Efficiency, Journal Publishing and Scholarly Research – A Discussion Paper

by

David Colander
Terry Plum

September 2004

MIDDLEBURY COLLEGE ECONOMICS DISCUSSION PAPER NO. 04-14

DEPARTMENT OF ECONOMICS
MIDDLEBURY COLLEGE
MIDDLEBURY, VERMONT 05753

http://www.middlebury.edu/~econ

Efficiency, Journal Publishing and Scholarly Research – A Discussion Paper

Dave Colander and Terry Plum

Prepared for the

Middlebury College Conference on Economic Issues, April 30 – May 1, 2005

Efficient Transmission of Scholarly Research

Draft 09/15/2004

The current transmission process of scholarly research through journals is highly inefficient and costly.[1] Although estimates vary by precisely how much, the underlying cost of distribution of scholarly research have fallen significantly, while the prices paid by users to access that research has not; the rate of increase in journal prices has actually risen. Association of Research Library members spend 215% more per serial unit cost in 2003 than they did in 1986, which is far beyond the 68% rise in the CPI in this period. (Association of Research Libraries 2004) The average expenditures for serial subscriptions for all serials (not just scholarly journals) in ARL academic libraries in 2003 are $5.46 million. (Association of Research Libraries. University of Virginia Library 2004) An estimate based on 2002 ARL data by Getz of the average total subscription cost of scholarly journals to the typical research library is $3.69 million. (Getz 2004) From 1993 to 2002, the United States Periodical Price Index shows an average annual increase in the serial subscription price of 10.7% in chemistry and physics journals, 11.12% in medicine, and 7.8% in business and economics. From 1984 to 2002, business and economics journals increased in price 423.7%, chemistry and physics journals increased 664%, and journals in medicine by 628.7%. (Albee and Dingley 2004) Irrespective of how they are measured, scholarly journal prices are high and are going up.

The irony of the situation is that, except for patentable research, all users and most scholarly researchers would prefer a system that had a much lower price. For users, the logic of free or low cost access is obvious. Perhaps not so apparent, scholars who produce research also favor free or low cost access to their research. Scholars are not necessarily beneficent; however, they seldom receive income directly from their scholarly research. They publish because (1) they receive recognition from a network of scholarly colleagues, (2) they gain advancement and promotion from their university, and (3) they derive pleasure from influencing people and advancing knowledge in their area. Thus, most would be happy to provide their research to as many individuals as possible at as

[1] In this paper our primary concern is scholarly journal research in those fields such as social science, science, and math, in which journal publication is central to the tenure and promotion process. Our consideration is based most strongly on the economics field, where we have the most direct knowledge of the situation, but we believe that most of the arguments carry through to other social science and science fields. Fields such as history or English, in which book publication is central to the tenure and promotion process, are not being directly considered in this paper, although some of the same issues apply to print books with limited demand which are heavily subsidized by universities.

low a cost as possible; the broader the research is disseminated, the more recognition they receive.

To some degree, free dissemination of research already occurs. Many scholars post their published research on their web sites, on pre-print servers or on institutional repositories that have been developed to make scholarly research broadly available. In fact, all contemporary research from now on could relatively easily be posted on web sites and made available at a small fraction of the costs of the current journal methods of distribution. But free access has not replaced journal publication and distribution. Instead, what has developed is a parallel system of dissemination in which the web posting is not a substitute for the expensive journal publication process; but instead a complement to it. If the webposting process did become widespread and institutionalized as a substitute for publishing, then we predict that it would be either be opposed by or absorbed into for-profit publishers; given that development, they would likely retain, or enforce their already retained copyrights, limiting or incorporating this alternative dissemination mechanism.[2] To the degree that these limitations allow publishers to cover their necessary costs, these limitations are reasonable, but they are not reasonable if they simply create rents for publishers and make the access to the material more difficult. The reality is that despite networking technology that would allow easy access to almost all for-profit published material, the publishing industry today too often makes research less, not more, widely available, and, in the process, raises the price of accessing it.

This irony has generated a number of initiatives, (Budapest Open Access Initiative 2002, Bethesda Statement on Open Access Publishing 2003, Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities 2003, UK House of Commons Science and Technology Select Committee 2004, and US House Appropriations Committee Open Access Plan for the National Institutes of Health 2004) and there are ongoing discussions of these issues. Groups have formed to study and advocate open access distribution, and other changes in how the dissemination of scholarly research is to be conducted and financed (See Suber 2004a, Suber 2004b and related links for the best list.). The situation will change in the next five years; the question is how.

From the considerable and ever-growing literature on scholarly communication, we focus on three points. The first is that the visionary views of cheap dissemination of published research are generally unrealistic, and impossible to achieve. Selecting, editing, and archiving research are costly, and Harnad's (1994) subversive proposal for electronic publishing, when viewed in its full complexity, is much more costly than it first appears. (Quandt 2003) William Bowen made the point nicely when he said that we "need to be

[2] Currently once an article is published, the author often gives up copyright to a publisher and the publisher to varying degrees places limitations on its distribution and dissemination of that research so that they can cover their costs and, in the case of non-profit publishers, make a profit. Even though in many cases publishers could possibly limit the practice of web posting articles, currently, most publishers give permission to the author to post their article on their website, which allows more open access. But if that posting became standard, and libraries and researchers no longer felt that it was necessary to maintain journal subscriptions, we suspect that to protect rents, the practice of scholar web posting would be strongly opposed by journal publishers.

realistic in thinking about costs and avoid the ever-present danger of believing that great things can be accomplished 'on the cheap'." (Bowen 2001) The second is that preserving research material presents serious problems and needs to be explicitly considered in open access proposals, especially institutional repositories. (Lynch 2003) The third is that there are significant price differences between for-profit and not-for profit publishers, and that the prices of journals published by university presses are much more justifiable on the basis of costs than those charged by for profit publishers. (Bergstrom and Bergstrom 2004, Bergstrom 2001)

In this paper we are not surveying the past discussion; Quandt (2003), the SPARC Open Access Newsletter (Suber 2004c) and other publications nicely survey past and current developments. The purpose of this paper is to raise two related central issues about the changes that are occurring in journal publishing that we believe the earlier literature has not sufficiently addressed. The first is the need to establish a *hard publishing constraint* in any alternative system; the second is the need for reform to concentrate not on establishing new institutions, but on *getting incentives right for scholars by having the incentives scholars face direct them to the most cost efficient outlet for their research.*

Scholarly Incentives and the Hard Publishing Constraint

The idea of a hard publishing constraint is a modification of economist's concept of a hard budget constraint.[3] *A hard publishing constraint would require that any journal published work meet minimum criteria in terms of the amount of subsidy given to the publication of the work, relative to its cost of transmission.* The idea of a hard publishing constraint is that the transmission mechanism chosen for research should reflect a real demand in the sense that the users would be willing to pay for that transmission. For example, if the cost of publishing an article in a particular medium is $15,000, then there should be a revealed demand out there willing to pay that $15,000 for those methods of dissemination. Otherwise it makes sense to use alternative, less expensive, methods of information dissemination. Our contention is that reforms to the publishing system will only work effectively to the degree that they harden the publishing constraint for scholarly research.

We further argue that many of the proposals being offered for efficient scholarly research transmission do not incorporate a hard publishing constraint, and that they therefore they will not lower the costs to universities, but will simply change how the costs are paid by universities. For example, we believe that one proposed model, scholar-subsidized open access, is precisely the wrong answer because it does not harden the publishing constraint, but may actually soften it.[4] It has researchers paying publishers to

[3] Economics is the study of constrained optimization and how agents react to various budget constraints. In studying how planned economy's tough sounding plans that incorporated hard budget constraints morphed into unsustainable systems with almost no fiscal discipline, Janos Kornai coined the phrase "soft budget constraint." With a soft budget constraint, one can balance the books on paper, but one does not "mark to market" so that the balances in the book do not require actual balances of the flows, thereby reducing the effectiveness of the budget constraint.

[4] A similar point was made by Esposito (2004).

disseminate their work, when researchers can simply post their work on the web and make it available to all at almost no cost, if efficient dissemination was their goal.

The reason researchers would want to journal publish their work rather than simply posting it on the web, has to do with the second problem that we believe any solution to the currently journal-publishing problem must deal with: getting incentives right. Researchers want to "journal publish" their work because it is only in publishing in peer review journals that they are rewarded for publishing. Only by changing that incentives can one change the system. "Print journal publishing" is the current coin of the academic realm, (although, it is slowly changing with the advent of "online peer review journals") and is the reason scholarly print journals have flourished, even as technology has made print journal publishing obsolete.[5] Scholarly journal publishing today is far less important for the dissemination of information than it previously was. Much internal scholarly interchange occurs at the working paper stage.[6] Journal publishing is primarily for establishing formal rights to an idea and archiving; journal publishing means that research has passed a peer review process, and will count as a publication for tenure and scholarly advancement.[7] Under the current incentive system, the only research that can serve the purposes of most social science or science scholars is peer review journal publication which is why journal publishing remains important. Those incentives must change if the system is to change.

Scholarly incentives in publication are important in thinking about the reform of the journal system because universities control the incentive system of academics. By changing the incentives universities can change the system. As we will discuss below, it is because universities have not adequately dealt with how technological changes have interacted with that incentive system that the current problems of journal cost to libraries have arisen. Any institutional change that does not address scholar and institutional incentives, so that it incorporates an effective hard-publishing constraint in the gate-keeping functions of scholarly research, will likely increase the expenditures on journals or simply change the side of the university that pays for the journals; with open-access it will simply shift the soft publishing constraint on journals currently existing on the demand side of journals over to the supply side, both of which are funded by the university. Library budgets might fall, but other university budgets will rise. Getting scholar research incentives right is to incorporate hard publishing constraints in the incentives. If the incentives are right, then the hard publishing constraint will be part of the system. If the incentives are wrong, regardless of the plan, the system will become inefficient and much more costly than it need be.

[5] The importance of article publication differs among fields, and we see it as no coincidence that the problem of journal pricing is most acute in those fields that emphasize journal publishing for tenure.

[6] In economics if one hasn't read the paper at the working paper stage, and are only reading it at the publication stage, you are unlikely to be part of the scholarly debate because the debate will have already moved on to different issues.

[7] The value of a publication to an academic has been studied by economists, and estimated at $500 per article, and –per citation. (DC) Each university has its own weighting system of journals, and some have 20 page statements of how to count publications in different journals, with values dependent on such issues as citations, co authorship, month of publication, words per page, and journal distribution.

What we mean by getting the incentives right is that the incentives for the type of publication chosen by a scholar are consistent with the allocation of internal credit for the most cost-efficient method of disseminating that information. Currently, scholarly research incentives do not take cost of dissemination of information into account, which creates the pressures to provide the method of dissemination that provides the highest value to the scholar. Efficiency of transmission requires a price to be faced by both demanders and suppliers of research reflective of the cost of transmitting that research so that authors of research provide it in the most cost effective manner.

The system must incorporate some mechanism that insures that, for a journal to be published, there are a minimum number of people who would actually be willing to pay to have access to that research in a published print journal, and that university libraries should not be the primarily source of journal revenue.[8] The system must insure the existence of a demand for the research being published that is separate from that created by the university tenure system itself to publish. As we will discuss below, we believe there are a number of steps that colleges and universities can take that would harden the publishing constraint and provide scholars with more effective incentives.

The advantage of user-based methods of paying for gate-keeping of research is that they add at least a minimum hard budgeting constraint on research. Fifty years ago, there was a very hard publishing constraint, as the physical costs of journal publication and dissemination were comparatively high. University presses, university owned journals, university sponsored journals, and association sponsored journals developed to reduce that constraint, and partially subsidize the publication costs of the journals. However, over time technological change has reduced the costs of publishing significantly, and, as it has done so, has reduced the hardness of the publishing constraint. Moreover, by accepting a system of differential pricing of journals for individuals and libraries, universities have further softened the publishing constraint since publishers could recoup most, or all, of their publishing costs simply through the sale of high cost university library subscriptions, which may or may not reflect an effective demand for their research at the price that the journals charge. Lower costs led to more journals, which led to more profits, which led to more journals, which further softening the publishing constraint.

Although the previous work on the efficient transmission of scholarly research distinguishes between the journal open access and institutional repositories, there is an assumption that published peer reviewed research will be provided through the current journal system, open access or otherwise. We believe that assumption is inappropriate. The current journal system is not transmitting scholarly research efficiently in the way that it did previously. Creating a new model for the scholarly publication is central to the issue of reform of the scholarly information transmission process. Journals may be this vehicle, or they may not be, but if they are, the role they actually are fulfilling is the role

[8] We are not saying that the other research should not be done, or that it should not be made widely available; all we are saying is that the dissemination mechanism should not be high cost journal publication in its current form.

that they should be the only role that they are paid for, and the publishers of those journals should not extract large rents from universities for playing that role.

Should the journal system of distribution survive, one likely outcome of adding an effective hard publishing constraint will be the reduction in the number of journal based, publications. Such an outcome, we argue, will be for the best, and will not result in inefficient scholarly transmission of research, since all university researchers have an alternative dissemination alternative—posting their research on the web, through self-archiving, pre-print or post-print servers, or institutional repositories, making it available to all. If scholars receive institutional credit for doing so through self-archiving, then the item may never be published as a journal article, but still play a role in the scholarly debate. Scholars do not need journals for information dissemination; they need journal-like functions for institutional or peer-review gate-keeping. Journals sort and rank research, placing their stamp of approval on published work.

Another likely effect of adding an effective hard publishing constraint to scholarly research process would be the development of a multiple tier, peer review system of scholarly research dissemination. The distinctions between the tiers would include the cost, the rigor of peer review, the weighted value toward tenure or prestige, the means of dissemination, the value-added access, and the level of formal stewardship, preservation, and finally archiving that the work receives. The higher the tier, the greater degree of formal archiving.[9] We would expect that the archiving process of various tiered research will itself likely develop and evolve, driven by the market, the hard constraints, and incentives. Thus our vision of the future is a multiple-tiered system—the highest tier might involve a system of comparatively few, relatively high cost, most likely online, refereed journals. But even these would have lower prices to universities than most for-profit journals do at present.

For the top tiered journals we do not see a large change. These top tiered journals will likely be university site license financed, and the library will still handle the subscriptions. Vendors will offer all of the highest tier journals in a bundled package for a site license prices, with an appropriate surcharge for the convenience. The change will be that these top-tiered refereed journals will be more association, individual, or reader (and less university library subscription) financed, and that, while not published on the cheap, will not include large rents that serve little purpose in the system. What we picture as top tier journals are ones such as those published by scholarly associations, such as the American Economic Association. These journals will work in essentially the same way they do now; they may initially have limited access to non-members upon initial publication, but will likely have broader access soon thereafter through institutions such as JSTOR. It is the very high priced to libraries for-profit journals that we see being replaced with alternative transmissions mechanisms.

Lower tiers of research might reside of a system of institutional repositories for the management and dissemination of digital materials created by institutions and its

[9] Even the lowest tier peer reviewed research could be archived, although the necessity to preserve it for all times will be less compelling.

members. These institutional repositories would make digital scholarship available and would preserve it. (Lynch 2003). Lower tiered research might also include pre-print and post-print discipline-defined servers for working papers or published materials, such as RePEc and similar organizations. But these types of distribution systems only reduce the costs if they do more than add enhanced functionality and service to the existing journal-publishing model; they reduce costs only if they replace portions of it. Ultimately we see formal preservation of this research, if there is any, will be more scholar, and university based, and less journal based, although the two archiving methods may overlap.

How We Got to Where We Are

One of the lessons of political economy is that technological change modifies the roles of institutions, but that these institutions often resist change in order to protect the income flows earned under the previous technology. In our view that is precisely what has happened with journal publishing, and in the case of for-profit publishers their current role is inefficient. The for-profit publishers structure the system so that it creates rents for themselves, not so that it promotes the efficient transmission of research. We do not blame for-profit publishers for this development; their job is to make profits. The blame, we believe, lies on university administrations, which have allowed this situation to develop and to grow. Universities that have subsidized the expansion of print journals through large expenditures on both the supply side--universities, not journals, have borne much of the gate-keeping costs--and the demand side--universities pay large fees for journals that far exceed the price that individuals pay for that same journal. Given that both the supply and demand are heavily subsidized, the expansion of for profit journals and the exploding library budgets were inevitable.

The primary reason for the inefficiency that currently exists in scholarly research dissemination is technological change, which has impacted the process on two different levels. Publishing costs are reduced, as are hard budget start-up costs for new journals, creating the opportunity for rents. The authoring of articles is easier, faster, and cheaper, creating the opportunity for increased output by the scholar, and the incentives for starting new journals. In fact, in an effort to leverage declining production costs with the increased value to the users of the networked journal through Metcalfe's law, publishing institutions are now actually slowing the research transmission process, and increasing the costs of distribution of that research by placing legal impediments to its efficient transmission and storage. They do so in an attempt to guarantee the income streams that the previous technology enabled. As we stated above, currently most research can be easily disseminated via the web. Because of the new web technologies, journals serve little purpose today, other than gate-keeping.

To push the argument further, many journals are not effectively serving their gate-keeping function either; they are making it far too easy for scholars to disseminate their knowledge in an inefficient method, simply because that method is what creates value for the scholar. This ease of publication creates a serious externality for librarians because it means that they must formally create access to, store, and preserve much more research

than is efficient.[10] The reality is that for-profit publishers only care about the gate-keeping function of the journal as it relates to making a profit. The two issues are quite different, and the goal of reform of the journal publishing process should be designed to better equate the two, so that the incentives in the system guide publishers of journals to add more value to the process, and to extract less rent for their services.

It was not always this way. Initially journal publishers served an important role; they provided more efficient transmission of research than otherwise would have been the case by removing the mundane typesetting and distribution issues from scholarly researchers. The budget constraints of publishing were so hard that when many of the more established journals first developed, they were priced at cost or below because university presses or universities subsidized them. There was no profit to be make, and hence no for-profit publishers. However, over time, technological change and economies of scale have lowered costs significantly in almost every aspect of journal publication; including copy preparation, composition, printing, binding, short-run manufacturing, marketing, distribution, and the office workflow of journal publishers.[11]

As technology has advanced, unit costs of the process fell. Moreover, many of the technological developments also moved costs from the publisher to the scholar and to the university who provides services for the scholar, further reducing the hard publishing constraint. For example, universities bought word processing software for scholars making it possible to provide camera-ready copy to publishers. Even a complicated paper involving many equations and symbols can be submitted by the researcher in a form that requires little additional work by publishers. Technology has removed a significant reason for much of the high price of math journals, yet the journal prices paid by libraries of these technical areas did not fall, but actually increased significantly. The reality is that with modern word processing programs, researchers can provide almost publishable copy to publishers, so there is little additional work that they have to do. We are not saying that the preparation of these papers is not costly; we are simply saying that the high costs of the journal preparation have been shifted to universities, which support the hardware and software for scholars, provide IT staff support, in addition to supporting the labor necessary to prepare camera ready copy, whether by the researcher or by administrative support staff.

In the process, however, for-profit journals took control of gate-keeping. The editorial boards of journals, assembled by journal publishers, decided what was published; their endorsement of the research, through publication, became an important determinant of quality. Based on that role, journals became built into the institutional tenure and promotion structure of universities in those fields where transmission of ideas is primarily through short articles, rather than through books. The gate-keeping

[10] Librarians are trained to provide access to information that scholars have decided is worth preserving; their job is not to be an arbiter about what is worth preserving in an absolute way.

[11] Some of the major changes were the introduction of reprography with the Xerox 914, word processing for authors of articles, the ability and finally the demand for camera ready text in copy preparation, electronic photocomposition that replaced in-house Linotype and Monotype machines, and then was outsourced to printing houses, and finally the Internet and the web, which has completely altered the most efficient distribution methods of many smaller-read journals.

function—deciding what is good research, and massaging the submitted research so that it is clearer and in good form—is expensive. Estimates of first copy costs are about $2,000-$4,000 per journal article (Bergstrom 2001, Getz 2004, Odlyzko 1999) depending on the number of pages, but go as high at $13,000 per article (Siegfried 2003). But with many of the non-association journals produced by for-profit publishers, this gate-keeping function is primarily paid for by academics and academic institutions, not by the for-profit journal publishers. The reason is that journal publishers are not the actual gatekeepers of content; they simply organize an editorial board and reviewers generally composed of academics who perform that function, often either for free, or for far below the cost of actually providing that service in a business market.

Let's consider a hypothetical example of a small journal of a for-profit publisher. (Willinsky 2003 does a similar exercise for a quarterly journal published by a non-profit, scholarly association.) The editor of that journal might receive $20,000 a year from a publisher. Let's assume that the job represents half time work—($60,000), that the office space supplied by the university has a value of $20,000, and that administrative support for manuscript preparation, copyediting, compositing, and proofing provided by the universities costs about $25,000. In addition, there are the reviewers, who supply their work for free, but who would have an implicit cost of $45,000 (assuming 300 articles received for reviewing (30 accepted) with three reviewers each at $150 a review.) Assume also that the publisher has additional costs of say, $20,000 in organizational costs, and another $10,000 in general overhead costs associated with the gate-keeping costs.[12] With these numbers, which we believe are representative of small journals, the publisher pays about 28% of the gate-keeping cost, with the university and academics already paying the rest.[13]

Gate-keeping costs pertain in both the print and online environments, and today these gate-keeping costs are the primary cost in the publishing a journal. Fifty years ago, the gate-keeping costs were relatively less important since there were also high composition, print and distribution costs. It was these high costs that initially created the hard publishing constraint, and limited the number of journals, because the journal had to cover these print and distribution costs above and beyond the subsidized gate-keeping costs. Over the past 40 years the composition, print, and distribution costs have fallen, first through technology-driven lower print costs, and then through the publisher leveraging of network technology such as the online transmission of unfinished manuscripts. As these costs have fallen, the number of journals has increased since the hard constraints that these print and distribution costs imposed on journals, and hence on the scholar, have decreased. In that sense the problem is not new, the Internet has simply made it more apparent and obvious. As publishers have discovered that libraries would further subsidize their costs through differential pricing, the number of journals has increased substantially.

[12] These gate keeping costs are the largest percentage of the publishing costs. For on line journals the distribution costs are extremely low, and for print journals, the print and distribution changes are $5 to $10 a journal depending on the print run and the size of the journal. With a journal with a print run of 600, that would amount to $3,000 to $6,000, which is far below the actual gatekeeping costs.

[13] These numbers for gate-keeping costs also give a sense of what we mean by a hard publishing constraint. The higher the percentage the publisher pays, the harder the publishing constraint on the scholar.

In a highly competitive market, the fall in costs for publishers would mean that prices of journals would decrease significantly, and that new means of distributing research would replace the technically obsolete methods. But, as we stated above, that has not occurred; instead there has been a proliferation of print journals (the number of journals has doubled since the 1980's) and higher prices of almost all journals to libraries.[15]

Archiving is another aspect of the publishing process that is being affected by technological change. During the era of the analog journal, universities made enormous investments in collecting, collating, binding, housing, providing shelf space, creating on- or off-campus storage, and then providing access to or retrieving the print journal. Now, in the era of the digital journal, universities are doing it again. Having funded campus networks, provided digital storage, IT staff support, web servers, and other networked technology, these same universities are being pressured through the establishment of institutional repositories to solve the problem of preserving and archiving of scholarly research in digital form. (See, for example, Create Change http://www.createchange.org) Although it is true that the transition to electronic journals will reduce the cost of such library expenses as selection, accessioning, cataloging, and access to journals as compared to print expenditures (Schonfeld and others 2004), infrastructure overhead and preservation costs must also be counted. MIT's DSpace ™ institutional repository system, designed to capture, distribute, and preserve the intellectual output of the university, is being adopted by numerous institutions (http://dspace.org and Smith 2003). Outside of the US, institutional repository and self-archiving initiatives are even more active. The GNU Eprints, an author/institution self-archiving open source software developed at the University of Southington, has been adopted by over 100 institutions (http://celestial.eprints.org/cgi-bin/eprints.org/graph). Through these and other efforts, universities are being lobbied to create and preserve open access to either the digital intellectual output of the university or at least to the peer-reviewed research output.

The commitment to preservation of the archived materials varies. For example, the Eprints Handbook states that:

> If you are worried about the preservation of the online version, it is to its publishers and subscribing/licensing librarians that your worry needs to be

[15] From 1993 to 2002, the United States Periodical Price Index shows an average annual increase in the serial subscription price of 10.7% in chemistry and physics journals, 11.12% in medicine, and 7.8% in business and economics. From 1984 to 2002, business and economics journals increased in price 423.7%, chemistry and physics journals increased 664%, and journals in medicine by 628.7%. (American Libraries http://www.ala.org/ala/alonline/selectedarticles/usperiodicalprices2002.htm)[15] Ulrich's Periodical Directory lists over 22,800 scholarly/academic refereed journals in its database (Ulrich's Periodical Directory 2004).

> addressed. The preprints and postprints that are being self-archived by their authors in their institutional eprint archives today are intended to maximize impact by providing immediate open access; they are merely open-access supplements to that toll-based primary literature at this time, not substitutes for it. (http://software.eprints.org/handbook/preservation.php)

On the other hand. DSpace™ outlines different levels of preservation, and at the minimum commits to bit-level preservation, ensuring that a file will remain exactly the same over time, while specifying functional preservation for known formats, so that users of the future will be able to read the information (http://dspace.org/faqs/index.html#preserve). It is likely that for what we call Tier 1 research, the DSpace model for attention to preservation will prevail, and as the value of the material in the institutional repositories increases, an increased commitment to preservation will be required.

Nonprofit and For-Profit Publishers

With the decrease in costs caused by the technological changes, and with much of the publishing overhead now assigned to the university budget rather than publisher's expenses, journal publishing has become a profitable venture for for-profit publishers. Increasing the number of journals is desirable for for-profit publishers because it gives them more profits. Under the current incentive system it is also desirable for scholars because it gives them more possibilities for publications, softening their publishing constraint. Scholars have an incentive to have as many publishing outlets for their research as possible. In the short run, increasing the number of journals per researcher in the field softens the publishing constraint on the researcher, and thus is desirable for researchers. But in the long run, it does not; it simply creates "tenure publication inflation"; the number of publications required for advancement increases. To soften the journal publication constraint, researchers need an ever-increasing number of journals; it is a circular process that feeds upon itself. Today the same colleges and universities that in 1950 required one journal publication for tenure now often require seven or eight.

Lowering the journal production costs undermined the hard publishing constraint that previously kept the bar high in the gate-keeping function performed by scholarly journals. Universities, which are the largest demanders of research, condoned the process by subscribing to journals through their designated instrument of egalitarian distribution and open access, the library. As for-profit journal publishers discovered that they could lower the bar further by differential pricing—charging libraries much more than individuals—they created more journals and the already softened publishing constraint was further softened.

From the publisher's point of view, the decreasing production costs could have been passed on to libraries, or could be used in subsidizing the creation of more journals, in selling those journals to researchers and libraries, and in protecting their copyrights. For the most part for-profit publishers have followed the latter strategies, especially in those fields where journal publication is emphasized for promotion. For-profit publishers provide seed money to various academic groups, handling many of the technical issues

with publication, and another journal is born, destined to become part of the publisher's bundle that they will provide to university libraries with a site license. From the for-profit publisher's perspective such journals are investments in the future, which will be heavily subsidized on both the supply and demand side, and will therefore provide a continual flow of profits to the publisher once the journal is established and becomes part of the tenure process. Publishers have further discovered that the initial establishment of the journal can be nurtured by bundling the new journal with older established journals, thereby expanding the package they provide libraries, and providing a justification for the increasingly high prices they charge.

There is no shortage of editors or editorial boards for these new journals, since being on the board gives scholars what they value most—access to publication and to the gate-keeping function. Thus the new journals have editorial boards, editors, issue editors, and a peer reviewing process that meets university's criteria for research. Initially they may have low rejection rates, but with the pressure on scholar researchers at varying levels for publications for tenure and promotion, they often, generally after about five to ten years, have a high rejection rate and a solid footing in their particular subfield.

We are not saying that these journals are second-rate; often the only difference between a new journal and a more established Tier 1 journal is that one is established, and the other is not. Many of these new scholarly journals are extremely high quality, and in many cases with more interesting research than many established journals. They reflect exciting research; they foster new developments in subfields of a discipline; they allow alternative points of view to be expressed, and they sow the seeds for future developments in the field.[16] So we are strongly in favor of the dissemination of the research being done in these journals. Our only point is that these journals should not be as heavily subsidized on the demand side or the supply side by universities as they currently are. In today's technological environment interesting ideas can become part of the debate through less costly means, and the incentives in the system should be for scholarly researchers to use the most efficient transmission mechanisms.

For profit publisher are adapting and have structured their business plans so that they can maintain as much in rents as possible within the changing technology. The typical business plan involves leveraging their historical gate-keeping function into a rent-protecting system of intellectual property, licensing, subscriptions, and other constraints on distribution. They are combining large packages of titles, and providing database search engines, author citation counts, additional content in methods and materials addenda, and usage metrics, to university libraries. While these additional services are useful, in terms of the relative costs of the entire process, they are minimal, and the functions could easily be replicated by universities themselves. The reality is that the universities are already providing the large majority of the gate-keeping costs free to

[16] There are, of course, quality differences among journals, and librarians can identify publishers who are simply jumping on the latest fad, and are not committed to establishing quality journals. That is not our argument here, but to the degree that the new journals are not quality journals, our argument is strengthened.

publishers, who then charge universities, through their libraries, for those services. The result is huge rents that go almost entirely to the publishers.[17]

Librarians and library science researchers have most openly recognized the problem because library budgets are the part of the university operating expenditures have been bearing much of the costs of the distribution process. Libraries simply reflect the derived demand for the scholarly research. Libraries subscribe to what the university scholars say they need for teaching and research, limited only by the library's budgets as determined by university administrators. It is for that reason that journal pricing cannot be seen as a library issue; it is a university administration issue that in integrally tied in with the entire scholarly enterprise. Reform of both must occur simultaneously. What has happened is that for-profit publishers have, quite naturally, used the diverse needs of the various university constituencies to create rents for themselves, since no one was considering the issues from an overall perspective.

There is a reason universities have allowed the system to develop. Although universities are non-profit, they are highly competitive. They want their scholars to produce scholarly research, since it is an important evaluative measure. A large number of scholarly publications helps to advance scholars and also helps the prestige of the university. Producing scholarly research is one of university's missions. In the competitive university arena journal publication enhances the prestige of faculty, achieves recognition by a network of scholars, and influences people. For the university, these are all good outcomes. The argument can be made that universities are committed to the present system, because by supporting ever increasing publication, the institution is accomplishing its narrower goal of improving its competitive position with other universities, or at least not falling behind. Increasing the journal publication output of its faculty makes it easier for universities to acquire grant funds, since granting agencies consider the researcher's past publications as an important criterion in funding a grant proposal. Thus, though their financial support, the university, as well as research scholar, is complicit in the development of the current system. The universities are purchasing prestige by supporting a scholarly communication process that maximizes the number of journals regardless of the costs of those journals. So in the short run the universities are receiving value for their expenditures. Otherwise they would not have allowed the system to continue.

Competition among universities can lead to the short-term goal of increasing publications to enhance prestige and other limited goods relative to other colleges and universities. However, long-term, increasing the quantity of expensive publications is unlikely to serve the purposes of the colleges and universities. In the long-term publication expectations increase for all faculty and universities, and the relative positions of the universities in the marketplace remain relatively unchanged. So, what in the short term makes sense, in the long-term does not. For-profit publishers recognized this difference between the short term and the long term interests of universities and built their journal business plan to take advantage of the short-term incentives, and to try to

[17] These will not necessarily show up in profits, because they can be used up in X-inefficiency, capitalized into the costs, devoted to protecting its monopoly, or providing funds to invest in new journals.

insure a flow of rents to themselves even as technologies in large part make them less relevant.

A blunt way to make put our argument is that, because of the subsidies on both the demand and supply side of the publishing process, there is far too much formally journal published research, which exists only because its production, its transmission, and its consumption are highly subsidized. Not only do universities pay to develop the research, they also pay to publish and disseminate it. It is this latter subsidy that we are arguing that universities should reduce. Our argument is that with today's technology, academics can informally provide their research to others on their university web sites at little cost. Today, researchers get little credit for such informal publications, and that, we argue should change. Academic credit should be given for all types of research—formal and informal. Universities should reconsider the entire gate-keeping role for research.

To demonstrate what we mean by changing incentives, let us consider an alternative tenure and promotion system—one that emphasized blind reviewing. Under this system all research would be presented to tenure evaluation committees without pedigree as to where it was published. The review would thus be blind in the same way that refereeing in peer review journals is supposed to be blind. When a scholar comes up for tenure or promotion, the scholar could present his or her research in a standard form that eliminates its means of dissemination, allowing it to be judged solely on its merit. Our argument is that were such an alternative tenure and promotion evaluation process in place, the journal publishing system would be much smaller and fundamentally different than it currently is. Because formal journal published research would be stripped of its role in the tenure and promotion process, the number of journals would shrink enormously, and the gate-keeping role of journals would be changed to one that is useful to researchers, not to the professor. The journals would be performing their gate-keeping function—telling the reader that, according to the editors, this research is especially worth looking at, but since journal publication would no longer be useful to the scholars in the tenure process, they might even start demanding payment to be published in the journal in the same way that they receive payment for consulting.[18]

Responses to the Journal Pricing Issues

The responses to the problem of journal pricing to date have taken several forms, although none focusing on hard publishing constraints or changing the incentives. One response is the proliferation of pre-print servers or gray literature. The technology of the web has enabled a number of pre-print servers to make technical reports, working papers, business documents, and conference proceedings available to all, even those not in the knowledge flow for a particular subspecialty. In the spirit of open access to pre-peer reviewed publications, these papers are indexed, abstracted, and are available full text within such pre-print environments as RePEc, Research Papers in Economics, (http://www.repec.org) and SSRN, Social Science Research Network, (http://www.ssrn.com/), although earlier efforts were in the sciences and government

[18] We would not expect such a proposal to actually be feasible, but it is useful to keep in mind in order to separate out the scholar's need for journals and the reader's need for journals.

technical reports. To date the accumulation of pre-print servers does not seem to have affected the transmission of scholarly knowledge through journals, but has remained an added-value service for scholars and students, especially for those who would not have otherwise had access to the network of collegial distribution.

A second response has been proposals for open access journals. Peter Suber, in a discussion of open access definitions in the *SPARC Open Access Newsletter*, #64, defines open access literature as online, free of charge, and free of most copyright, licensing and permissions restrictions. A number of initiatives are actualizing the open access process; these are surveyed by Suber in his *Guide to the Open Access Movement*,

Open access is something most people can support; the question is how to pay for open access. There are a number of possible models, most of which are described in the Open Society Institute's *Guide to Business Planning for Launching a New Open Access Journal*. The methods include author submission or publication charges, article processing fees, offprint sales, advertising, sponsorships, journal publication in off-line media, electronic marketplace, dues surcharge, grants and contributions, and partnerships. Many of these models depend upon the university or grant funding organizations, the author-pays model the most obvious example.[19]

One possible outcome of the open access journal model would recreate all of the aspects of digital journal publication process including copy preparation (provided by the author), uploading to pre-print server, composition (Open Journal Systems software), printing (omitted), binding (omitted), short-run manufacturing (first digital copy - OJS), marketing and distribution (through pre-print servers, post-print servers, Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH) compliant institutional archives and OAI compliant search engines), and the office workflow of journal publishers (Open Journal System software). Archiving, never a commitment of the commercial publisher, would be accomplished by the OAI compliant institutional archives, the university thus solving one of the primary criticisms of the commercial journal publishers for them. In this model, the university would support almost aspects of processing and labor costs, recovering some indirect costs through grant finance and administration for those articles written with federal grant sponsorship.

Such open access methods may well have unintended consequences, benefiting the for-profit publisher. Any open access system is open to all, including for-profit publishers. If the for-profit publisher incorporates access to open access repositories and journals into its suite of for-profit, closed access journals, it will create a value added aggregation that open access repositories or journals alone cannot match. The for-profit publisher may then justify its price to universities by adding value to open access, especially if open access carries concealed costs which only gradually become apparent. As Esposito states, "OA [open access] is a paradise – for publishers. Expenditures will rise and fleet-footed publishers will profit from this." (Esposito 2004)

[19] It is likely that most commercial publishers will permit some sort of post-print archiving, as long as it does not develop as a substitute for the journal.

Toward a Solution

Our consideration of the problem in this paper does not lead to any pre-determined solutions, but it does lead to a set of ideas that we believe any solution should keep in mind. Specifically, it suggests that any solution must include incentives for scholar researchers that they embody reasonable hard publishing constraints that encourage the efficient transmission of scholarly research. An effective hard publishing constraints would mean that much scholarly research will never be formally journal published, but will simply be made available on the web for all to see. Some method of giving research credit to scholars for such information dissemination needs to be developed if that is to happen. There are a variety of forms this could take, and we believe a discussion of such ways is an important component of the solution. These changes will lead to changes in journal pricing and use; if these changes are not made, then any reform will be unlikely to be successful.[20]

One set of methods would be the development of new top-down gatekeepers—editorial ranking boards, paid for by universities or scholarly associations, who sift through the informally published research, and choose articles to be archived and kept, and moved into a "best of the research" website that would be formally archived. Associations could establish reviewing boards that would judge a scholar's work when they come up for tenure. Another set of methods could be built on bottom-up gate keeping, that is, a ranking of links and visits to a particular research paper. Digital archives and electronic aggregators can provide libraries with far more information about the use of digital resources than was ever possible for print. Harnad and others (2003) propose that the university's eprint archive can be used to develop measures to assess research productivity. With these measures scholars and librarians will be able to more clearly distinguish the importance of various publications to their clientele. Eventually, this bottom up gatekeeping function will likely be incorporated into a journal publishing system, with articles that meet some access related index being published in a book or "Best of the Web" Journal that would be permanently archived We suspect that the final system that develops may be a combination of these two types of methods, and that the movement toward these alternative ranking systems will involve political fights and academia faces the dragon that it normally hides—how to evaluate scholar's work.

We do not claim to have the answer to these difficult political questions. Our argument is simply that these questions are intricately involved with the journal-pricing problem. High cost journals have been allowed to develop precisely because they permitted universities to avoid facing difficult questions. Universities must face up to the fact that many of the reasons for university-subsidized distribution of research are gone

[20] In thinking about the variety of ways in which incentives can be given for web disseminated research, each with its own political difficulties. In thinking about these it is important to be cognizant of Lynch's warnings that "Campus administrators, librarians, and faculty members wishing to challenge existing systems of scholarly publishing (specifically their economic models and their creation of barriers to access through intellectual property control and licensing arrangements) may try to link their efforts too directly to institutional repositories by imposing inappropriate policy constraints upon the repository services."(Lynch 2003)

and that today, journals exist too much for their tenure gate-keeping functions—not the efficient transmission of information gate-keeping function. If journals are to serve their efficient transmission of information function best, their monopolistic role in the academic tenure and promotion process needs to be reduced, and their previous role—guiding readers to determine what is worth reading, and what is not—needs to be reestablished.

The library too will have a new role as these questions are answered. Libraries will have to decide how they will collect, organize and present each tier of research. It is likely libraries will become involved in institutional repositories or university self-archiving initiatives as their role as the financial police on the demand side of university-funded research publication changes. It is unlikely that libraries will vanish from the university scene as digital information becomes defined by university site licenses, institutional repositories, and open access. Preservation and archiving of digital materials need advocates, and libraries are the logical choice. (Smith 2003) The new digitally based information structures will have to be integrated with new digital learning environments. Metadata standards and content will become as important as the library catalog was to the analog library. Libraries and librarians have the opportunity to redefine acquisitions, cataloging, access and storage within their traditional missions of supporting teaching and research, as the scholarly communication system adjusts itself to technology.

Conclusion

Let us conclude with a variety of ideas that we believe help incorporate appropriate incentives into scholar publishing decisions, and which we hope start a debate that will lead to reform of the system.

- All university subsidies of per page charges for publication of articles should be eliminated. Scholar subsidies of such publication will be strongly discouraged, and would have to be reported to tenure committees. Any research that requires a per page charge by the scholar should be disseminated through other means.

- Universities should limit the amount of outside gate-keeping done by its scholars unless that work is paid, possibly in the form of reduction in the costs of journals to the university from that publisher. This would include work on editorial boards, in reviewing, or in other editorial functions, since that work takes away from their teaching duties.

- Universities and grant-giving institutions should develop standard copyright agreements for research done with their support that maintain primary copyright access through the university or scholar, not with the journal. This would be enforced by universities only allowing scholars to count as publications for tenure work that is published in journals that accept the university's copyright requirement. University copyright requirements could allow open Internet access through institutional

repositories to their research six months (or some agreed upon time) after formal publication.[21]

- Universities should require that any research published in journals that cost greater than some amount per standard journal page, would not count for tenure. Such an announcement by a major set of universities would quickly serve as a limit on what journals would charge. If the publishers do not meet these requirements, the editorial boards can simply move the entire operation to another publisher who will, as happened with the European Economic Association, where the entire editorial board from a for-profit publisher and moved a university press. The journal had a new name, but otherwise was the same.

- Universities should limit the price discrimination between libraries and individuals to no more than 100%, so that library subscriptions cannot be priced at more than twice the individual rate.

Many other rules or incentives are possible, and our argument in this paper is not that any one of these should be adopted. It is only that any reform has to link the scholar's incentives for dissemination with efficient costs of dissemination if it is to have a hope of lowering costs. Unless university administrations make a concerted effort to deal with the allocation of the rents involved, the for-profit publishers will change whatever system develops into one that lowers their costs even more, puts more costs on universities, but does not make the research as efficiently transmitted as it could be, or which continues to move unrecognized expenses to the university without university input or control. It is only by specifically considering the incentives for researchers, and facing the hard political questions about how research is to be evaluated for the tenure and promotion process that universities and research-supporting institutions can positively influence that transition.

[21] According to the RoMEO Directory of Publishers, over 80% of all journals from over 55% of the journal publishers permit self-archiving, either pre-print or post-print (Harnad 2004, http://www.ecs.soton.ac.uk/~harnad/Temp/Romeo/romeosum.html).

References

All web links were checked September 3-10, 2004.

Albee, Barbara, and Dingley, Brenda. (2004) U.S. Periodical Prices – 2002. *American Libraries.* http://www.ala.org/ala/alonline/selectedarticles/usperiodicalprices2002.htm

Association of Research Libraries. (2004). Monograph and Serial Costs in ARL Libraries, 1986-2003. http://www.arl.org/stats/arlstat/graphs/2003/graph2_03.xls

Association of Research Libraries. University of Virginia Library. (2004). Summary Statistics. http://fisher.lib.virginia.edu/cgi-local/arlbin/arl.cgi?task=setupstats

Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities (October 22, 2003) http://www.zim.mpg.de/openaccess-berlin/berlindeclaration.html

Bergstrom, Carl T. and Bergstrom, Theodore C. (2004) The Costs and Benefits of Library Site Licenses to Academic Journals. *PNAS* 101(3): 897-902. http://repositories.cdlib.org/ucsbecon/bergstrom/2004A

Bergstrom, Theodore C. (2001) Free Labor for Costly Journals. *Journal of Economic Perspectives* 15(4): 183-198. http://www.econ.ucsb.edu/~tedb/Journals/jeprevised.pdf

Bethesda Statement on Open Access Publishing. (June 20, 2003) http://www.earlham.edu/~peters/fos/bethesda.htm

Bowen, William G. 2001. The Academic Library in a Digitized, Commercialized Age: Lessons from JSTOR. http://www.jstor.org/about/bowen.html

Budapest Open Access Initiative. (14 February 2002). http://www.soros.org/openaccess/

DSpace™. (2004). Massachusetts Institute of Technology. http://dspace.org

Esposito, Joseph J. (August 2004). The Devil You Don't Know: The Unexpected Future of Open Access Publishing. *First Monday* 9(8) http://firstmonday.org/issues/issue9_8/esposito/index.html

Getz, Malcolm. (2004). Open-Access Scholarly Publishing in Economic Perspective. Department of Economics. University of Vanderbilt Working Paper No.04-W14. http://dspace.library.cornell.edu/handle/1813/177

GNU Eprints. (2004). University of Sothington. http://eprints.org

Harnad, Stevan. (1994). Scholarly Journals at the Crossroad: A Subversive Proposal for Electronic Publishing. http://nvv.arl.org/scomm/subversive/sub01.html

Harnad, Stevan; Carr, Les; Brody, Tim; and Oppenheim, Charles. (2003). Mandated Online RAE CVs Linked to University Eprint Archives. *Ariadne* 35. http://www.ariadne.ac.uk/issue35/harnad/intro.htm

Lynch, Clifford. (2003). Institutional Repositories: Essential Infrastructure for Scholarship in the Digital Age. *ARL Monthly Report* (226): 1-7. http://www.arl.org/newsltr/226/ir.html

Odlyzko, A. M. (1999). The Economics of Electronic Journals. In Ekman, R. and Quandt, R E. (Editors.), *Technology and Scholarly Communication.* Berkeley, CA: University of California Press. pp. 380-393.

Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH). (2004). http://www.openarchives.org/OAI/openarchivesprotocol.htm

Open Society Institute. (2003) *Guide to Business Planning for Launching a New Open Access Journal*. 2nd Edition http://www.soros.org/openaccess/oajguides/html/business_planning.htm

Public Knowledge Project, Open Journal Systems. (2004) http://pkp.ubc.ca/ojs.

Quandt, Richard E. (2003). Scholarly Materials: Paper or Digital? *Library Trends* 51(3): 349-375.

RePEc, Research Papers in Economics. (2004). http://www.repec.org.

Schonfeld, Roger C.;, King, Donald W.; Okerson, Ann; and Fenton, Eileen Gifford. (2004). Library Periodical Expenses: Comparison of Non-Subscription Costs of Print and Electronic Formats on a Life-Cycle Basis. *D-Lib Magazine* 10(1) http://dx.doi.org/10.1045/january2004-schonfeld

Siegfried, John J. (2003). Report of the Treasurer. *American Economic Review* 93 (2): 482-3.

Smith, Abby. (2003). *New-Model Scholarship: How Will It Survive*. CLIR Report 114. Washington, DC: Council on Library and Information Resources.

Smith, Mackenzie and others (2003). DSpace: An Open Source Dynamic Digital Repository. *D-Lib Magazine* 9(1) http://dx.doi.ort/10.1045/january2003-smith

SSRN, Social Science Research Network. (2004). http://www.ssrn.com/.

Suber, Peter. (2004a). *Guide to the Open Access Movement*. http://www.earlham.edu/~peters/fos/guide.htm .

Suber, Peter. (2004b). Open Access Overview. http://www.earlham.edu/~peters/fos/overview.htm

Suber, Peter. (2004c). SPARC Open Access Newsletter. http://www.earlham.edu/%7Epeters/fos/newsletter/archive.htm

Ulrich's Periodical Directory. (2004). R.R. Bowker. http://ulrichsweb.com

United Kingdom House of Commons Science and Technology Select Committee. (2004). http://www.parliament.uk/parliamentary_committees/science_and_technology_committee.cfm

United States House Appropriations Committee Open Access Plan for the National Institutes of Health. (2004). http://appropriations.house.gov/index.cfm

Willinsky, John. 2003. Scholarly Associations and the Economic Viability of Open Access Publication. *Journal of Digital Information* 4(2): article no. 177, 2003-04-09. http://jodi.ecs.soton.ac.uk/Articles/v04/i02/Willinsky/