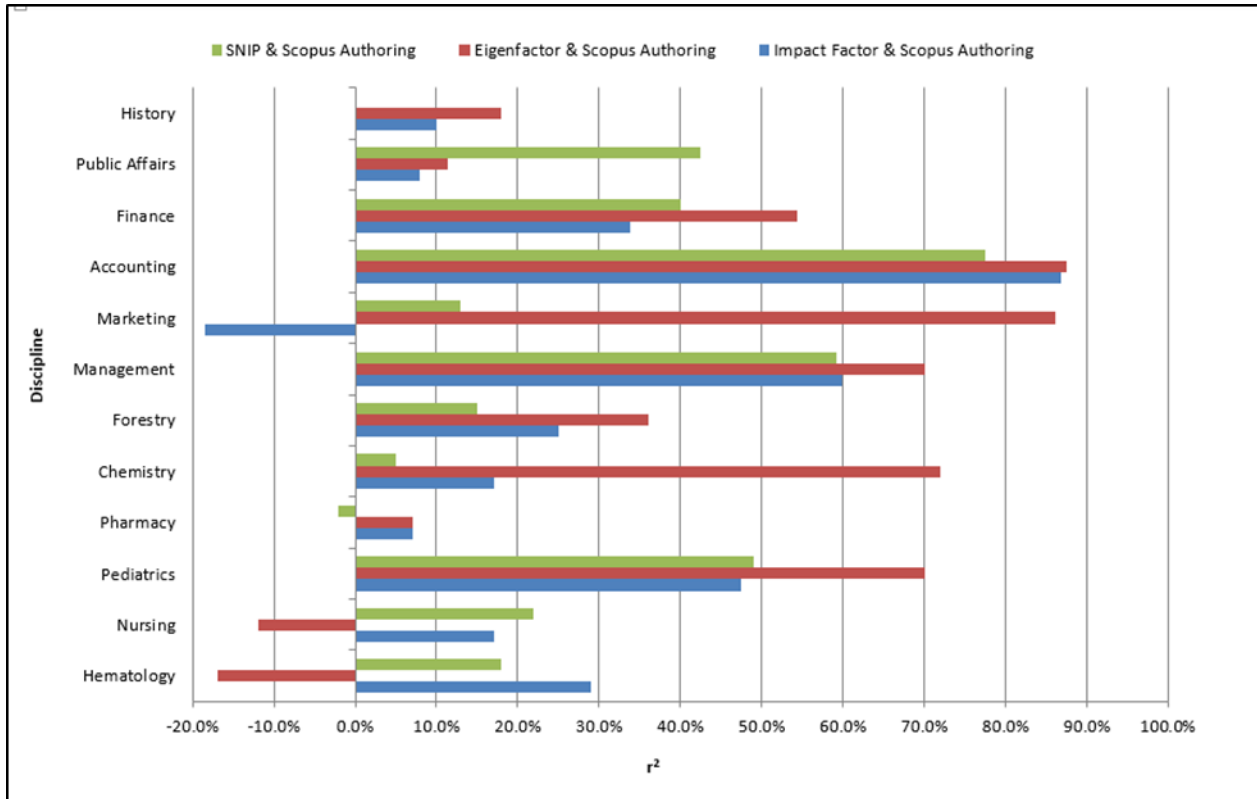


Figure 2
Journal ranking and authorship choice using SNIP, Eigenfactor, and impact factor score correlated with U-MN authored titles in Scopus.

Comparatively, in the Web of Science authoring results shown in Figure 3, the Social Sciences and Humanities impact factor rankings overall were weak to moderate predictors, except for History where impact factor is a strong predictor. Eigenfactor on the other hand, was the overall stronger predictor, in the subjects of History, Finance, Accounting, and very strong in Marketing.

Finally, SNIP proved to be a better predictor only for Finance.

The Web of Science authoring results in the Physical and Health Sciences subjects illustrate a very different, far less stable pattern of correlations. Here Eigenfactor is most predictive only for Chemistry, and all other Web of Science authoring relationships are moderate at best, but mostly weak or negative.

In summary, the data comparing a discipline’s impact measure and its faculty journal authoring choices suggests that impact factor rankings are weak predictors about half the time, but the strongest predictors are in the Humanities and Social Sciences where Eigenfactor may be “good enough”.

Citing Decisions by Peers: Is this U-MN article worth citing?

How are U-MN faculty researchers viewed by their peers? To put it another way, were the journals that cited U-MN faculty’s research also the most downloaded journals by U-MN users? Among the disciplines analyzed, the external citing patterns for many disciplines, including Public Affairs, Accounting, Finance, Management, Hematology, Pediatrics, Forestry, Chemistry all showed strong relationships with

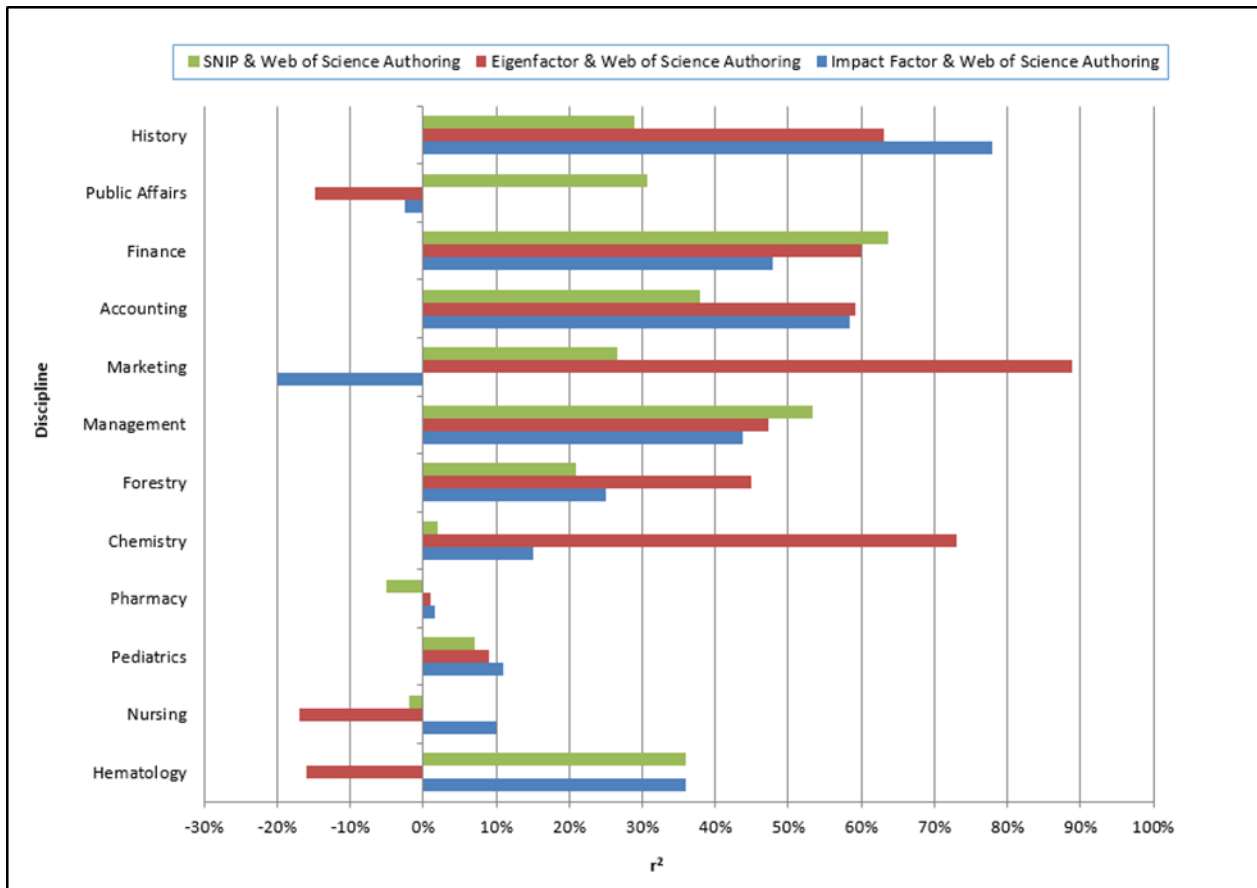


Figure 3
Journal ranking and authorship choice using SNIP, Eigenfactor, and impact factor score correlated with U-MN authored titles in Web of Science.

either Scopus or Web of Science, and as noted in Figure 4, a few instances of disciplinary relationship strength in both tools. Conversely, History, Marketing, and Pharmacy had weak-to-moderate citing correlations in both Web of Science and Scopus. Finally, nursing results show the greatest variability, where Web of Science is strong and Scopus is a negative relationship. The results show Web of Science citing correlated stronger in the majority of disciplines except for Hematology, Pediatrics, and Accounting, fields where Scopus is a stronger predictor.

Also analyzed were citing decisions by external authors and impact measures in Web of Science. Were the journals that cited U-MN faculty's

research also the journals that external rating services consider to be of the highest quality? As Figure 5 illustrates, the Social Sciences and Humanities results present multiple strong correlations in Management, Accounting, and Finance. Public Affairs and Marketing each have one strongly predictive value measure, SNIP and Eigenfactor respectively. Overall, the value metrics that are most predictive are SNIP and Eigenfactor.

In the Natural, Physical, and Health Sciences, common patterns are far less pronounced, though for Forestry, Chemistry, and Pediatrics, Eigenfactor is strongest. Beyond these subjects, Web of Science citing shows moderate, weak or

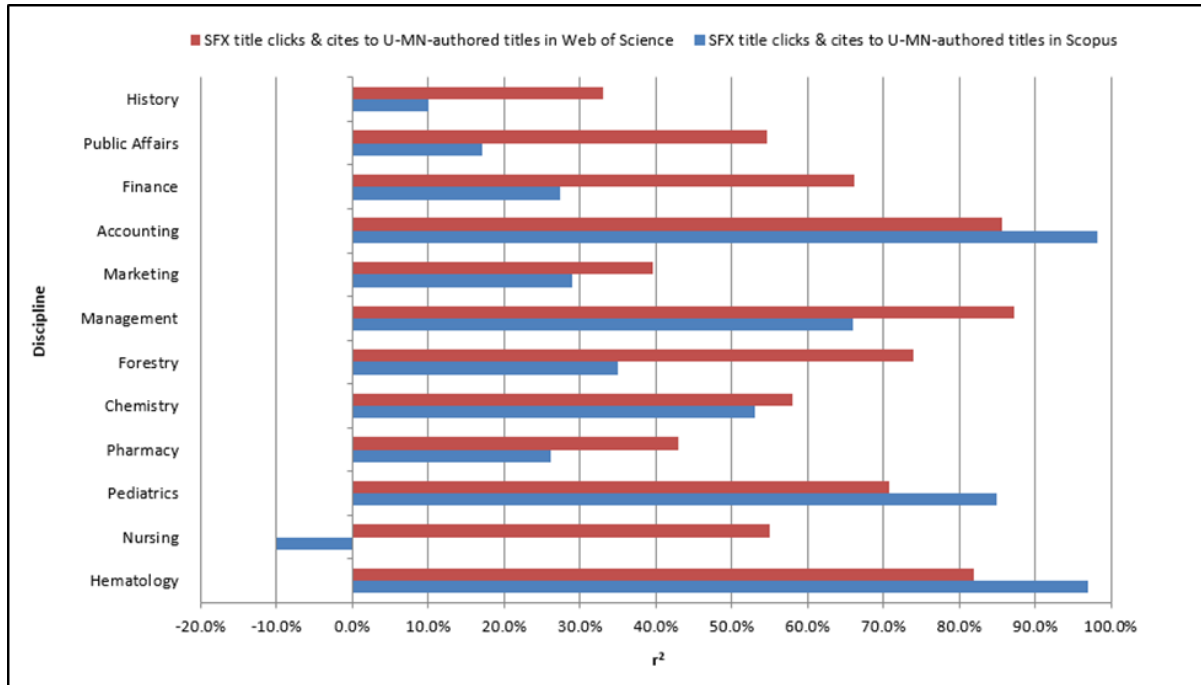


Figure 4
Downloads and others citing U-MN based on SFX title clicks correlated with cites to U-MN authored titles in Web of Science or Scopus.

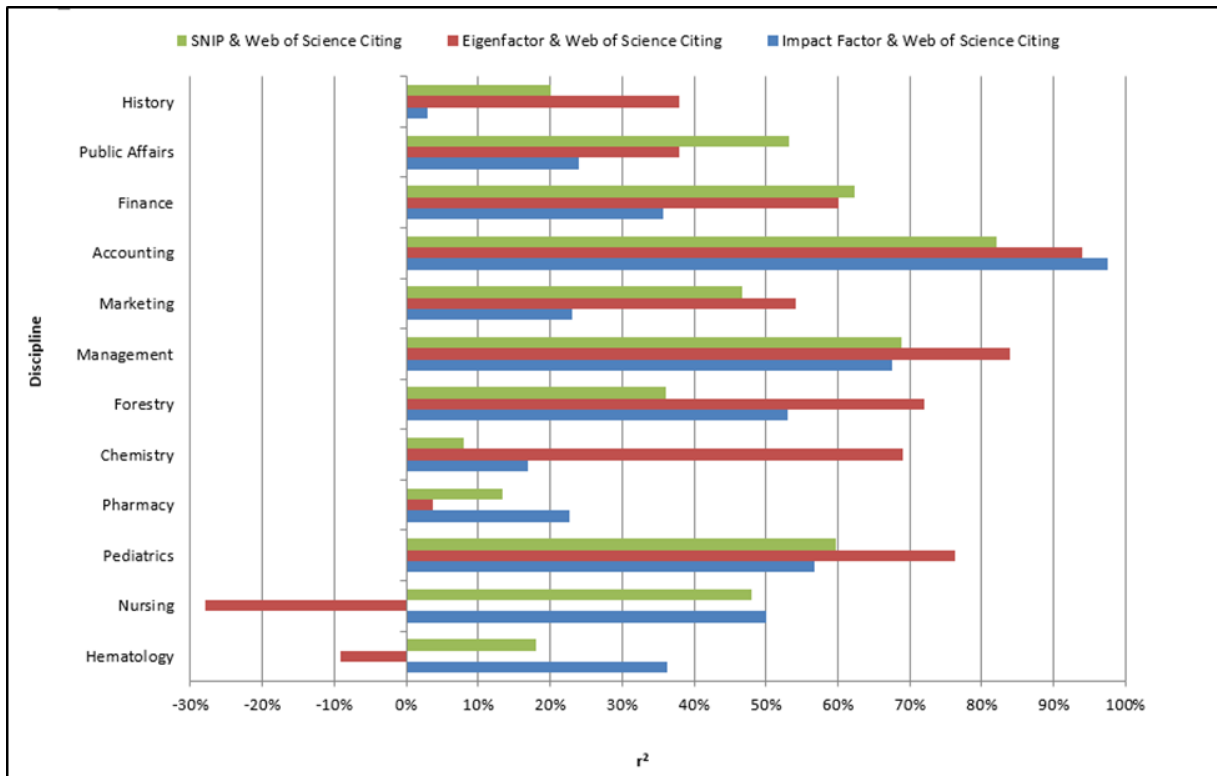


Figure 5
SNIP, Eigenfactor, and impact factor scores correlated with cites to U-MN authors titles in Web of Science.

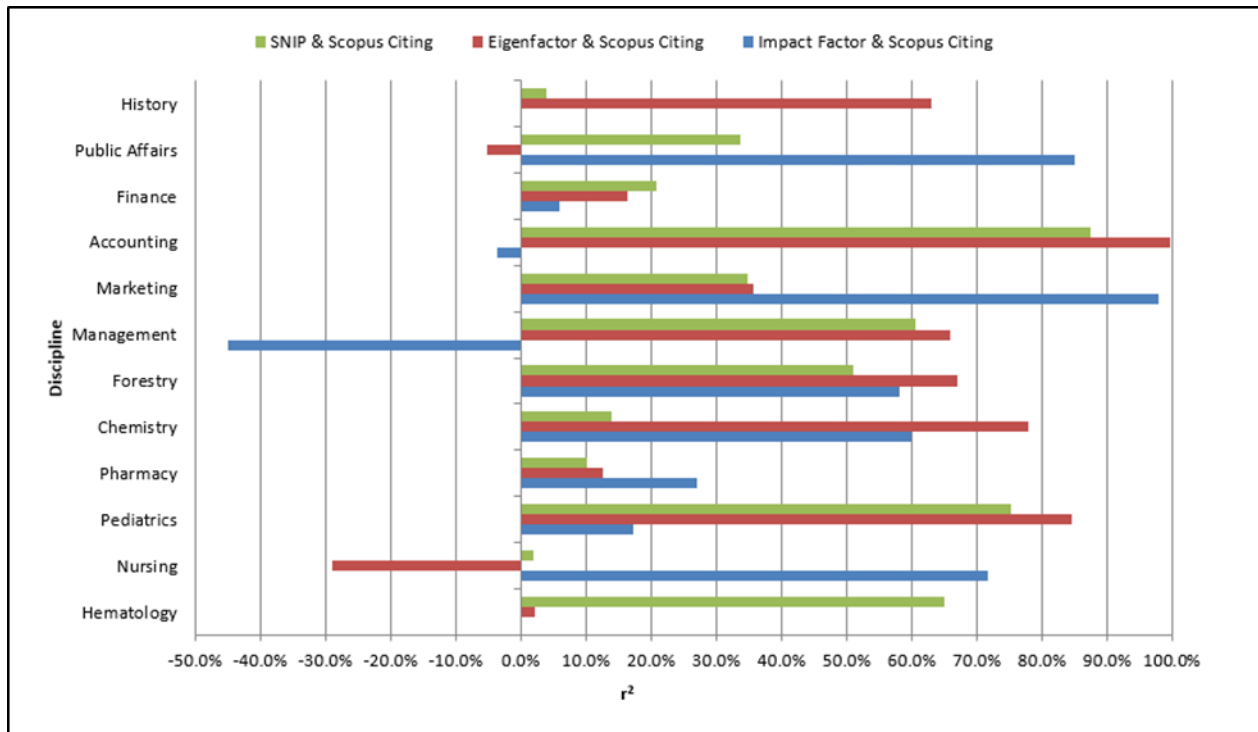


Figure 6
SNIP, Eigenfactor, and impact factor score correlated with cites to U-MN authored titles in Scopus.

negative relationships to the three impact value metrics.

Using Scopus citing data, almost all disciplines have at least one impact measure with strong correlation, but no one measure stands out as most predictive overall. Figure 6 shows multiple negative or weak relationships are evident when looking at peer citing decisions in Finance, Pharmacy, and Nursing. And some of the strongest relationships are found with impact factor for both Public Affairs and Marketing. On the other hand, Eigenfactor is strongly predictive with peer citing in History, Accounting, Management, Forestry, Chemistry, and Pediatrics. Meanwhile, SNIP shows strong relationships in Hematology, Pediatrics, Management, and Accounting. Finally, these results provide evidence to answer the question of comparative impact measure at the journal discipline level. While many

disciplines have multiple strong correlations, many also have weak or negative relationships. Thus, discipline does matter in terms of overall impact measure decisions, though patterns do emerge for some fields where the discipline result may be sufficient for a group of subjects, such as business, as we found for Eigenfactor in Web of Science. The same though cannot be said for health subjects where a far more nuanced approach may be required.

Discipline Usage Behaviour

What could be the possible explanation behind low to barely moderate, or even the negative correlations with regards to authorship, citing behaviour, or relationships with value metrics such as impact factor? Is there something in the usage behaviour of discipline specific users that can provide insight? One way to understand these differences is to look at U-MN's affinity

Table 8
Affinity String Usage of Harvard Business Review 2009-2012

Affinity String	Status	College	Department /School	No. logins 2009-2012
tc.grad.csom.bus_adm.EMBA	Graduate student	Carlson School of Management	Business Admin	2734
tc.grad.gs.humsrc_ir.ma	Graduate student	Graduate School	Human Resource Development	507
tc.grad.gs.	Graduate student	Graduate School	General	485
ahc.pubh.hcadm.mha	Graduate student	Academic Health Center	Public Health	338
tc.grad.csom.bus_adm.DMBA	Graduate student	Carlson School of Management	Business Admin	323
ahc.grad.nurs.d_n_p	Graduate student	Academic Health Center	Nursing	212
tc.grad.cehd.humsrcdev.m_ed	Graduate student	Education & Human Develop	Human Resource Development	156
tc.grad.csom.humsrc_ir.ma	Graduate student	Carlson School of Management	Human Resources	156
tc.grad.gs.strat_comm.ma	Graduate student	Graduate School	Strategic Communication	133
tc.grad.gs.workhumres.phd	Graduate student	Graduate School	Work & Human Resources Education	106
ahc.staff.pubh	Staff	Academic Health Center	Public Health	93
tc.grad.cehd.humresdev.humresd_g r	Graduate student	Education & Human Develop	Human Resource Development	93
tc.grad.gs.mgmt_tech.ms_m_t	Graduate student	Graduate School	Management of Technology	87
tc.ugrd.csom.mktg.bs_b.cl2011	Undergraduate student	Carlson School of Management	Marketing	86
tc.ugrd.fans.env_scienc.bs.nas	Undergraduate student	Food, Agricultural & Natural Resource Sciences	Environmental Sciences	84
ahc.staff.med	Staff	Academic Health Center	Medicine	81
tc.grad.gs.humsrcdev.m_ed	Graduate student	Graduate School	Human Resource Development	81
tc.grad.csom.bus_adm.CEMBA	Graduate student	Carlson School of Management	Business Admin	73
tc.grad.gs.publ_pol.m_p_p	Graduate student	Graduate School	Public Policy	57
tc.grad.cehd.workhumres.phd	Graduate student	Education & Human Develop	Work & Human Resources Education	57

string data. Affinity strings provide some insight into usage patterns at college or school level, as well as degree or subject discipline level. Affinity string data reveals who is accessing U-MN electronic resources without identifying a specific person.

Sometimes this data reveals rather surprising things. For instance, Table 8 shows that among the top twenty users of the *Harvard Business Review* are graduate school nursing students, as

well as public health and medical school staff. So decisions about the *Harvard Business Review* would not only impact the academic business community, but the health sciences as well.

Within a particular school, there can be differences in what e-journals are accessed. Nursing or Pharmacy staff and faculty (which includes research assistants, fellows, and PhD candidates) access a wide variety of journals outside of their immediate disciplines. Research

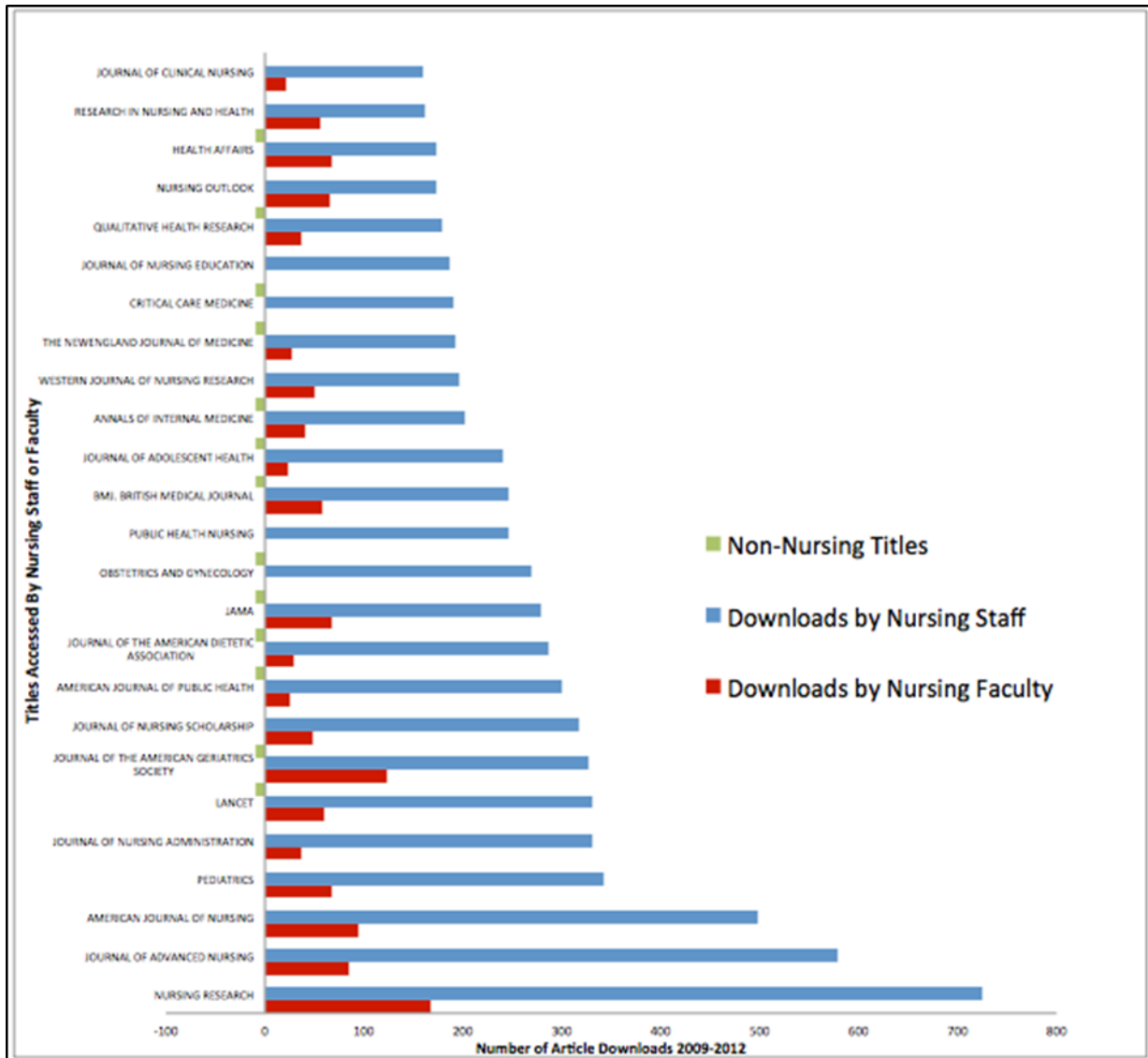


Figure 7
Nursing staff download activity versus nursing faculty download activity

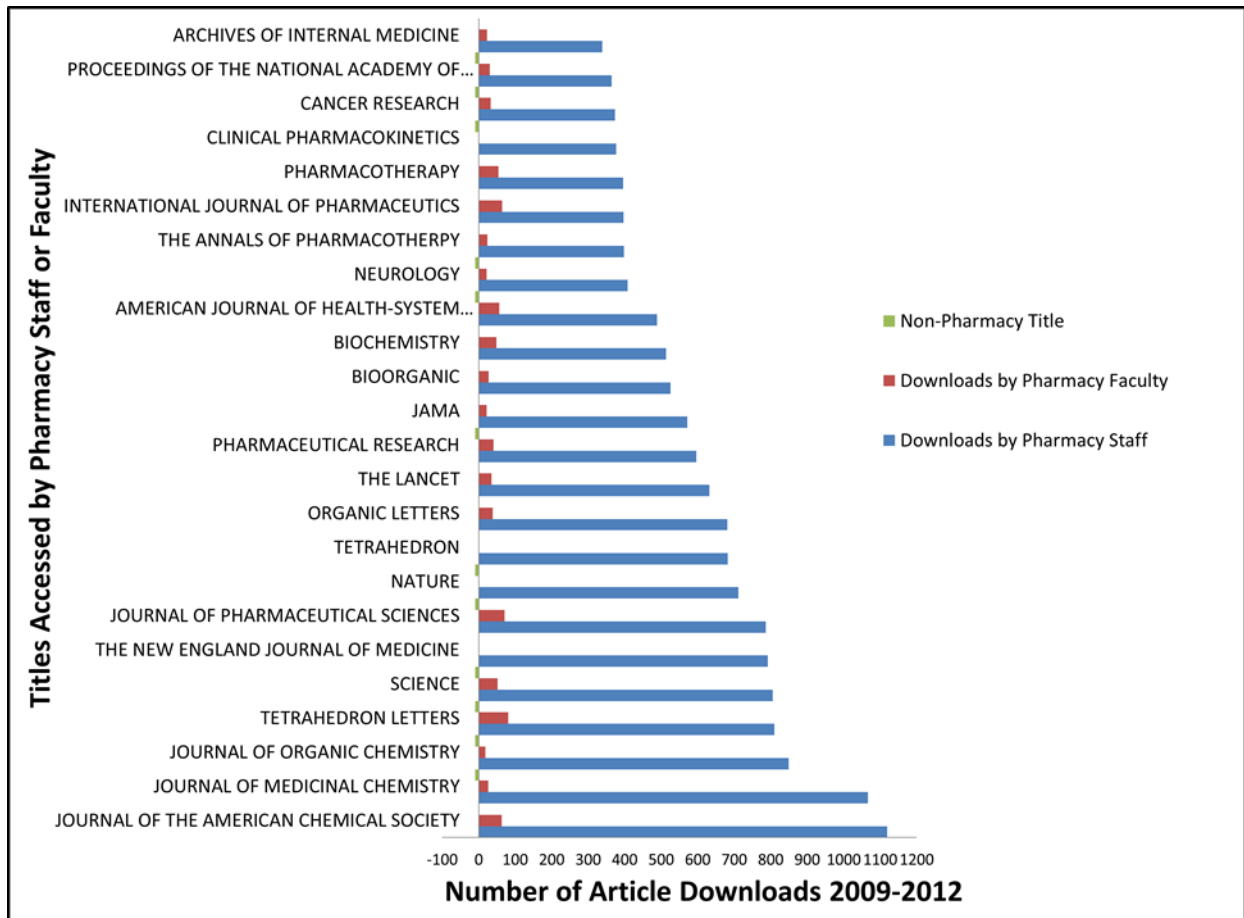


Figure 8
Pharmacy staff download activity versus pharmacy faculty download activity.

staff download to a much greater extent than faculty, possibly because they are the ones doing the bulk of the background work for grants, publications, or curriculum instruction (Figures 7 & 8). So decisions about any health sciences/bio-sciences titles could impact how the nursing school or college of pharmacy would be able to conduct research, apply for grants, or build curriculum content.

Publication Practices

When looking at where nursing or pharmacy authors chose to publish, the vast majority publish within their disciplinary journals. However, when looking through a list of articles that have the highest citation counts that include nursing or pharmacy authors, the top journals

are not nursing or pharmacy journals, but well-known medical titles, such as the *New England Journal of Medicine* or *Circulation*. Examining the author list from these articles reveals the increasing interdisciplinary nature of research, where the nursing or pharmacy author is one member of a team.

Selected Disciplinary Evidence: Visualizing the Data at the Discipline Level

The results illustrate that disciplinary trends exist. Can a more careful look at specific funds determine how these data actually may impact librarian selection decisions, or certainly the discussions that surround selection/deselection? To draw out patterns in the data, and hopefully

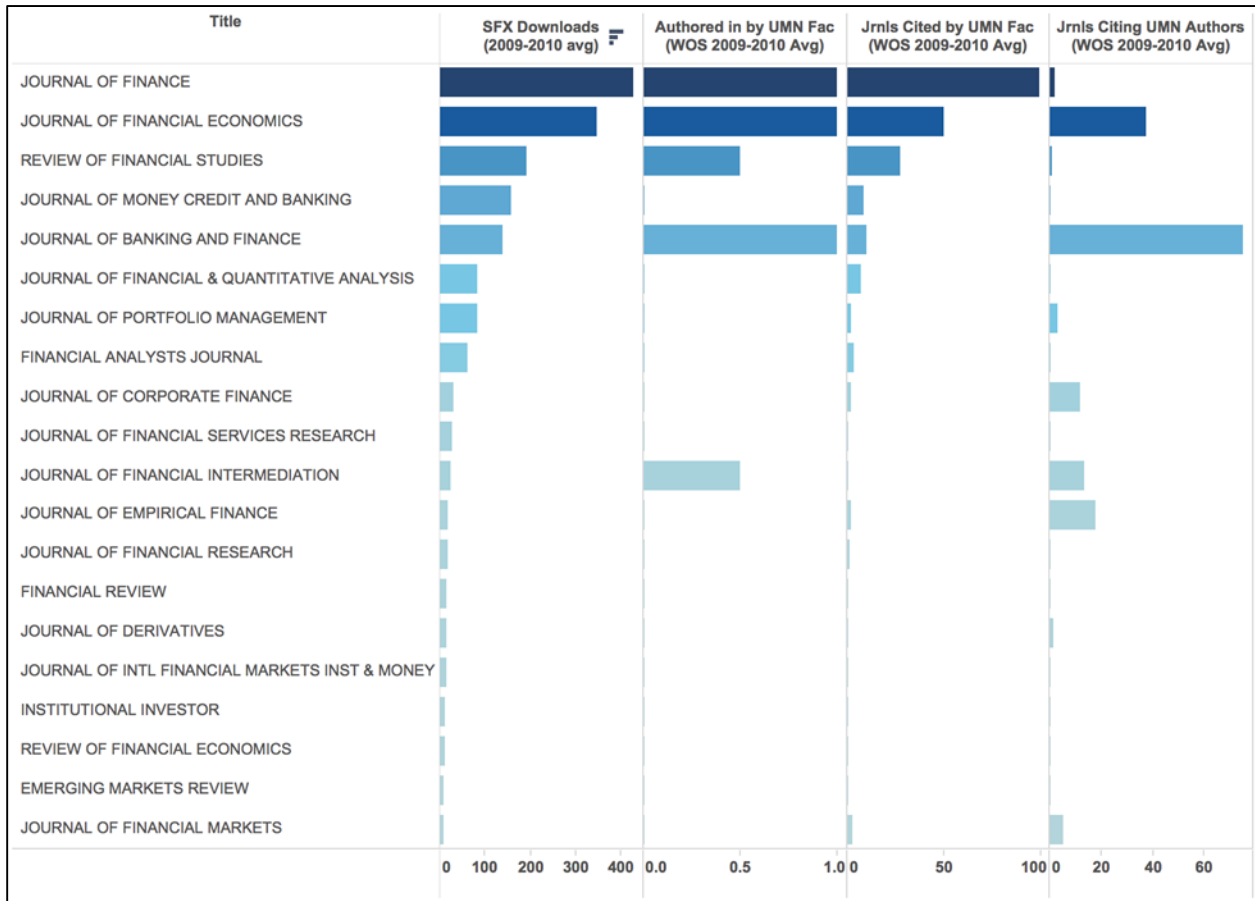


Figure 9
Journals selected using the Finance fund.

tease out a more meaningful story, the data was visualized using Tableau software.

Figure 9 represents titles selected using the Finance fund. As noted above, Web of Science was found to be a strong predictor for both authoring in and peer citing for this subject. The addition of the Authoring data shows *Journal of Banking & Finance* and *Journal of Financial Intermediation* as titles with comparatively few downloads but marked faculty authoring activity. Couple this with the additional peer citing data from the last column and it becomes clear that the *Journal of Empirical Finance*, *Journal of Financial Markets*, and the *Journal of Financial Intermediation* are titles with higher local impact

to U-MN faculty than downloads alone would suggest.

Figure 10 highlights titles selected using the Public Affairs Fund. Seen here are *International Public Management* and *Journal of Transport Geography* as titles with a lower level of downloads, but marked authoring and peer citing activity. These additional journal level views provide a richer set of data from which to analyze collections.

It is enlightening to consider how “weak” “moderate” and “strong” correlations play out in practice. Through comparison, the next couple of figures offer some insight. For example, data for authorship and downloads in

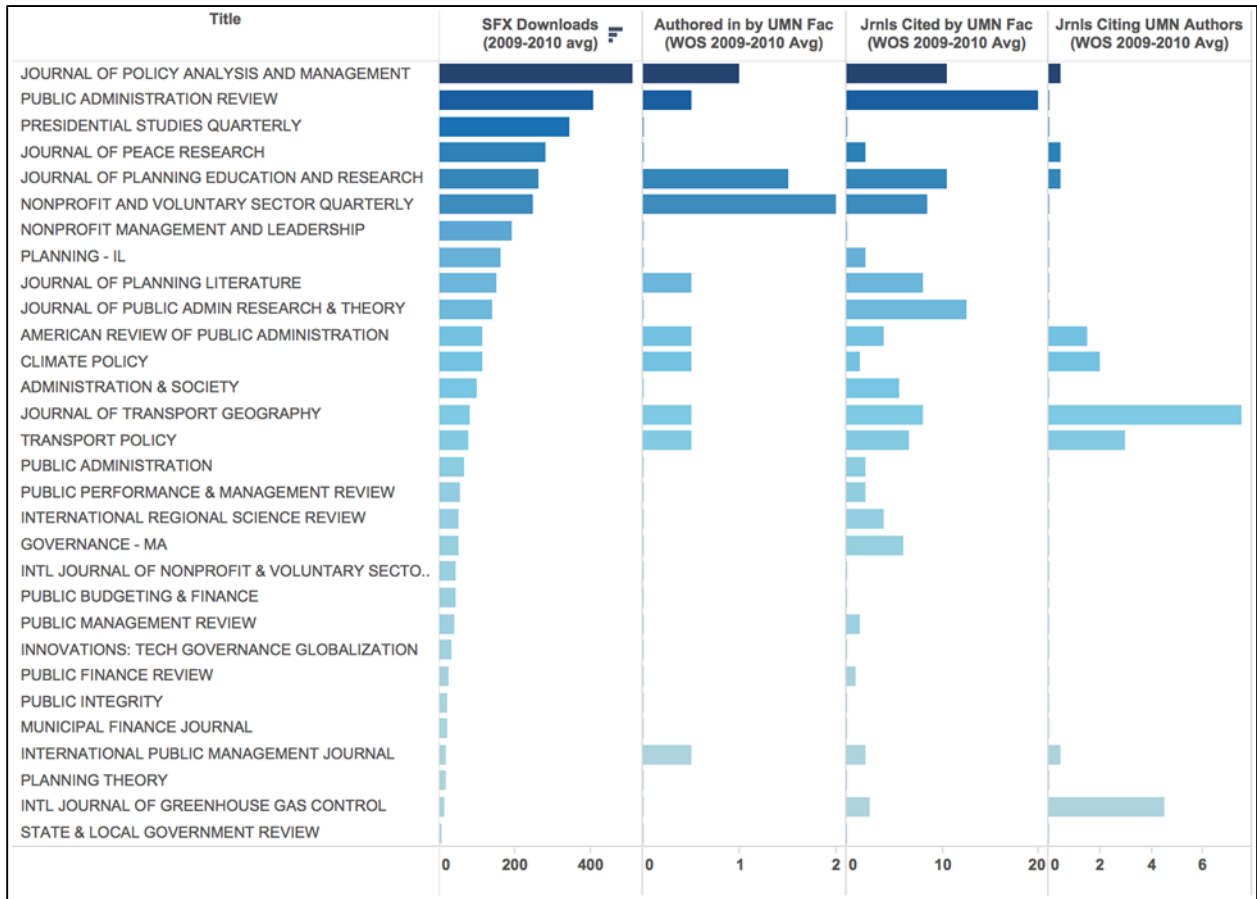


Figure 10
Journals selected using the Public Affairs fund.

History are presented in Figure 11 because of the previously noted gap between Web of Science authoring (at 75% correlation), shown in the first column, and Scopus authoring (at only 8%) shown in the second column.

Comparing the LJUR and Scopus columns for journals where data exists for both, Web of Science results are often higher than Scopus, but not always. Noticeable outliers include *Radical History Review* and *Historical Methods* with stronger Scopus authorship.

Forestry presents another view of variability (Figure 12). Presented are downloads in relation to citing by peers of U-MN authored works. The findings show Web of Science is the better predictor at 75% to Scopus 'moderate 35%.

While many of the same journals are represented as having been cited by peers based on data for both Web of Science and Scopus, what is remarkable is the degree of variation. Certainly, Web of Science tells a strong story. Scopus tells a story too, just not as compelling.

The final case study looks at the relationship between journal ranking measures and Scopus authoring in Public Affairs, the tools with the more predictive authoring result. Figure 13 shows impact results ranked by SNIP, the most predictive of the three measures in Scopus authoring. Ranked in descending order of SNIP values, Scopus does consistently provide comparatively stronger authoring relationships than either Impact Factor or Eigenfactor.

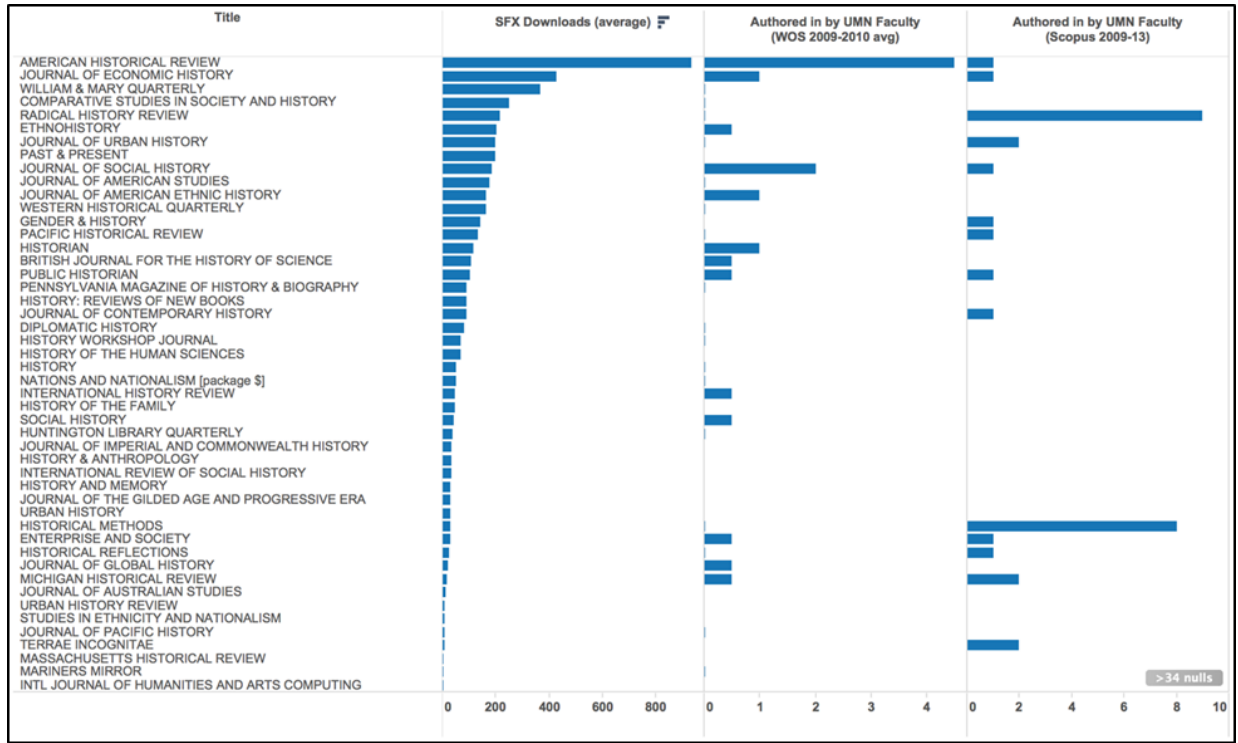


Figure 11
Journals selected using the History fund.

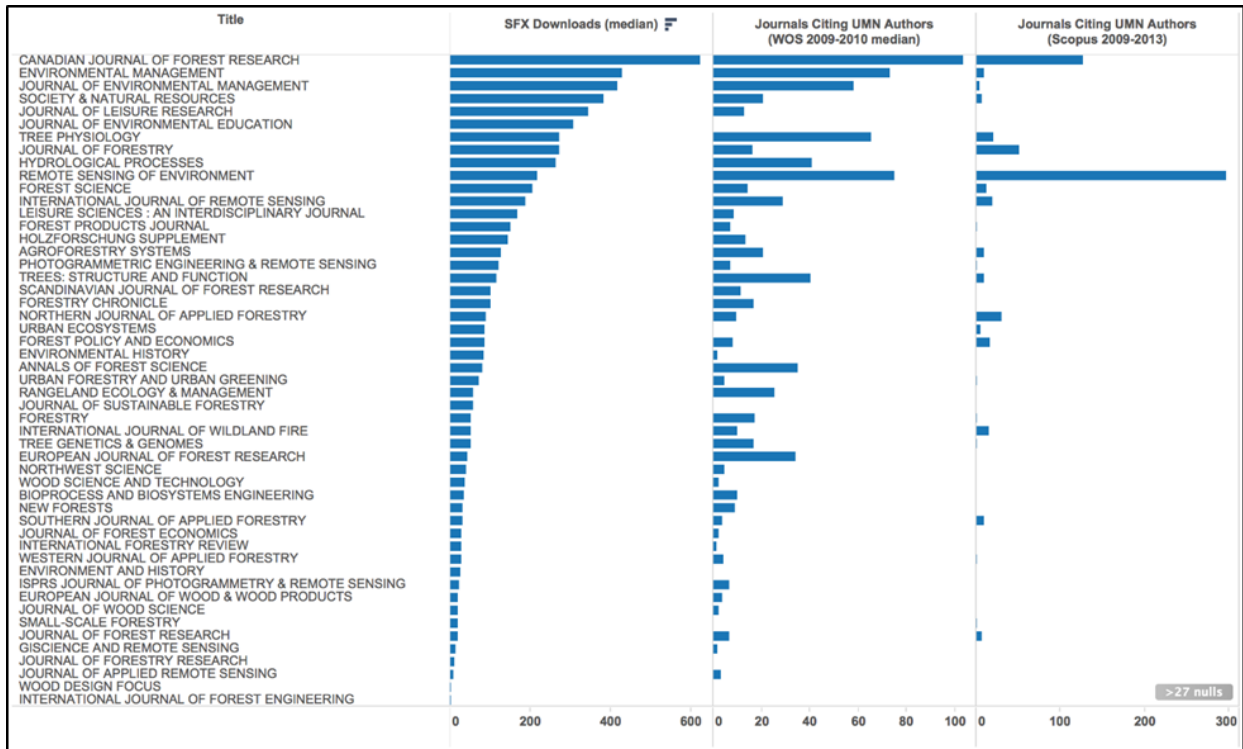


Figure 12
Journals selected using the Forestry fund.

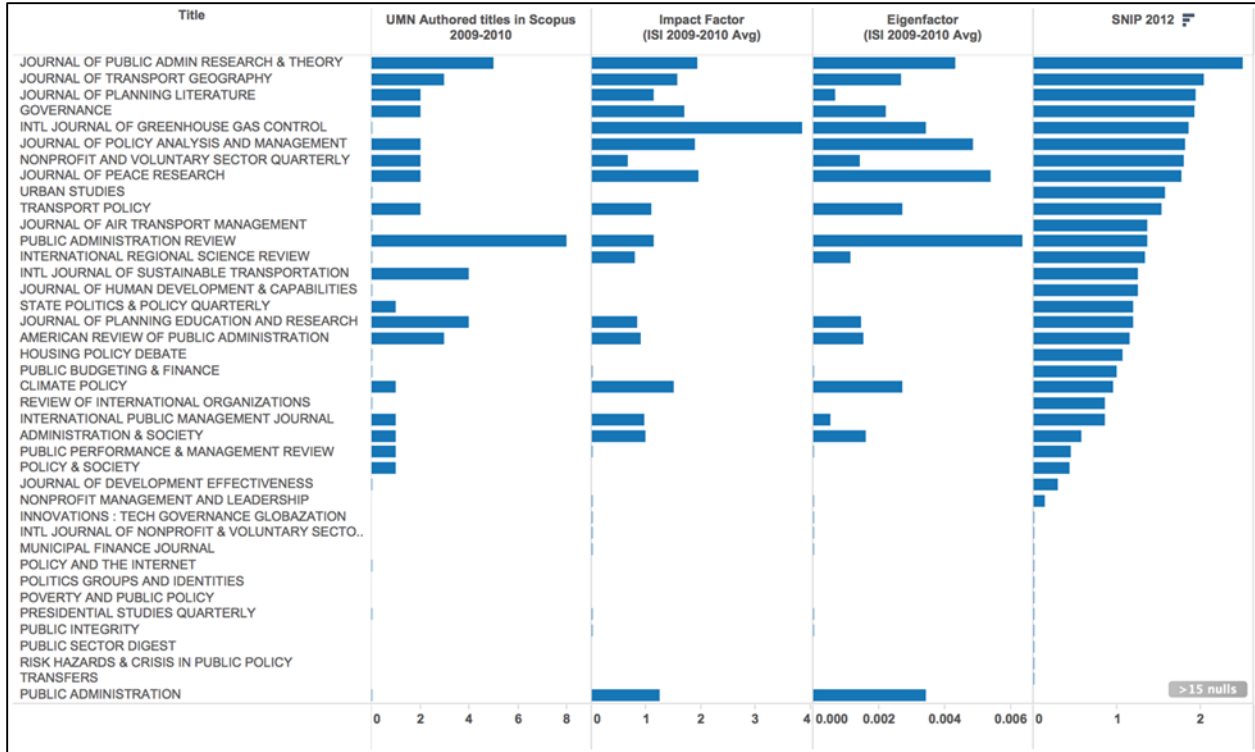


Figure 13
Public Affairs fund titles and impact measures.

Discussion

As both login demographics and interdisciplinary use are collected, correlated evidence of patterns of use emerge, resulting in a more accurate picture of activity. The results suggest practical ways to inform selection decisions. Web of Science provides more complete information on citing activity by faculty peers for subscribed titles, while Scopus provides better information on authoring activity by local faculty for subscribed journals. One solution is to use both the Web of Science Local Journal Use Reports and Scopus tools. If LJUR is too pricey but one subscribes to Web of Science, the latter can be searched by institutional affiliation (though this can be labour-intensive).

Given the trend toward more centralized collection development, it is still critical to obtain liaison/subject coordinator input no matter what datasets are used for decision

making. Not only do liaisons have the deepest understanding of disciplinary level use and quality, but as this research demonstrates, the “best fit” metric may vary both within a broad discipline category as well as between disciplinary categories.

Such analysis also provides proactive evidence of value to the academy. The process of looking at impact provides the same frame or structure across disciplines, often with very different outcomes. Furthermore, this evidence of value can be used to defend any local library “tax” that academic departments pay, as well as to promote services that help faculty demonstrate their research impact, e.g., for tenure portfolios.

Conclusion

Collecting and correlating authorship and citation data allows patterns of use to emerge, resulting in a more accurate picture of activity than the more often used cost-per-use. To find

the best information on authoring activity by local faculty for subscribed journals, use Scopus. To find the best information on citing activity by faculty peers for subscribed titles, use Thomson Reuters' customized LJUR report, or limit a Web of Science search to local institution. The Eigenfactor and SNIP journal quality metrics results can better inform selection decisions, and are publicly available. Given the trend toward more centralized collection development, it is still critical to obtain liaison input no matter what datasets are used for decision making. This evidence of value can be used to defend any local library "tax" that academic departments pay as well as promote services to help faculty demonstrate their research impact.

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