

# The Effects of Portfolio Purchasing on Scientific Subject Collections

Sarah Anne Murphy

A citation analysis was conducted to understand how the purchase of journal portfolios supports the research of faculty in the life, medical, physical and applied sciences and influences collections at The Ohio State University. Of the 253,604 citations from 6,815 articles reviewed, faculty cited 2,407 journal titles ten or more times. Results indicated that less than 50 percent of the titles listed for faculty in the Colleges of Dentistry, Nursing, Pharmacy, and Veterinary Medicine were acquired through a portfolio. A discussion questioning the value of the portfolio purchase follows, with the author concluding that journal portfolios are contributing to the normalization of library collections.



In recent years, several studies have mapped the literature of medical disciplines to identify core journals in their respective fields.<sup>1</sup> Based on the Bradford distribution, these studies demonstrated that the bulk of cited literature in any discipline is published in a core number of journals. As research libraries move toward purchasing the portfolios of science, technology, and medicine (STM) publishers' journals, similar studies mapping the citation patterns of STM faculty within their respective institutions may prove useful for evaluating the impact or effectiveness of such purchases.

High-profile exits from portfolio purchasing agreements in the last five years have highlighted the benefits and detractions of portfolio purchasing for research institutions.<sup>2</sup> Cornell University

cancelled its portfolio purchase agreement with Elsevier to regain the financial flexibility necessary to acquire other more frequently used titles published by non-profit societies.<sup>3</sup> Other institutions, like University of Wisconsin, Madison, have avoided the portfolio altogether, claiming they "weaken the power of librarians and consumers to influence scholarly communication systems."<sup>4</sup> Meanwhile, large purchasing consortiums like OhioLINK have enthusiastically embraced the portfolio purchase on behalf of its members, arguing that the benefits of acquiring more titles than any individual library could have obtained on its own outweigh the premium paid for the portfolio.<sup>5</sup> One question that deserves exploration, however, is whether the research institution truly benefits from purchasing the entire catalog of a publisher's journal offerings,

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as a significant portion of a portfolio includes titles not used by the institution's faculty. Further, could a consequence of the portfolio purchase be the normalizing of research library collections? Are some disciplines disproportionately supported by portfolio purchasing agreements?

Citation analysis may offer an answer to these and other questions. While the method in itself is not without limitations, it does provide some indication of the literature that faculty consults for research in their field.<sup>6</sup> Using the Bradford distribution as a tool to map the literature that faculty in life, medical, and physical sciences cite, a research library may obtain a better understanding of the journals that research faculty use regularly at their institution and determine the true cost-effectiveness of a portfolio purchase. Based on Samuel C. Bradford's Law of Journal Scatter, the heuristic is useful for demonstrating that a core number of journals generate the greatest number of citations in any given field.<sup>7</sup>

The Ohio State University Libraries currently offers access to more than 10,000 electronic journals to students, faculty, and staff of the institution. Of these journals, just over 6,000 are procured through OhioLINK, a consortium of Ohio's college and university libraries that is funded partially by the state government and partially by member institutions. The remaining titles are purchased both electronically and in print using funding designated for specific subject disciplines. The study reported in this paper continues and expands upon a previous study, conducted by the author, which examined the effects of portfolio purchasing on a specialized subject collection at The Ohio State University.<sup>8</sup> This study reports on a citation analysis that mapped the citation patterns of all faculty in the life, medical, physical, and applied sciences at The Ohio State University. The purpose of the study was to obtain a better understanding of how the consortium-negotiated portfolio purchase supports faculty research and influences the development of The Ohio

State University Libraries life, medical, physical, and applied science collections.

### Methods

A list of journal articles published between the years 2003 and 2005 by faculty in the life, medical, physical, and applied sciences was generated using ISI's Science Citation Index. Publications were then assigned to one of the university colleges listed in Appendix A, with multidisciplinary works assigned to the college of the first Ohio State University faculty author listed. Cited references for each publication were then pulled using Science Citation Index, coded for the appropriate university college, and sorted to separate cited books, conference proceedings, thesis, and "other" items from cited articles. If the information provided by ISI did not clearly indicate the nature of the cited reference, the author assigned the "other" category.

Cited journal references for each college were then analyzed to determine the number of times faculty cited a specific journal. A ranked list of cited reference counts was created for each college and organized in descending order. A second "master list" of all journals cited by Ohio State faculty in the life, medical, physical, and applied sciences was then created by combining the lists of the individual colleges. Journals cited fewer than 10 times on each list were then removed from each list, as the majority of these 17,827 titles were cited only once over the three-year period. The Bradford distribution was calculated by dividing the total number of citations for each list by three to determine the three groups or zones of cited references.<sup>9</sup> Zone 1 represented the core journals cited by faculty in each college and for the "master list" the core life, medical, physical, and applied sciences journals cited by faculty at The Ohio State University. Zone 2 represented more secondary titles for these faculty, while Zone 3 represented those journals cited least frequently.

**TABLE 1**  
**Number of Journal Titles Cited by Faculty by College**

	College of Biological Sciences	College of Dentistry	College of Engineering	“College of Food, Agricultural, and Environmental Sciences”	“College of Mathematical and Physical Sciences”	College of Medicine	College of Nursing	College of Optometry	College of Pharmacy	College of Veterinary Medicine	All Colleges
“Journals Cited 10 or more times”	290	75	422	379	511	791	17	27	149	275	2,407
“Journals Cited 9 or fewer times”	2,079	715	2,911	2,509	3,012	2,959	360	202	1,334	1,969	18,579
Total	2,369	790	3,333	2,888	3,523	3,750	377	229	1,483	2,244	20,986

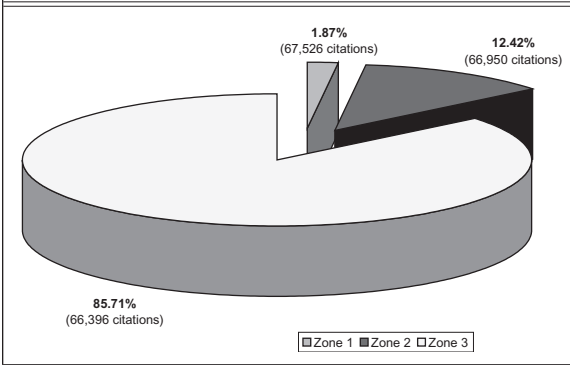
Publisher information was added to the lists to determine how the library procured access to the title: 1) through OhioLINK, the largest provider of portfolio-acquired content at The Ohio State University; 2) by purchasing an independent print subscription; or 3) by purchasing an independent electronic subscription. This information was then compared to Ohio State’s FY06 expenditures for independently purchased journals and OhioLINK-negotiated journal portfolios. Since the nature of portfolio purchasing makes it difficult to determine the cost-effectiveness of an individual journal subscription, a list of titles procured through OhioLINK-sponsored portfolio purchases was reviewed using subject headings listed in *Ulrich’s Periodicals Directory*, to remove humanities and social sciences titles from the list.<sup>10</sup> Ohio State’s contribution to OhioLINK-negotiated portfolio purchases was then adjusted by removing the percentage of out-of-scope titles to reflect expenditures on scientific information. The actual price of the scientific titles provided through the OhioLINK portfolio purchases was then gathered using a combination of

EBSCO’s *Librarian’s Handbook 2006–2007* and *Ulrich’s Periodicals Directory*.<sup>11</sup> Prices reported for FY07 in *Ulrich’s Periodicals Directory* were discounted by 6 percent to account for FY06 inflation. These activities were designed to determine what Ohio State would have actually paid if the university had purchased each title from these publishers’ portfolios independently.

**Results**

A total of 253,604 citations from 6,815 articles published by faculty in the life, medical, physical, and applied sciences were gathered for analysis. Of these 253,604 citations, 200,872 represented the 2,407 journal titles cited by faculty in all of the colleges at least 10 or more times over the three-year period (table 1). (The Bradford distribution for these cited references is listed in figure 1 and table 2.) Only 1.9 percent (n = 45/2,407) of titles cited more than 10 times by faculty were listed in Zone 1 of the distribution. This represented the core journals cited by Ohio State science faculty. Of the journals in Zone 1, 35.5 percent (n = 16/45) were purchased through an OhioLINK-negotiated

**FIGURE 1**  
**Bradford Distribution for Faculty Publications**  
**in the Life, Medical, Physical and Applied**  
**Sciences at The Ohio State University**



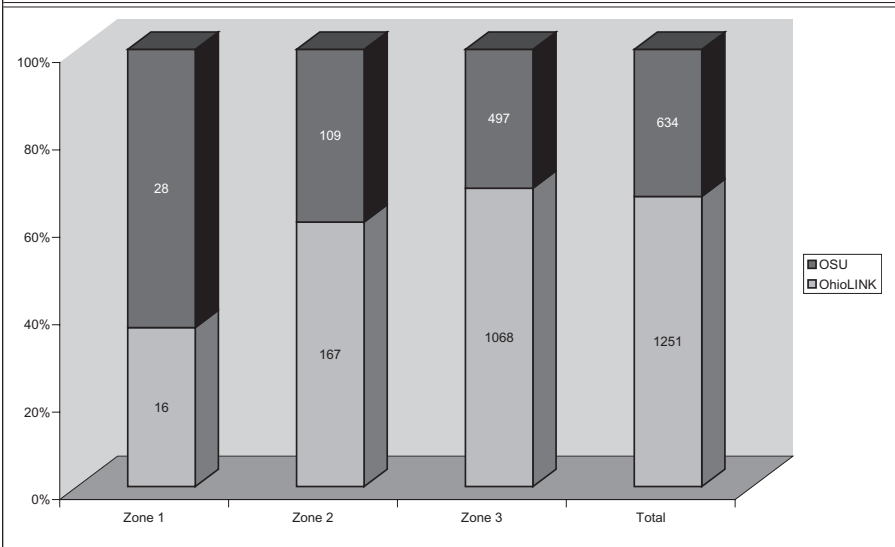
acquired through an OhioLINK-negotiated portfolio purchase. The remaining current subscriptions were either available only in print (7.0%, n = 168/2,407) or were purchased electronically by the libraries for faculty (26.3%, n = 634/2,407).

College of Medicine faculty cited references from the largest number of journal titles (n = 791), followed by the College of Mathematical and Physical Sciences (n = 511) and the College of Engineering (n = 422). For the College of

portfolio purchase, while 62.2 percent (n = 28/45) were procured individually by The Ohio State University Libraries (figure 2). While none were available only in print, it is important to note that the library was required to maintain print subscriptions for five of the titles, as electronic access was only available following a four- to twelve-month embargo. Overall, 52.0 percent (n = 1,251/2,407) of the cited journal titles in Zone 1, 2, and 3 were

Engineering, 62.0 percent (n = 18) of the journals listed in Zone 1 of the Bradford distribution were obtained through a portfolio purchase, while 85.7 percent (n = 6/7) of the titles listed in Zone 1 of the College of Mathematical and Physical Sciences were acquired through this means. In contrast, less than 40 percent of the journals included in Zone 1 for the Colleges of Biological Sciences (n = 4/12), Food, Agricultural, and Environmental

**FIGURE 2**  
**Electronic Journals Cited by Faculty by Zone OhioLINK vs. OSU**



**TABLE 2**  
**Bradford Distribution for Faculty Publications in the Life, Medical, Physical and Applied Sciences at The Ohio State University**

	College of Biological Sciences	College of Dentistry	College of Engineering	“College of Food, Agricultural, and Environmental Sciences”	“College of Mathematical and Physical Sciences”	College of Medicine	College of Nursing	College of Optometry	College of Pharmacy	“College of Veterinary Medicine”	All Colleges
<b>Zone 1</b>											
OhioLINK	4	3	18	3	6	3	0	2	3	3	16
OSU*	8	2	8	16	1	18	4	3	9	10	28
Print	0	1	0	0	0	0	0	0	0	1	0
Other**	0	0	3	0	0	0	0	0	0	0	1
<b>TOTAL</b>	12	6	29	19	7	21	4	5	12	14	45
<b>Zone 2</b>											
OhioLINK	30	5	51	40	28	58	1	4	18	17	167
OSU*	23	9	24	23	9	46	4	1	18	25	109
Print	1	3	3	6	1	2	0	0	1	6	13
Other**	0	1	7	3	0	1	1	3	0	0	10
<b>TOTAL</b>	54	18	85	72	38	107	6	8	37	48	299
<b>Zone 3</b>											
OhioLINK	155	22	154	167	261	351	4	5	47	99	1,068
OSU*	40	18	94	61	111	219	3	5	43	74	497
Print	8	6	21	17	31	41	0	2	3	19	155
Other**	21	5	39	43	63	52	0	2	7	21	343
<b>TOTAL</b>	224	51	308	288	466	663	7	14	100	213	2,063
<b>Grand Total</b>	290	75	422	379	511	791	17	27	149	275	2,407

\*Includes titles with 4–24 month embargos.

\*\*Other includes ceased, cancelled, title change, not at OSU titles.

Sciences (n = 3/19), Medicine (n = 3/21), Nursing (n = 2/5), Pharmacy (n = 3/12), and Veterinary Medicine (n = 3/14) were procured through a portfolio purchase.

While nearly half of the journal titles cited in Zones 1 and 2 for the Colleges of Biological Sciences, Medicine, and Food, Agricultural, and Environmental Sciences were acquired through a portfolio, access to 75.5 percent (n = 34/45) of the titles cited by faculty in the Colleges of Mathematical

and Physical Sciences and 60.5 percent (69/114) of titles cited by faculty in the College of Engineering was provided by a portfolio in these same zones. In the Colleges of Dentistry, Nursing, Pharmacy, and Veterinary Medicine, access to more than 50 percent of the titles cited in all zones were procured by the Ohio State University Libraries and not directly provided through an OhioLINK-negotiated portfolio purchase.

**TABLE 3**  
**Top 50 Journals Cited**

Cited Work	No. of Citations	OSU/ OhioLINK	Cited Work	No. of Citations	OSU/ OhioLINK
<i>Astrophys J</i>	4,815	OSU	<i>J Clin Oncol</i>	975	OSU
<i>J Biol Chem</i>	4,758	OSU	<i>J Dairy Sci</i>	912	OSU
<i>P Natl Acad Sci USA</i>	4,098	OSU	<i>J Exp Med</i>	863	OSU
<i>Science</i>	3,396	OSU	<i>Astron J</i>	860	OSU
<i>Phys Rev Lett</i>	3,032	OhioLINK	<i>Nucleic Acids Res</i>	806	OhioLINK
<i>Nature</i>	2,966	OSU	<i>Oncogene</i>	803	OSU
<i>Phys Rev D</i>	2,941	OhioLINK	<i>Gene Dev</i>	769	OSU
<i>J Am Chem Soc</i>	2,348	OhioLINK	<i>J Mol Biol</i>	748	OhioLINK
<i>Blood</i>	2,002	OSU	<i>Infect Immun</i>	734	OSU
<i>Phys Lett B</i>	1,988	OhioLINK	<i>J Cell Biol</i>	734	OSU
<i>Cancer Res</i>	1,878	OSU	<i>Lancet</i>	730	OhioLINK
<i>Cell</i>	1,766	OhioLINK	<i>Appl Environ Microb</i>	710	OSU
<i>J Chem Phys</i>	1,579	OhioLINK	<i>Appl Phys Lett</i>	696	OhioLINK
<i>J Immunol</i>	1,424	OSU	<i>Soil Sci Soc Am J</i>	691	OSU
<i>Nucl Phys B</i>	1,395	OhioLINK	<i>J Neurosci</i>	686	OSU
<i>New Engl J Med</i>	1,367	OSU	<i>J Am Vet Med Assoc</i>	682	OSU
<i>J Virol</i>	1,337	OSU	<i>J Clin Invest</i>	670	OSU
<i>Biochemistry—US</i>	1,306	OhioLINK	<i>Biochem Bioph Res Co</i>	630	OhioLINK
<i>Mon Not R Astron Soc</i>	1,220	OhioLINK	<i>Nat Genet</i>	624	OSU
<i>Am J Physiol</i>	1,178	OSU	<i>JAMA: J Am Med Assoc</i>	620	OhioLINK
<i>EMBO J</i>	1,150	OSU	<i>Am J Vet Res</i>	601	OSU
<i>Astron Astrophys</i>	1,132	OSU	<i>Cancer</i>	600	OSU
<i>Mol Cell Biol</i>	1,106	OSU	<i>Circulation</i>	592	OSU
<i>Phys Rev B</i>	1,031	OhioLINK	<i>Inorg Chem</i>	576	OhioLINK
<i>J Bacteriol</i>	999	OSU			
<i>Nucl Instrum Meth A</i>	991	OhioLINK			

A review of Ohio State's total expenditures on life, medical, physical, and allied science titles revealed that roughly 70 percent is dedicated to the support of OhioLINK-negotiated portfolio purchases.<sup>12</sup> Without OhioLINK, Ohio State would have paid 61.4 percent more to purchase each individual title included in the portfolios. An examination of titles listed in Zones 1, 2, and 3 of the "master list," however, indicates that Ohio State would have only paid 30.0 percent more for titles cited more than 10 times by faculty over the three-year period examined. If titles cited more than 15 times by faculty are examined, Ohio State only paid a 8.9 percent premium for the portfolio content.

### Discussion

The question remains whether the additional content provided by a portfolio purchase is truly worth the investment. While arguments for these packages note that libraries gain access to journals previously not owned, the structure of portfolio contracts, where prices are based on the institution's historical subscription levels, inhibit libraries' ability to purchase content from smaller publishers who often have higher-quality journals to offer. Jeon Doh-Shin and Domenico Menicucci view the site license as an unforeseen cost of the shift to electronic publishing. Social welfare decreases with the portfolio purchase as bundling both softens competition from books and "has an indirect effect of negative pecuniary externalities on all other publishers."<sup>13</sup> Thus, a side effect of portfolio purchasing is that the library commits less money to books and the journals of other publishers.

Indeed, at Ohio State, nearly 70 percent of adjusted expenditures on life, medical, physical, and allied science titles are committed to supporting OhioLINK-negotiated portfolios of large commercial publishers. Of the top 50 titles cited by Ohio State faculty, the majority were purchased by Ohio State (62.0%), whereas OhioLINK titles represented 64.7 percent of the adjusted cost (table 3). The Colleges of Math-

ematical and Physical Sciences and the College of Engineering disproportionately benefited from the portfolio purchase, at least for the core journals cited by faculty in Zones 1 and 2. Ohio State's commitment to the portfolio does affect subject areas not typically represented by large commercial publishers. Less than 50 percent of the titles cited ten or more times by faculty in the College of Dentistry, Nursing, Pharmacy, and Veterinary Medicine were provided by publisher portfolios. Such information is not surprising, considering the number of dental, pharmacy, and veterinary medicine schools both in Ohio and the United States. Much of the research in these disciplines is reported in the journals of small societies or publishers. Further, a large research university like Ohio State provides opportunities for research in many niche subject areas, typically not supported by the smaller research institution. This may explain why roughly 50 percent of the journals represented in Zones 1 and 2 for the Colleges of Biological Sciences, Medicine, and Food, Agricultural, and Environmental Sciences were provided via the portfolio.

Aaron Edlin and Daniel Rubinfeld have characterized the "Big Deal" as an anticompetitive strategic barrier, which inhibits a smaller publisher's ability to compete fairly in the open market.<sup>14</sup> Competition has moved from individual journals to large bundles of journals, especially as libraries achieve little savings by canceling individual titles in a Big Deal portfolio contract. If a small publisher introduces a new journal title, librarians do not have the flexibility to cancel a journal acquired through a portfolio to redirect funds to the purchase of a new title, even if the new title may be more relevant or valued by the institution's faculty. Further, it is difficult to justify spending an additional \$1,000 to purchase another title in a given subject area, when ten titles in that same subject area are already provided via the portfolio, even if three of these ten titles may be of lower quality. Proportionate savings cannot be guaranteed by



canceling these titles. Meanwhile, as more and more libraries purchase portfolios of journal titles, library collections become normalized. The lust to obtain access to more journals through a bundled package than the library could subscribe to individually comes at the expense of the ability to purchase unique, higher-quality journals that are often published by non-profit academic societies and better support faculty research interests and needs. This standardization of library collections has long-term implications for the entire scholarly communication process.

With the advent of portfolio purchasing, a new question to ask, however, is whether the threat of returning to à la carte pricing is truly a threat. Or, stated another way, is the library truly getting a great deal through the “Big Deal”? Commercial prices continue to outpace inflation, even as there are no significant differences in presentation or peer review between commercial and noncommercial journals, and noncommercial journals are cited more.<sup>15</sup> The nature of bundling, however, makes it difficult for the library to evaluate the true value of the portfolio

purchase. Ohio State pays somewhere between an 8.9%–30.0% premium to maintain access to the 3,813 titles representing 75.4 percent of the OhioLINK portfolio, which were not cited by faculty more than 10 times over the 2003–2005 period. This premium could have been directed toward higher-use and higher-quality journals, books, or other formats, which the university libraries must forego to direct funds toward the portfolio purchase.

### Conclusion

Mapping the citation patterns of faculty does provide valuable information to evaluate the cost-effectiveness of journal portfolios. The premium paid to maintain access to the 75.4 percent of titles in the portfolio cited infrequently or not at all by faculty should be reconsidered. Rather than contributing to the normalizing of library collections by supporting the strategic positioning of commercial publishers, large research libraries may respond better to the needs of all faculty, especially those conducting research in smaller fields, by returning to à la carte purchasing.

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## Appendix A

- College of Biological Sciences 1
- College of Dentistry 1
- College of Engineering 1
  - excluding the Knowlton School of Architecture 1
- College of Food, Agricultural, and Environmental Sciences
  - excluding the Department of Agricultural, Environmental, & Development Economics; the Agricultural Technical Institute; and the Department of Human & Community Resource Development
- College of Mathematical and Physical Sciences 1
- College of Medicine 1
- College of Optometry 1
- College of Pharmacy 1
- College of Veterinary Medicine 1



## Notes

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