

Exploring Relationships Between Funding of Research and Consumption of Scholarly Publications



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Abstract

Based in part on public and researcher concerns over the cost of access to publicly funded research (i.e., NIH Public Access Policy) we investigated the relationship between journal usage at a science and technology, state-supported university and the funding sources for research published in these journals.

This analysis reveals relationships between local usage and funding of research by federal, profit, non-profit and international agencies. This work contributes to an understanding of how funding sources (inputs) contribute to the scholarly publication process in terms of chemical publications (outputs), and how those outputs are consumed in the form of journal impact factors, citations and article downloads.

Background

- Previous studies have focused on:
 - Libraries and the “serials crisis”
 - Publishers and open access
 - Researchers and librarians’ roles in ideas and idea-generation
 - Incentives in publishing and the academic reward system
 - Patterns of information-use behavior

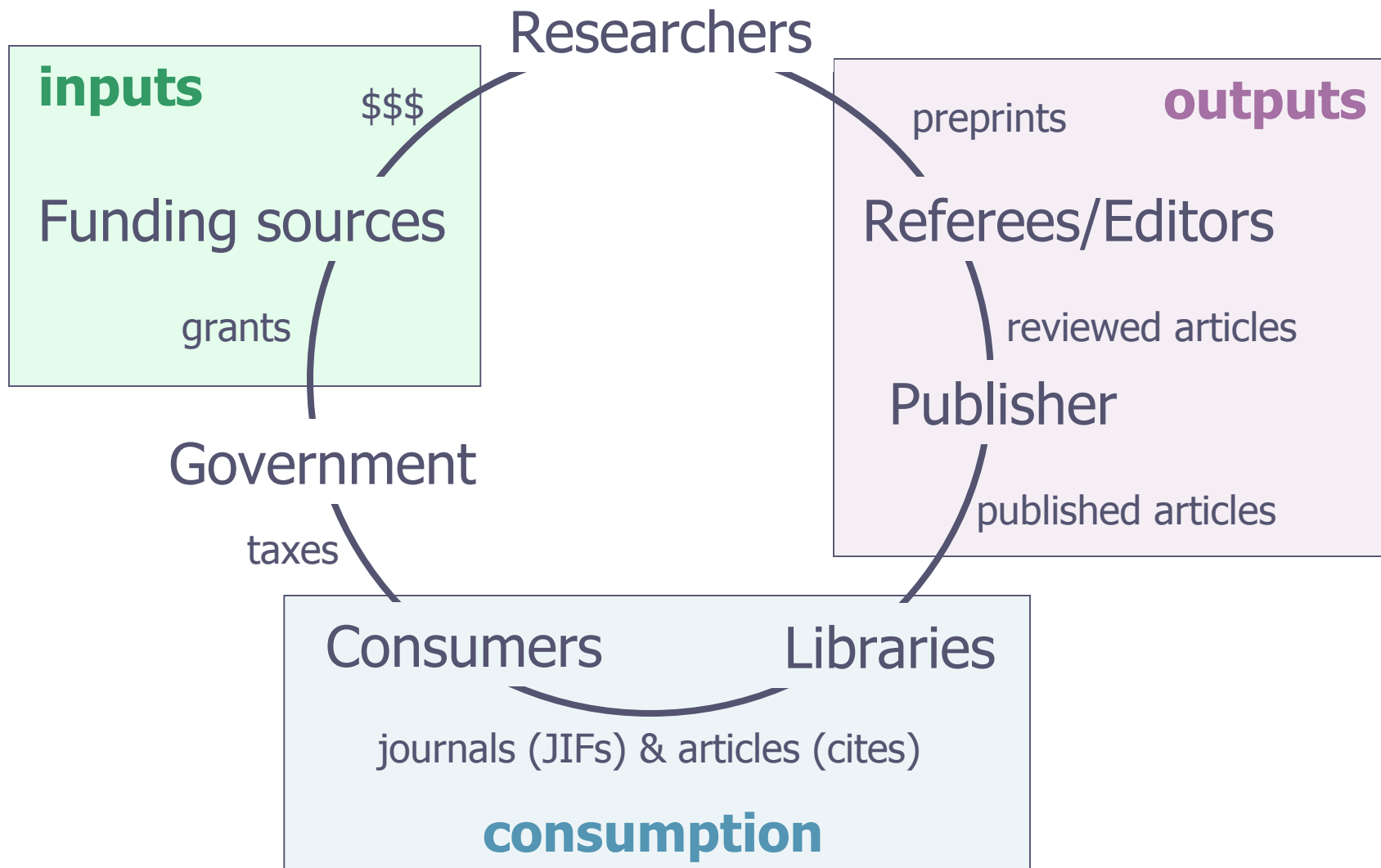
Using ciber as a model

- Ciber research group (UK) tracks the behavior of information and develops ways to measure input, output and consumption activities to aid various stakeholders to better understand and respond to the changes in the scholarly publication system
- This study loosely models the ciber research, using data collected from research conducted in the United States during the years 2002 and 2003 from American Chemical Society journals.

Research questions

- Who are the major supporters of published research in the chemical and biochemical sciences in the United States?
- What is the impact of funding sources at NCSU based on journal and article usage and the funding sources supporting research in those journals and articles?
- What types of funding agencies are contributing to scientific research as published by the American Chemical Society?

“Complex organism”



Methods

- Randomly sampled 565 articles (2002) and 562 articles (2003) from 32 American Chemical Society journals; each article with at least one USA-based author
- Collected the following for each article:
 - Journal title
 - Author affiliations
 - Number of citations to each article
 - Journal Impact Factor (ISI 2003)
 - Acknowledged funding sources

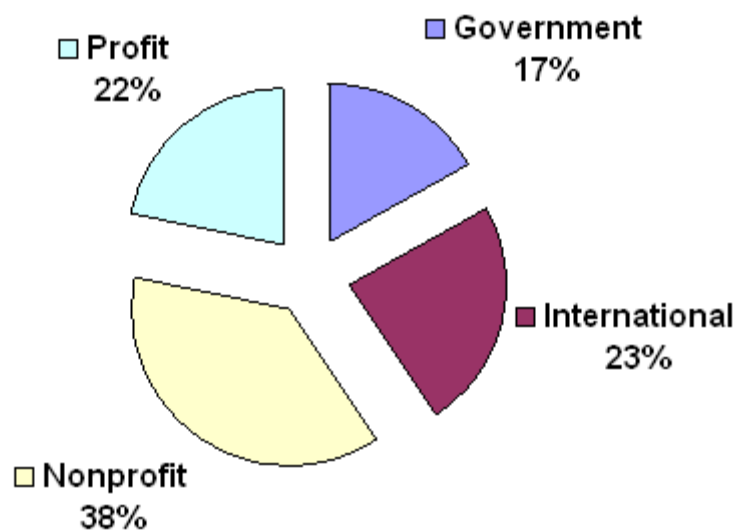
Methods cont'd

- Local Journal Usage Reports (ISI)
Collected frequency of NCSU-authored publications for ACS journals (2002 and 2003)
- ACS-generated Usage Reports
Collected frequency of successful full-text downloads by NCSU community for 2004-2005
- The frequency was compiled for each funding source if listed in the sample. Average number of citations and average JIF were tabulated for each distinct funding source.

Percentage contribution of distinct funding sources by type

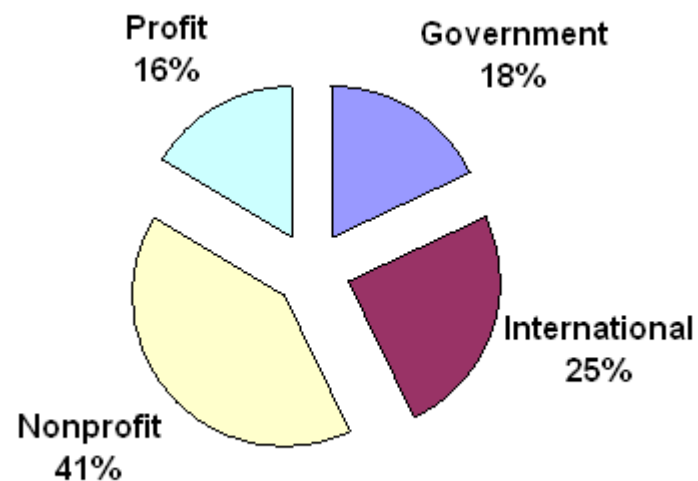
2002 sample

- 32 ACS journals
- 565 articles
- 273 distinct funding sources



2003 sample

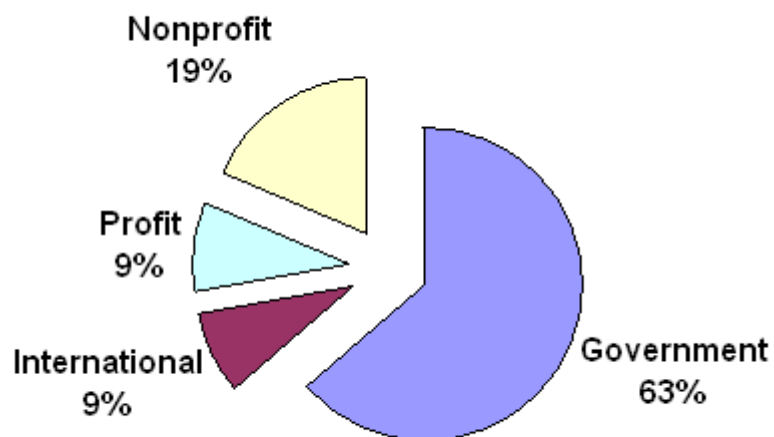
- 32 ACS journals
- 562 articles
- 285 distinct funding sources



Percentage contribution of all acknowledged funding sources by type

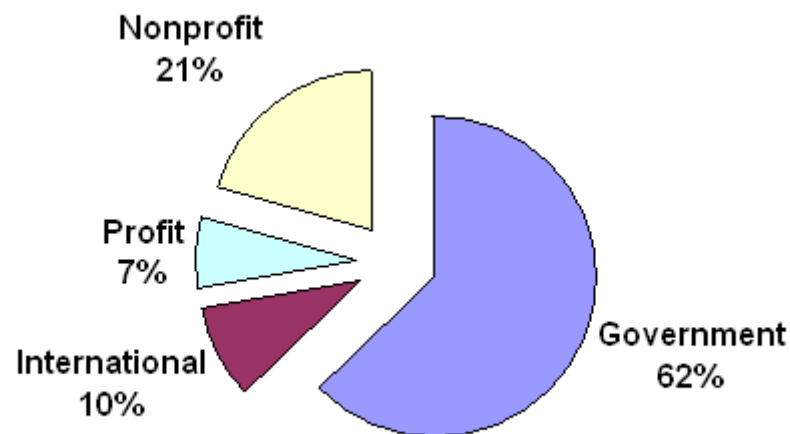
2002 sample

- 32 ACS journals
- 565 articles
- 1071 acknowledged grants or forms of support



2003 sample

- 32 ACS journals
- 562 articles
- 1148 acknowledged grants or forms of support



Top funding sources based on frequency

2002 sample

Funding sources	Frequency in Sample
National Science Foundation	230
National Institutes of Health	160
US Department of Energy	83
Petroleum Research Fund, administered by the American Chemical Society	26
US Office of Naval Research	25
National Cancer Institute	22
US Environmental Protection Agency	17
Robert A. Welch Foundation	14
US Army Research Office	12
Defense Advanced Research Projects Agency	10
US Public Health Service	10

2003 sample

Funding sources	Frequency in Sample
National Science Foundation	227
National Institutes of Health	165
US Department of Energy	70
Petroleum Research Fund, administered by the American Chemical Society	30
US Office of Naval Research	22
National Cancer Institute	20
National Aeronautics and Space Administration	18
US Environmental Protection Agency	17
Defense Advanced Research Projects Agency	16
US Department of Agriculture	16
Robert A. Welch Foundation	14

Top funding sources based on average number of times cited

2002 sample

Funding sources	Avg TC
Molecular Imaging, Corp	64
Universal Display Corp	57
AMDeC Foundation of New York City	57
University of Florida	57
Central Intelligence Agency	54
US Advanced Research and Development Activity and the	54
Johns Hopkins University	44
Organic Reactions, Inc.	36
University of California, Berkeley	36
Austrian Science Foundation	33
Japanese Society for the Promotion of Science	33

2003 sample

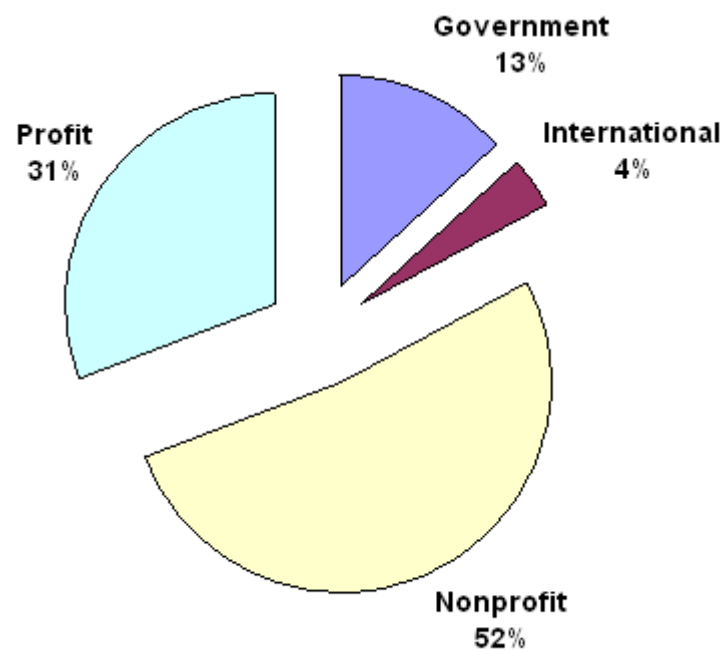
Funding sources	Avg TC
Alzheimer's Association	34
Knut and Alice Wallenberg Foundation	30
American Chemical Society Division of Organic Chemistry	30
Swedish Foundation for Strategic Research	30
Swedish Fund for Research without Animal Experiments	30
IBM	27
University of California, Los Angeles	27
Herman Frasch Foundation	25
University of Puerto Rico	23
Brigham Young University	21
University of Massachusetts, Lowell	21
GlaxoSmithKline	21

Cream of the Crop

Top funding sources based on JIF and Times Cited (2002-2003)

Funding sources	Funding Type	Average JIF+TC
Molecular Imaging, Corp	Profit	67.679
AMDeC Foundation of New York City	Nonprofit	63.516
University of Florida	Nonprofit	63.516
Defense Advanced Research Projects Agency	Government	60.389
Universal Display Corp	Profit	60.389
Central Intelligence Agency	Government	60.144
US Advanced Research and Development Activity and the Office of Naval Research	Government	60.144
US Department of Health and Human Services	Government	58.036
University of California, Berkeley	Nonprofit	57.036
Camille and Henry Dreyfus Foundation	Nonprofit	53.849
IBM	Profit	53.679
Organic Reactions, Inc.	Profit	52.016
Johns Hopkins University	Nonprofit	50.516
National Science Foundation	Government	49.873
Alfred P. Sloan Foundation	Nonprofit	48.766
DuPont Company	Profit	45.183
Eli Lilly and Company	Profit	45.183
US Department of Energy	Government	41.997
National Aeronautics and Space Administration	Government	40.679
Novartis	Profit	40.516
Austrian Science Foundation	International	39.516
Japanese Society for the Promotion of Science	International	39.516
US Air Force Office of Scientific Research	Government	39.516
National Cancer Institute	Government	38.245

Types of funding sources awarded to NCSU authors based on distinct types and frequency



Sponsor/Chemistry	Frequency	Type of Fund Source
National Science Foundation	42	Government
National Institutes of Health	22	Government
North Carolina Biotechnology Center	16	Nonprofit
US Department of Energy	6	Government
North Carolina State University	6	Nonprofit
US Department of Agriculture	4	Government
American Chemical Society	4	Nonprofit
US Office of Naval Research	3	Government
University of California	3	Nonprofit
Insect Biotechnology, Inc.	3	Profit
National Institute of Standards & Technology	2	Government
American Diabetes Association	2	Nonprofit
National Academy of Sciences	2	Nonprofit
Petroleum Research Fund, administered by the American Chemical Society	2	Nonprofit
BT Tobacco Ltd	2	Profit
Sumitomo Chemical Company	2	Profit

Two Types of Consumption

ACS Highest Downloads at NCSU (2004-2005)	Frequency	NCSU Authors' Citation Practices (Highest-cited ACS Journals 2002- 2003)	Frequency
National Institutes of Health	190	National Science Foundation	210
National Science Foundation	130	National Institutes of Health	182
US Department of Energy	39	US Department of Energy	41
Petroleum Research Fund, administered by the American Chemical Society	24	Petroleum Research Fund, administered by the American Chemical Society	30
National Cancer Institute	22	National Cancer Institute	20
US Environmental Protection Agency	22	US Public Health Service	15
US Public Health Service	18	US Office of Naval Research	14
US Office of Naval Research	11	Defense Advanced Research Projects Agen	12
Merck	8	US Army Research Office	11
Robert A. Welch Foundation	8	Camille and Henry Dreyfus Foundation	10
University of California	8	Robert A. Welch Foundation	10
Alfred P. Sloan Foundation	7	Alfred P. Sloan Foundation	8
Camille and Henry Dreyfus Foundation	7	US Air Force Office of Scientific Research	8
Defense Advanced Research Projects Agency	6	Merck	7
US Army Research Office	6	National Aeronautics and Space Administrat	6
US Department of Defense	6	American Heart Association	5
American Heart Association	5	Deutsche Forschungs Gemeinschaft	5
Eli Lilly and Company	5	Eli Lilly and Company	5
National Aeronautics and Space Administration	5	Research Corporation	5
National Institute on Drug Abuse	5	University of California (all)	5
US Air Force Office of Scientific Research	5	US Department of Defense	5
Wellcome Trust	5	Wellcome Trust	5
American Cancer Society	4	3M Corporation	4
Bristol-Myers Squibb	4	Bristol-Myers Squibb	4
Deutsche Forschungs Gemeinschaft	4	City University of New York	4
DuPont Company	4	DuPont Company	4
GlaxoSmithKline	4	Southern Illinois University	4
Pfizer, Inc	4	US Environmental Protection Agency	4
Research Corporation	4	Australian Research Council	3

Summary of Preliminary Conclusions

- Major supporters of chemistry and biochemistry research in the USA:
 - Based on frequency, government agencies are top funding sources
 - Based on times cited and Journal Impact Factor (JIF), nonprofit institutions and for-profit organization are top funding sources
- On a local scale, major supporters are government agencies and local nonprofits
- In terms of usage, government agencies remain the top funding sources followed by major non-profit foundations and major for-profit corporations
- In terms of diversity, nonprofits have the highest number of unique funding sources
- In terms of overall frequency, government agencies have the highest number of acknowledgments

Caveats & Future Directions

- While this study does not consider the monetary contribution of each funding source, this might be a more accurate indication of the relative support from diverse funding agencies for chemical and biochemical research in the United States
- Increase the sample sizes to include more articles
- Expand study to include additional journal publishers
- Broaden coverage by including more years of publications
- Using this method, the impact of funding sources can be assessed in other disciplines