

Comparing Value and Estimated Revenue of SciTech Journals

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Academic libraries currently devote about 74% of their chemistry journal budgets to titles produced by commercial publishers. Relative to U.S. association titles, however, commercial titles are generally much lower in value to the academic scientists they serve. The imbalance between the low value of commercial publications and the significant revenue they generate from academic library subscriptions is at the heart of the current crisis in scientific/technical (ST) journal costs.

The Study

These claims are the result of a study of three measures of value (faculty ratings, *Science Citation Index* [SCI] citation counts, and library use) and estimated revenue for a core group of chemistry titles. The list of chemistry titles, the measures of faculty ratings, and the SCI citation counts were derived from a dataset originally developed for Stephen J. Bensman's (1996) "The Structure of the Library Market for Scientific Journals: The Case of Chemistry." The primary component of this set was faculty survey data collected by the Louisiana State University (LSU) Libraries for its 1993 Serial Redesign Pilot Project. The LSU survey asked faculty in the Chemistry Department to name those titles necessary to support curriculum and research, and to indicate whether each title was needed on subscription or if access through a subsidized, unmediated document delivery service would suffice (Hamaker 1994). The second dataset was provided by Tina E. Chrzastowski of the University of Illinois' Chemistry Library. Chrzastowski had collected library use data for a study of chemistry journals she conducted at Illinois. She defined use as the number of times an item was reshelfed or circulated. The two datasets were combined using only those titles from the Illinois use study that were also included in the LSU data. Estimates of revenue generated by the titles were then added to allow for the exploration of the relationship between the allocation of resources on a national level to chemistry titles and these three measures of value.

Underlying this study of chemistry journals are the findings of recent research conducted by Bensman and Wilder. The Bensman/Wilder analysis, "Scientific/Technical Serials Holdings Optimization in an Inefficient Market: A LSU Serials Redesign Project Exercise" (July 1998), establishes that throughout each of the ST journal literatures, faculty value highly a relatively few titles, most of which are U.S. association publications. They also establish that a relatively few titles account for a substantial portion of the cost of subscribing to these literatures. Most of these titles are commercial publications.

Bensman and Wilder use three measures of value in their analysis of ST literature: faculty ratings, SCI citation counts, and use. One of the surprising results of their analysis is that, once appropriate subject groupings have been established, each of these measures of journal value produce virtually equivalent results in terms of journal rankings. In particular, equivalency among these value measures is evidence that researchers in each ST discipline *operate within a similar system*. This system is marked by broad consensus on what is important research, which

academic programs tend to produce it, and which journals publish it. This consensus is so pervasive that the same journals rise to the top regardless of which of the three value measures one uses. Given that the basic relationships between value, cost, and publisher type were found to be identical throughout the ST disciplines, the results of the present study of chemistry journals can be said to be illustrative of general patterns in other ST journal literatures.

Measuring Revenue

There is no way of knowing with certainty the amount of subscription revenue a journal generates, but a reasonable estimate can be obtained by multiplying its price by the number of libraries holding it as reflected in the OCLC database. This approach misses subscriptions held by individuals or by institutions that do not place their holdings in OCLC, and it may overestimate the number of subscriptions to titles that have been canceled by libraries but are still listed in the OCLC holdings statement.

Nonetheless, even publishers with substantial individual membership income rely primarily on library subscriptions for their revenue. For instance, Lorrin Garson (1997) of the American Chemical Society (ACS) recently stated that 90% of ACS' subscription revenue comes from institutions. Given that an overwhelming majority of journal revenue stems from sales to libraries, and that a large number of U.S. academic libraries participate in OCLC, counting OCLC holdings is sure to capture a substantial portion of both subscriptions and revenue from U.S. academic libraries.

Publisher Types

Bensman and Wilder separated the journal titles into four publisher types: U.S. commercial, U.S. association, foreign commercial, and foreign association. Both the LSU and Illinois datasets under-represent commercial titles and over-represent U.S. association titles in respect to the universe of published research in chemistry. Many commercial titles were excluded from the sets either because they were not selected by LSU faculty or because they are not indexed in the print version of the *Science Citation Index* (SCI). Both cases are an indication of low value to academic users.

This under-representation of commercial titles may result in an understatement of the actual value of the association titles.

Results

Revenue Skew

Within each publisher type, a small number of titles accounts for a significant proportion of the revenue. A look at the top five revenue-generating titles in each category, however, reveals wide variation. Of the 29 chemistry titles from U.S. associations, the top five journals are 17% of that set's titles, and 51% of the total revenue. For U.S. commercials, the top five are 13% of the 38 titles, and 38% of revenue. For foreign commercials, the top five of the 81 journals are

only 6% of the titles, but 33% of revenue.¹ This concentration of revenue in the foreign commercial set is particularly noteworthy, indicating that a very small core of foreign commercial titles subsidizes a long list of lower revenue titles in this set.

Relationship of Value to Revenue and Titles

Table 1 presents the revenue and value measure data (faculty ratings and SCI citation counts) for chemistry from the LSU data set. U.S. association publishers produce value in excess of the revenue they receive: they account for 19% of titles and 18% of revenue, but 40% of faculty ratings and 45% of total citations. Commercial publications, on the other hand, receive more revenue than the value they produce: they account for 78% of titles and 74% of total revenue, but only 57% of faculty ratings and 50% of total citations.

The Illinois dataset on library use produces similar results, with disproportionately high value among the U.S. association publishers, and disproportionately low value among commercial publishers (Table 2).

One might conclude from these data that commercial publications supply over half of faculty value as reflected in faculty ratings (57%). However, this conclusion does not account for the much larger number of commercial titles present in both data sets. To correct for this imbalance, Bensman/Wilder created a concept called leverage, a ratio that normalizes the values. In the present analysis, two types of leverage are considered: revenue and title leverage.

Revenue leverage expresses the value of journals in relation to the revenue they generate, and is calculated by dividing the percentage of each value measure by the corresponding percent of total revenue (Table 3). For example, the percentage of faculty ratings for U.S. association titles (40%) is divided by the percentage of total revenue for those same titles (18%), resulting in a revenue leverage of 2.17 (variations due to rounding). Using the revenue leverage scores in Table 3, one concludes that U.S. association journals have 2.9 times the value of commercial publications (U.S. and foreign combined) as measured by faculty ratings (2.17 divided by .76), 3.6 times the value as measured by total citations (2.47 divided by .68), and 4.5 times the value as measured by library use (2.60 divided by .58).

Title leverage expresses value obtained per title, and is calculated by dividing the percentage of each value measure by the corresponding percent of total titles for each publisher type (Table 4).² Comparing title leverage as for revenue leverage above, one concludes that U.S. association journals have 2.9 times the value as measured by faculty ratings, 3.7 times the value as measured by total citations, and 4.4 times the value as measured by library use. The revenue and title leverage measures reveal a more accurate picture of the relationship between publisher types: commercial publications manage to contribute over half of total value as measured by faculty ratings only because there are so many more of them.

Revenue per Title

For the set of chemistry titles examined, there is no statistically significant difference between the average revenue per title generated by commercial publishers and that generated by U.S. association publishers from U.S. academic subscribers. How can this be, given the unusually high cost of commercial publications? One explanation lies in the concept of "first copy costs," expenses attributable to the preparation of a journal for printing, including peer review, technical editing, and marketing, for example.

While estimates of first copy costs vary from 60-80+%,³ first copy costs are an important consideration for all publishers. When first copy costs must be covered over a smaller subscription base, a higher price is required. On average, the commercial publications in the chemistry dataset have only half of the subscription base of association journals as measured by OCLC holdings, but charge about 80% more (Bensman 1996). In other words, the commercial publishers' high prices make up for smaller subscription bases, and their rising prices may be in part a function of cancellations. If so, commercial publishers are caught in the unenviable position of charging higher prices for products of lower value to a declining subscriber base.

Conclusion

Whatever the components of commercial ST journal pricing, the value to academic scientists is small relative to the revenue they receive. Whereas commercial journals in chemistry account for 74% of the revenue generated by ST publications, on a per-title basis they contribute only between 22-35% of the value of their U.S. association counterparts. This pattern detailed in chemistry has been demonstrated by Bensman/Wilder to exist in the ST literatures in general.

Addressing the imbalance between value and revenue will require a change of philosophy for academic libraries that currently pursue comprehensiveness in regard to ST journal literatures. It is the nature of progress in ST disciplines to require a high degree of consensus among researchers, and one reflection of this consensus is the relatively small number of ST journals deemed important by researchers themselves. Use of journal literatures within the conscribed sphere of high-value titles is so heavy that subscription is easily the most cost-effective form of access. For titles outside this sphere, use is so infrequent that document delivery from commercial document suppliers is currently much less expensive. This is true for large and small institutions alike, meaning that cooperative collection development in ST journal literatures is not cost-effective.

By placing value at the heart of their ST collection development philosophies, academic libraries can free themselves from the high-cost, low-value commercial titles that currently consume such a large proportion of ST journal budgets. The resulting re-allocation of resources will reverse the present imbalance between value created and revenue received by funding only high-value titles, and relegating lower value titles to more cost-effective on-demand acquisition strategies.

Table 1: Revenue Estimates with Faculty Score and Total Citation*

	Number of Titles	%	Estimated Revenue	%	LSU Faculty Score	%	Total Citation	%
U.S. Association	29	19%	\$13,165,270	18%	5,502	40%	872,141	45%
U.S. Commercial	38	25%	\$11,250,297	16%	2,038	15%	248,589	13%
Foreign Association	5	3%	\$5,355,872	7%	501	4%	87,257	5%
Foreign Commercial	81	53%	\$42,522,015	59%	5,862	42%	727,026	38%
Combined Commercial	119	78%	\$53,772,312	74%	7,900	57%	975,615	50%
Total	153	100%	\$72,293,454	100%	13,903	100%	1,935,013	100%

* Figures in table are rounded

Table 2: Revenue Estimates with Illinois Use*

	Number of Titles	%	Estimated Revenue	%	Illinois Library Use	%
U.S. Association	25	21%	\$12,798,017	20%	36,004	51%
U.S. Commercial	27	23%	\$9,776,615	15%	4,724	7%
Foreign Association	5	4%	\$5,355,872	8%	4,700	7%
Foreign Commercial	63	53%	\$36,728,964	57%	24,644	35%
Combined Commercial	90	75%	\$46,505,579	72%	29,368	42%
Total	120	100%	\$64,659,468	100%	70,072	100%

* Figures in table are rounded

Table 3: Revenue Leverage*

	LSU Faculty Score	Total Citation	Illinois Library Use
U.S. Association	2.17	2.47	2.60
U.S. Commercial	0.94	0.83	0.45
Foreign Association	0.49	0.61	0.81
Foreign Commercial	0.72	0.64	0.62

Combined Commercial	0.76	0.68	0.58
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* Figures in table are rounded

Table 4: Title Leverage*

	LSU Faculty Score	Total Citation	Illinois Library Use
U.S. Association	2.09	2.38	2.47
U.S. Commercial	0.59	0.52	0.30
Foreign Association	1.10	1.38	1.61
Foreign Commercial	0.80	0.71	0.67
Combined Commercial	0.73	0.65	0.56

* Figures in table are rounded

Endnotes

¹ Foreign association journals are not listed here because only five of them were in the LSU data.

²In considering the results presented in Table 4, it should be noted that the high title leverage of foreign association journals is partially due to the necessity of combining the five bibliographically separate sections of the *British Journal of the Chemical Society* into a single entity.

³Lorrin Garson, in his presentation at the National Meeting of the American Chemical Society (8 September 1997), "Economics of Scientific Publishing," stated that first copy costs for the ACS are 84% of the journal publishing expenses. John Cox of Carfax Publishing estimated in his paper at the 17th annual Charleston Conference (November 1997) that first copy costs of scholarly journals range from 60-70%.

References

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