

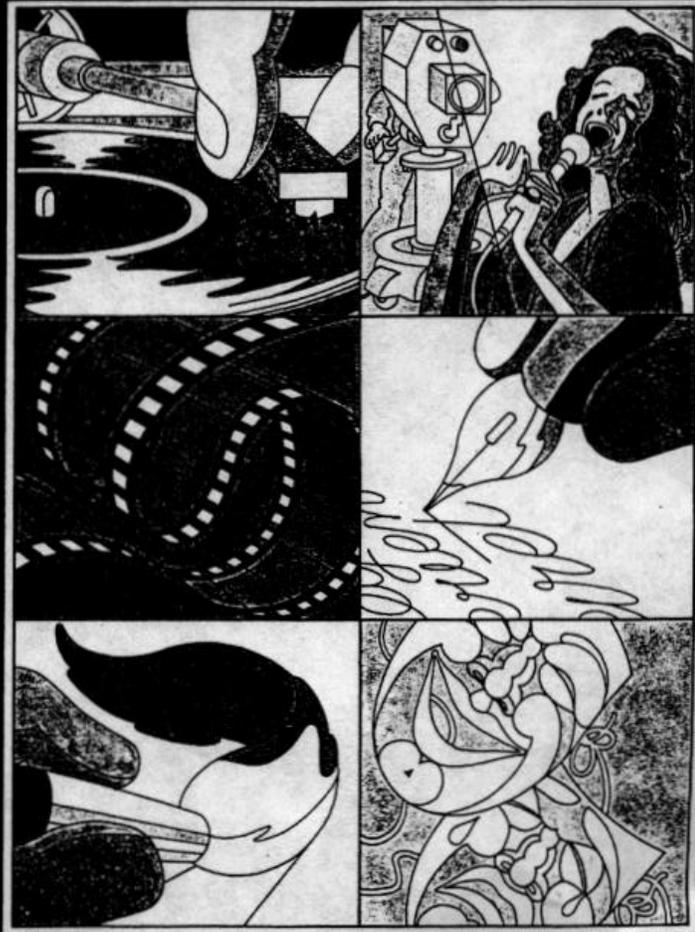


Consumer and
Corporate Affairs
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The Impact of Reprography on the Copyright System

S. J. Liebowitz



THE IMPACT OF REPROGRAPHY ON THE COPYRIGHT SYSTEM

S. J. Liebowitz
Department of Economics
University of Western Ontario (Now University of Texas at Dallas Management School)

Copyright Revision Studies

- A. Research and International Affairs Branch
- B. Bureau of Corporate Affairs
- C. Consumer and Corporate Affairs Canada

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The views presented in this paper reflect those of the author and do not necessarily reflect the views of the Department of Consumer and Corporate Affairs.

** Note: this report was created using OCR software. There are likely to be some mistakes, for which I apologize now. This report, written in 1981 was the basis for several articles, none of which discussed the theory of copying as directly as it is found here. The articles based largely on the work in this report are:

“Durability, Market Structure and New-used Goods Models,” American Economic Review, September 1982, Pp. 816-824.

“Copying And Indirect Appropriability: Photocopying Of Journals,” Journal Of Political Economy, October 1985, Pp. 945-957.

“Copyright Law, Photocopying And Price Discrimination,” Research In Law And Economics, 1986, Pp. 181-200.

“Price Discrimination by Journal Publishers: Its Impact on Copyright Law and Photocopying,” European Intellectual Property Review, July 1983, Pp. 184-189.

Copyright Revision Studies

Research and International Affairs Branch
Bureau of Corporate Affairs

Published

Copyright Obligations for Cable Television: Pros and Cons by S.J. Liebowitz, 1980.

The Mechanical Reproduction of Musical Works in Canada by Mike Berthiaume and Jim Keon, 1980.

A Performing Right for Sound Recordings: An Analysis by Jim Keon, 1980.

Term of Copyright Protection in Canada: Present and Proposed by Barry Torno, 1981.

An Economic Analysis of a Performers' Right by S. Globerman and M.P. Rothutan, 1981.

Crown Copyright in Canada: A Legacy of Confusion by Barry Torno, 1981.

Copyright, Competition and Canadian Culture: The Impact of Alternative Copyright Act Import Provisions on the Book publishing and Sound Recording Industries by A.G. Blomqvist and Chin Lim, 1981.

The Impact of Reprography on the Copyright System by S.J. Liebowitz, 1981.

Available in both official languages from:
Communications Branch
Consumer and Corporate Affairs Canada
Ottawa, Ontario
K1A 0C9

Forthcoming

Ownership of Copyright in Canada by Barry Torno.

Canadian International copyright Relations Under the Berne and Universal Copyright Conventions by Barry Tomb.

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Remedies and Enforcement by A.M. Butler.

? Minister of Supply and Services Canada 1981

Cat. No. RG44—1/8E

ISBN 0—662—11396—9

FOREWORD

This series of studies concerning aspects of copyright law was initiated to provide a better understanding of some important problems and issues involved in the revision of the Canadian Copyright Act. The present Act is now more than fifty years old. The wide breadth of legal, economic and technological developments since the Act was proclaimed underlie the significance of the revision process. The creation and dissemination of information is becoming an increasingly important resource of our society. In addition, the copyright community, including authors, publishers, the film and video industries, broadcasters, the recording industry, educators, librarians and users, contributes hundreds of millions of dollars to the economy. For this reason the Research and International Affairs Branch of the Bureau of Corporate Affairs felt it necessary to undertake in-depth economic and legal research into the cultural, economic and legal implications of the most important of the copyright issues.

With respect to the appropriateness of the economic studies of this series the following passage from the 1971 study of the Economic Council of Canada entitled Report on Intellectual and Industrial Property is perhaps the most perceptive and eloquent:

It is sometimes implied that where cultural goals are important, economic analysis, with its base associations of the market place, should take a back seat. But this involves a serious misconception of the proper and useful role of economic analysis. It may well be true that in the final analysis, economics is much more concerned with means than with ends, and that the really fundamental “achievement goals” of a society are largely, if not wholly, non—economic in nature. It is also true, however, that, in practice, means can have an enormous influence on ends, whether for good or ill, and that as a result, the systematic analysis of economic means is indispensable both in the specification of social goals and the planning of how to achieve them. In the case of cultural goals, among others, economic analysis can be of great help in bringing about a clearer identification of the goals in the first place, and then in planning for their attainment by the shortest, least costly and most perseverance—inducing route.

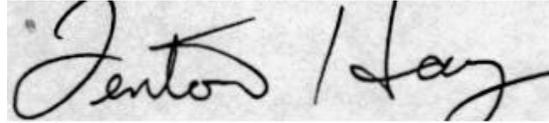
It is particularly important that the relevance of cultural goals in a policy—planning situation should not be used as a smoke screen behind which material interests are allowed to shelter unexamined. In an increasingly service—oriented and knowledge—based society, cultural matters in the broadest sense are to a growing extent what economic life is all about. They must not fail to be studied in their economic as well as their other aspects. (pp. 139—140)

It is within this spirit that the economic studies completed for the Branch have been commissioned and carried out.

In addition to internal studies, the Branch has contracted with research academics from the Canadian university community who have a special interest in copyright. The external funding of research provides the Branch with new insights and perceptions from some of the most highly skilled academics in Canada with respect to the many complex issues inherent in the revision of the Copyright Act. Additionally, it serves to foster an interest and involvement in these important policy issues amongst others within the academic community. Such involvement and input can only lead to a better understanding and a consequent improvement in the copyright policy formation process.

This study by Professor S. J. Liebowitz of the Department of Economics, University of Western Ontario on the impact of reprography on the copyright system offers another example of how new technology affects traditional forms of reproducing and using copyrighted works. The author develops a theoretical model of the impact of reprography on publishers which is related to the economic rationale for copyright protection. This model is then evaluated empirically. The result of this analysis is an insightful and pragmatic examination of the actual economic impact of photocopying on copyright owners' revenues. The rigour of the economic analysis and the exposition of photocopying practices makes this report of direct interest to academic economists, copyright owners and intermediaries such as librarians, as well as to all those with an interest in the implications of new technology for the copyright system.

The results and recommendations contained in this study are those of the author and do not necessarily imply acceptance of same by Consumer and Corporate Affairs Canada. We believe that this approach is optimal for the purpose of encouraging the researchers to employ the widest scope in both the creation and presentation of their views.

A rectangular box containing a handwritten signature in black ink. The signature is written in a cursive style and reads "Fenton Hay".

r
Fenton Hay
Director

Research and International Affairs Branch

SUMMARY

This paper examines the economic impact of reprography on the copyright system in order to predict the likely results of proposals for altering present copyright law as opposed to leaving the law unchanged. The paper is divided into four major sections.

Chapter I examines the economic nature of copyright. Copyright is seen to be a legal remedy for a market failure such that authors are given a property right over their intellectual creations. It increases the ability of authors to appropriate revenues from those who use the intellectual property. A copyright system is beneficial to society since authors are given a financial incentive to create intellectual works more in line with society's valuation of such works. On the other hand, granting a monopoly to copyright holders will reduce the quantity of physical representations made for any intellectual work below the optimal quantity. It is argued that this latter effect is small because of competition between intellectual works. This last argument, while providing a justification for copyright, also underlies the importance of promoting competition between intellectual works. Judgments of proposals to deal with reprography will be based partly on how they influence competition in the industry.

Chapter II is a long and difficult chapter. A model representing the economic impact of reprography on publishers is created. The underlying idea driving the model is that the price of a new good reflects its value to all future users, not just the value to the first purchaser. An analogy is made to the new automobile market where resale value is known to enter into new car prices. The point of the model is to determine the conditions under which the value of a product to future users will not influence the original purchaser to the new item.

Several parameters are seen to influence the workings of this model. The discussion of these parameters is somewhat technical and may be circumvented by those readers unwilling or unable to follow these arguments in detail. A summary is provided of how the parameters influence the model.

The last part of the chapter applies the model to the particular industry involved with publishing intellectual works. Through examination of the parameters influencing the model as they appear to exist in the world, predictions can be made regarding the actual impact of reprography on copyright holders. The implications of the model were not unambiguous but there was reason to think that reprography might not seriously weaken the appropriability of authors.

Chapter III is an empirical attempt to evaluate the impact of reprography on copyright holders. The use of photocopying in libraries is considered by evaluating several published studies which examined the nature of photocopying. While these published studies are not always in complete agreement, several results seemed rather pervasive. Journals were the most heavily photocopied category of copyright materials. Both the number of multiple Copies made and the number of pages copied per photocopied item were small. A large majority of copyrighted works photocopied in Canada were of non-Canadian origin. These facts would seem to imply that photocopying is not likely to have had an extremely strong negative effect on Canadian copyright holders.

Next, the behaviour of journal subscriptions during the past twenty years is examined, the period during which use of reprography has grown at great speed. After surveying five large studies, several features emerge. The evidence does not indicate that journal subscriptions have fallen; in fact, they appear to have kept up with population growth. In addition, journals have increased in size and in numbers. While individual journals may face difficulties, there have been many more births than deaths and the industry as a whole does not appear to be suffering from a decrease in demand.

Lastly, the behaviour of journal prices for individuals and institutions is reviewed. Institution prices are seen to be higher than individual prices, with the difference widening over time. This price behaviour conforms to the predictions of the model which indicate that photocopying will increase the value of journals to those subscribers who do the most photocopying (libraries) and that copyright holders can capture this increased valuation. It is also shown that libraries increase their expenditures on heavily photocopied items such as journals.

The final chapter examines several proposals to deal with reprography. The first is enforcement of copyright laws in libraries and other institutions. In theory, strict enforcement could appropriate the value users place on intellectual works, but the costs of this system appear quite high. Voluntary compliance with the law would encourage cheating. The present Copyright Clearance Center in the United States works along these lines and its results have been rather dismal. In Canada the system would be even more costly to run per dollar of royalty payment and seems most impractical. On the other hand, strict enforcement would be very costly. Monitoring the thousands of photocopy machines in use would be no easy task and the revenues generated would be unlikely to cover the costs.

Charging for each photocopy machine would be a much less costly system, but dividing these fees among copyright owners would lead to difficulties. It is unlikely that copyright holders would be paid in proportion to the valuation of their property by those making photocopies. A divergence between these valuations and payments weakens the purpose of copyright and promotes inefficiency. Such a system could also decrease the competition between various copyright holders at the expense of users of intellectual property.

The final proposal consists of enhancing the ability of copyright holders to price discriminate — in other words, to charge different prices to different subscribers. Such a system has a very low operating cost. It also keeps copyright payments in line with users' valuations and there is no decrease in competition between various copyright holders. The market has already begun to move in this direction. For these reasons this last proposal is recommended as the one most likely to help copyright holders without reducing the dissemination of information or hurting users of copyrighted materials.

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INTRODUCTION

In 1938, Chester Carlson, a patent attorney, conceived of a way to reproduce documents with a process now known as xerography. After ten more years of research (with the help of the Battelle Development Company), his idea began to show commercial potential and Carlson joined with the Haloid Corporation (later to change its name to Xerox) in developing his process. In 1959, after surmounting many difficult problems, the Xerox 914 copier was introduced. Since that time, many refinements in quality and cost have led to a burgeoning industry involved in making these copiers. The use of these copiers has become almost universal in business, teaching and research.

The example of Xerox is a textbook case for students interested in patent law and its effects on innovation. It has also had a profound impact on the study of copyright and proposals to alter copyright law. Xerography (or photocopying in general) is a particularly inexpensive and fast form of reprography. As such, it is widely perceived as a danger to copyright holders. The president of Williams and Wilkens, a firm publishing many journals which later went to court over the issues of copyright infringement, has said:

Uncontrolled photocopying is largely responsible for the death of two journals which were published by the Williams and Wilkins Company, and, if the condition is allowed to continue many more will either go out of business or be published under government subsidy.... (Thatcher, 1978, p. 324)

Scholarly Publishing, a Canadian journal with an audience of writers and publishers, has had many articles appearing in it which contain similar views. Sanford Thatcher writes:

Beginning about 1960, photocopying changed character. The introduction to the market place of the office copying machine made photocopying rapid, cheap and readily available. The legitimate interests of copyright owners must, accordingly, be measured against the changed realities of technology. (Thatcher, 1978, p. 317)

Similarly, Spilhaus notes:

Photocopying is an important supplementary distribution mechanism for publications, but photocopying has eroded library subscriptions, which are the base of support for most journals, Library networks are building. For how many journals might one copy some day serve the needs of the North American continent? (Spilhaus, 1978, p. 143)

It is abundantly clear that photocopying may have a powerful influence on copyright holders. The aim of this study are threefold. First, it is necessary to ascertain the possible impact of reprography on copyright holders. Various parameters will influence the impacts and thoughtful analysis will delineate the workings of these parameters. The second task will consist of measuring various magnitudes as they now exist. The amount of photocopying, what materials are photocopied and the behaviour of journal subscriptions are oàly some of the factors which will indicate what the impact of reprography has actually been. The final goal of the study is to determine the impact of various copyright proposals in light of the previous findings. The impact on the users of copyrighted materials is art important concern as well as the impact on copyright holders.

Chapter I

THE NATURE OF COPYRIGHT

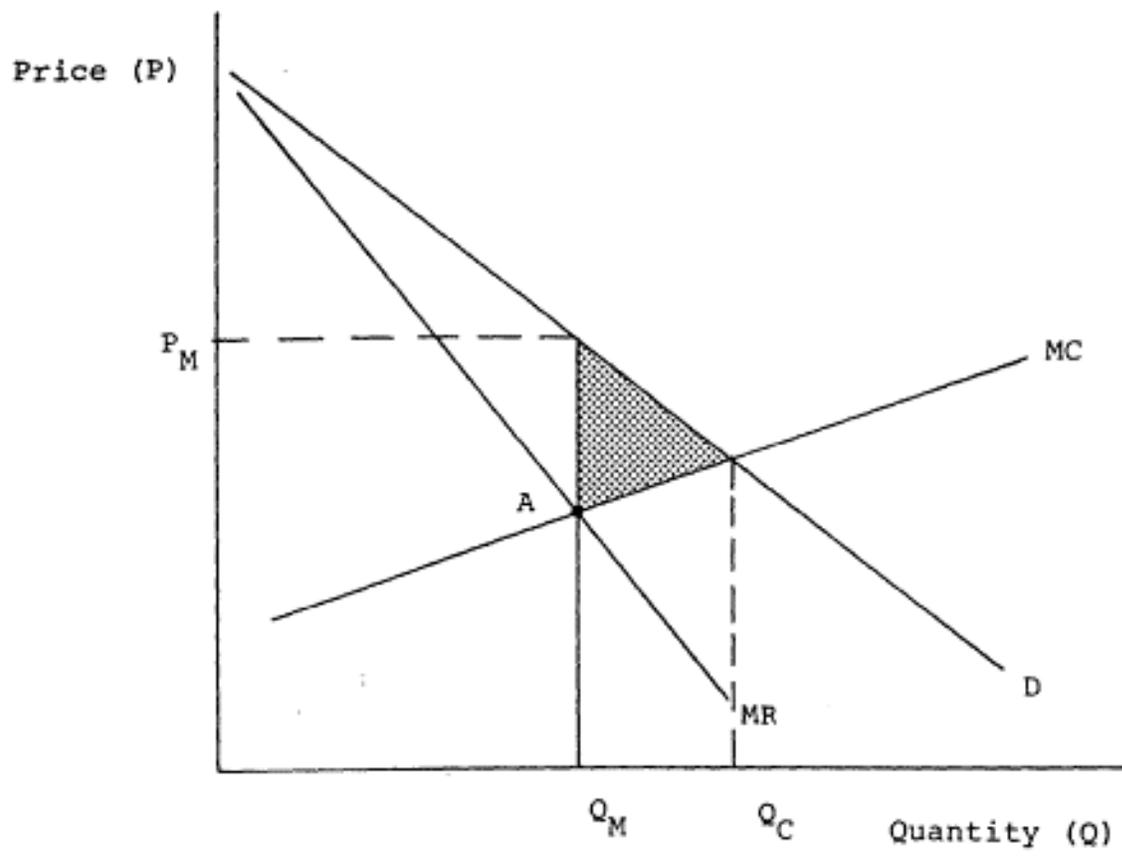
Copyright and Appropriability

Copyright law is in essence an attempt by government to compensate for a market failure: the inability of authors to capture rewards for their efforts in a free market because, in such a market, they could not prevent competitors, who do not have to engage in the resource—consuming act of writing the manuscript, from producing the same work.

The issue boils down to one of property rights. A farmer will not voluntarily cultivate land if any other person can come along and harvest the crop. When given property rights on the land which entitle him to harvest the crop he plants, he has the proper incentive to cultivate the land. The law and economics literature is replete with examples of the interaction of property rights with the efficient use of resources. If an author does not have property rights over his creations he, like the farmer, will not have sufficient pecuniary incentive to engage in the productive act of artistic creation. A copyright is merely a means by which the author is given a property right over his artistic creation. Other persons cannot use his property without his permission.¹ The copyright allows the author to gain financial rewards for his artistic endeavors.

The granting of a property right in artistic and intellectual works is not without its societal costs, however. Since each work is unique, the holder of the property right becomes a monopolist with respect to his work. The work will be published in a manner which maximizes the profits of the copyright holder. Profit—maximizing behaviour implies that the output of the work will occur at that point where the marginal revenue equals the marginal cost (point A in Figure 1). At this production level there is a deadweight loss to society equal to the shaded triangle. This deadweight loss is due to the fact that additional units of output beyond Q_M have a

¹ As is true for most commodities, property rights over intellectual property are limited. When, for example, the author sells copies of his book, a purchaser may lend it to a friend without needing the permission of the copyright holder. In addition, fair dealing (a legal concept to which we shall return later) enables an individual to copy parts of the book without being liable for copyright infringement.

Figure 1

value to society given by points on the demand curve whereas the cost to society is given by points on the supply curve. Beyond Q_C (the optimum output) any additional output would cost more than it was valued by consumers and so only the output less than Q_C has a value greater than its cost. This deadweight loss would disappear if there was free competition in the publishing of this work.

The primary conflict in the economics of intellectual property concerns balancing the rewards needed to encourage authors to produce artistic and intellectual works with the benefit to society of removing deadweight losses.

A rather unique aspect of intellectual property which reduces the author's control of his property is its public goods characteristics. A public good is defined as a good such that one person's consumption of it does not reduce the ability of others to consume it. If someone eats an apple or buys a chair for his living-room, no one else can eat that same apple or put that same chair in his room without abridging that person's property rights. However, one person's consumption of a poem, an idea or a song does not reduce anyone else's possible consumption. The physical representation of these goods (e.g., the paper on which they are written) have the characteristics of private goods in that a person's reading of a book usually precludes others from reading the same book at the same time.

A necessary condition for the market to produce goods effectively is that it must be possible to exclude people from using the good. No one would pay for an automobile if he could use any car he wanted without paying for it. Property rights over goods provide exclusion in most cases since the law prosecutes those who use the good without transacting for it. Some goods, by their very nature, make exclusion difficult or impossible. It is difficult to prevent someone from benefiting from national defense if they live in the protected country. The same is true for public health or the elimination of contagious diseases. Goods for which exclusion is not possible are known as collective goods.

Normally when goods are sold the new owner is given the right to do almost anything he wishes with the good, including selling it. The original owner or creator of the good usually gives up all rights to it. Intellectual works are different in that when someone buys a physical representation of an intellectual work, such as a book, they receive a set of property rights over that physical representation (they can resell it, burn it or use it as a paperweight) but they are given no property rights over intellectual property contained within the physical representation of the work.

Thus if a person takes a picture of his car, he can sell it if he wants since he owns the film and has the associated property rights. If, however, he photographs a page of a book, he cannot sell it because this would constitute selling a physical representation of an intellectual work without having property rights over that intellectual work. The law provides this extra protection because it is the only way for the owner of the intellectual work to appropriate the value of the good and to keep his property right over that good. The question of appropriability is central to the discussion of copyright and reprography.

By legislating copyright law, the government has indicated that it wishes to promote the production of intellectual works by giving the author certain property rights over his productions. Basically, the copyright holder is given the sole right to reproduce his work. Copyright has been extended to apply to public performances and broadcasts of the copyrighted work.²

New technological advances appear to be capable of disrupting the linkage between use of the work and compensation for the author. In particular, reprography allows any individual with access to a copying machine to make copies of the work as if he himself was a publisher. Activity of this kind may be an infringement of copyright unless such behaviour falls under the rubric of fair dealing.

Not surprisingly, authors cry “foul” at this infringement and would like stronger copyright enforcement. Such behaviour is economically rational if reprography reduces the profits flowing to copyrighted materials. This kind of reproduction is quite different than that envisioned by the framers of the original copyright laws. The infringements conceived of in those days were of a commercial nature and certain to harm the authors.

This brings us to the crux of the issue. If infringement of copyright reduces appropriability, then it is in the copyright holder’s self-interest to reduce infringement to the lowest possible degree. Not all cases of infringement reduce appropriability. An example would be where an individual makes a copy of a poem and gives it to his friend instead of just lending out the original. In this example, reprography has not reduced the appropriability of the intellectual work, the poem, because it has not reduced either the revenues or the profits

² Other components of property rights included in copyright are translation and adaptation rights.

of the copyright holder. With no recourse to reprography, the poem would have been loaned to the friend. In this example, reprography does not harm or diminish his property rights over the intellectual property. It is therefore not in the author's self-interest to prevent it in this instance. Copyright law does not forbid loans of authorized physical representations of a work. The physical representation is treated like any other commodity and can be loaned or sold to another individual.

It might seem that appropriability is incomplete for all goods which can be loaned or resold. Would the creator of any good not be better off with no resale or lending the product allowed? Any person who wanted to use the product would then have to buy a new one from the original creator. However, the relationship between property rights and appropriability is not a simple one. It may well be that creators of goods are worse off with a more complete set of property rights. This will be demonstrated in a later section.

The Monopoly from copyright Protection

Economic criticism of copyright is often based on the monopoly granted to the copyright holder. As described earlier in this chapter, monopoly leads to a smaller quantity and a higher price for a particular copyrighted commodity (as well as a welfare loss in its production) than would exist if the commodity was produced competitively. Against this loss is usually balanced the need to promote creative production, which is accomplished by copyright. It is important to investigate the nature of the copyright monopoly. Later sections of this paper will examine proposals⁵ to strengthen copyright legislation, some of which alter the nature of the copyright monopoly in significant ways. The analysis in this section will allow a better understanding of the impact of these proposals.

Writing has no barriers to entry save the talent of the individual which should tend to lead to a competitive industry. Given this fact, how can monopoly come to be a force in this industry? The answer lies in the fact that the distribution of natural talent is very uneven and rents accrue to those lucky enough to be born with large amounts of talent.³ This is true in all sectors of the economy; individuals with unique talent generate rents; copyright is merely the mechanism which allows authors with unique talents to generate rents on their talents.

³ Or to those influenced by environmental factors. The genetic versus environment debate is unimportant in this discussion.

This is not to say that these authors would not generate any rents without copyright protection. The advantage of being the first to publish a book is often enough to generate rather large profits even without copyright protection. In fact, Sir Louis Mallet, a member of the 1876 Royal Commission on Copyright, argued that it “will always be in the power of the first publisher of a work so to control the value, by a skillful adaptation of the supply to the demand, as to avoid the risk of ruinous competition, and secure ample remuneration both to the author and himself” (Plant, 1934, p. 193). All this means is that the monopoly power inherent in being the first publisher was considered to be almost as great as the monopoly power conferred by copyright. There is some evidence that this was, in fact, true when this statement was written.⁴ Given the speed with which publishers can now bring a book to market,⁵ it is unlikely that first publishing rights confer a degree of monopoly power anything like that in the last century.⁶ Because of changes in technology and the competitive nature of the publishing industry, copyright in modern times probably confers a much greater degree of monopoly power than would exist without it.

Copyright cannot grant any real world monopoly power unless the book has intrinsic monopoly power. Most books probably would not have a great deal of monopoly power (steep demand curves), because it is quite easy to create close substitutes. If a book on running becomes popular, many other publishers will rush out to buy manuscripts on running and publish their own versions of similar books. The ease of creating substitutes seems to be equal to that of many other industries where each firm in an industry will imitate a successful product

⁴ Plant (1934) presents evidence that nineteenth century U.S. publishers voluntarily paid royalties to authors, even when there was no copyright protection, in order to have first publication rights.

⁵ Consider the speed with which the Watergate tapes or accounts of the Israeli raid on Entebbe were brought to market.

⁶ This point seems to have been overlooked by Hurt and Schuchman (1966). In an otherwise interesting paper they disregard the changes in printing, that have occurred in the last hundred years. They imply that copyright is unnecessary but, if this statement were true, the only inefficiency created by copyright would be the costs of legal mechanisms.

line.⁷ The fact that some books do not seem to have close substitutes is a function of the distinct and individual talents of the author more than any feature of the market. The author has a monopoly on his talent, style and name in the same way that companies have monopolies on their brand names. If everyone had equal talent as a writer, all books would have virtually perfect substitutes and no book would have monopoly power, regardless of the existence of copyright.

Having demonstrated that copyright merely enhances the monopoly power of authors, it may now be asked whether there is justification in eliminating this monopoly power. In a narrow economic sense there are valid reasons for eliminating deadweight losses due to monopoly power, regardless of its cause.

Economic analysis of patent protection is very concerned with deadweight loss and some researchers have concluded that society would be better off with no patent protection. Copyright has not been subjected to the same degree of economic criticism as patents, probably due to an intuition among economists that deadweight losses under copyright are less severe than under patents. There are valid reasons for this intuition. Patent protection is given to the first of many possible inventors. However, when several authors write books on the same subject, each can receive copyright protection. Copyright law allows closer substitutes than does patent law because the property right is granted on the style of expression and not the ideas. It is more difficult to find substitutes for ideas. Deadweight losses are reduced when substitutes are created. Any such loss associated with copyright is caused by the unique style of the author, whereas the deadweight loss caused by a patent results from the position of the patent in the manufacturing process. Moreover, a patent need not cover an idea unique to one individual. This has not been intended as a comparison of the intellectual achievements underlying patents and copyrights but is meant, instead, to expose differences in the nature of the monopoly.

This raises a second possible reason why copyright has not undergone major criticism. Since the monopoly power of a

⁷ In fact, many industries which are not necessarily considered monopolistic have much greater difficulty creating substitutes. When the Ford Mustang became a huge success in the mid—1960s, it took several years for Ford's competitors to introduce their versions of similar automobiles. The large lead time in the automobile industry between conception and production can give a successful new design several years of monopoly power.

copyright is tied to the monopoly power of an author's talent, it would appear to be unjust to remove the monopoly power of an author without removing the monopoly power of other talented individuals. For example, exceptional performers can earn large amounts of money and would be expected to maximize their profits by using the full potential of their monopoly power. This means, of course, that they restrict live performances to some level that is suboptimal from society's point of view. Their output could be changed so that they would produce the optimal number of performances if it was possible to make perfect imitations of the original. If, for example, there were many mimics who could dress, sing and act like Frank Sinatra, and if they were allowed to advertise themselves as Frank Sinatra, Frank Sinatra's monopoly profits from live performances would disappear and society would have an increased quantity of Sinatra performances. This would be analogous to the position of authors in a world without copyright protection. Since the source of monopoly power for live entertainers cannot be separated from the individual, society cannot diminish this power unless it used draconian methods to force these individuals to increase output and lower price. This point is equally valid for famous athletes, surgeons and business executives.

Authors are in a unique position in that their output can be easily separated from their performance of the output. Thus a competitive supply of their product can be produced without resorting to extreme methods. This leads to a dilemma: elimination of monopoly power is usually a good thing but in this instance it would be highly discriminatory and perhaps "unjust." Justice is not an issue that can be answered with economic analysis. However, society has chosen to deal with rents accruing to individual talent by using the progressive income tax to reduce these rents—not only for authors but for others in the economy. (This method does not, however, reduce the deadweight loss.)

It should be pointed out that the monopoly power in publishing is much lower when book publishers compete with one another than if they were to jointly maximize profits so that the potential welfare loss from monopolies in publishing is decreased. Monopolistic competition would aptly describe the market structure in this industry.

For all these reasons copyright has not usually been considered to be a harmful institution. This assumption will prevail throughout the rest of this paper.

Fair Dealing, Property Rights and Appropriability

Fair dealing is a defense to a claim of infringement which is currently provided for in the Canadian Copyright Act. It is stated in section 17(2)(a) of the Act that the “following acts do not constitute an infringement of copyright: (a) any fair dealing with any work for the purpose of private study, research, criticism, review or newspaper summary.” Exactly what constitutes fair dealing is determined by the courts and is a vague concept as presently defined in the law.

What is the economic rationale for fair dealing? Does it benefit one group (researchers, students, reviewers) at the expense of others (copyright holders)? Or perhaps it merely removes the restrictive covenants of copyright law in those instances where economic well-being is not threatened. A strong case can be made for the latter hypothesis.

As has already been stated, the economic justification for copyright consists in its ability to confer a property right over an intellectual work. It has also been pointed out that this property right is somewhat different than that usually given to other entities. No one is allowed to make a physical representation of the given intellectual work except the copyright holder, but anyone who wishes may use the work for private non-commercial purposes if they have access to a physical representation.

A copyright holder's well-being is threatened when his ability to appropriate revenues is reduced. Fair dealing may do this if, for example, researchers, students and reviewers make copies of a work instead of buying it. Clearly, in the days before reprography, any individual copy would have to be created by hand and the costs in time spent making a copy would be very high. It is almost impossible to imagine someone illegally copying by hand some or all of a work if they could buy it. Allowing fair dealing in this instance would not reduce the revenues of authors. In fact, research, reviews and study of an intellectual work create interest which may result in the purchase of that work or some other which might not have been purchased without the fair dealing doctrine.

In the present world where modern photocopying machines make it much easier to copy an intellectual work, fair dealing is more likely to decrease the ability of the copyright holder to appropriate revenues. Reviewers and scholars can now copy parts of a work at relatively low costs. Some may copy the work instead of buying it. The likelihood of this occurring must be known before the impact of fair dealing on the copyright holder can be judged. This will be referred to as the substitution effect.

There are other important parameters of interest. While photocopying may incline some individuals not to buy an intellectual work, it is also likely that it increases exposure to parts of various works. This is particularly true among academic researchers using scholarly journals. Since many journals can only be read in a library, prior to the advent of photocopying machines a researcher would only read those journals which he considered most important since taking notes in libraries is a rather unpleasant task. With modern repro— graphic methods the researcher can make copies of articles in any journal and read them at his leisure (taking notes in the margins of the copy). This increases the number of articles he is likely to read and also increases his exposure to new journals, some of which he may subscribe to eventually. This will be referred to as the exposure effect.

In addition, the price of the intellectual work will reflect the value placed on it by those who buy the work. This value will go up if the purchaser intends to let acquaintances copy parts of the work, since he could charge them either in pecuniary terms or by building up goodwill. Also, depositories of books and journals (i.e., libraries) will have their holdings more highly valued by users and should therefore be willing to pay more for the journals (and perhaps to increase their total number of subscriptions). The ability of copyright holders to capture revenues from those making copies of their work is of key importance. To the extent that they can accomplish this end, the negative impact of a reduction in sales will be mitigated. This will be referred to as the aftermarket effect, for reasons to be explained later.

Thus the impact of reprography on revenue can be seen as the net impact of the substitution, exposure and aftermarket effects. The substitution effect reduces appropriability, the aftermarket effect increases it and the exposure effect does not affect appropriability but influences the well—being of copyright holders. To comprehend this last statement, one must realize that our interest in reprography lies in its impact on the transmission mechanism between the use of the intellectual work and the payment to the copyright holder. Both the substitution and aftermarket effects act upon this mechanism. The former reduces payments for a given level of use while the latter increases the level of payment. The exposure effect, however, affects only the amount that the goods are used and does not influence the transmission mechanism between payment and use. For this reason it is not the proper concern of copyright policy. It is of interest to those concerned with the welfare of copyright holders since it influences the resources society spends on intellectual works.

Fair dealing can be evaluated in terms of these effects. Prior to cheap reprography, it is likely that fair dealing had a negligible substitution effect, a positive exposure effect and a small positive aftermarket effect. If this is a proper assessment, then fair dealing had a beneficial impact on copyright holders. In recent times, with cheap reprography, the substitution effect has probably greatly increased and the exposure and aftermarket effects are probably greater as well. A more detailed examination of empirical facts is necessary to gauge the net effect of these impacts.

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Chapter II
REPROGRAPHY AND COPYRIGHT

Economic Impact of Reprography on Publishers

The economic impact of reprography has not received proper attention in previous work. Reproduction of a copyrighted work appears to be a clear infringement of copyright law (excluding the question of fair dealing) and is thought to reduce compensation to the copyright holder due to the substitution effect. It is not clear, however, that the copyright holder's compensation is reduced just because the user of reprography pays no explicit copyright royalty.

The word "explicit" is emphasized because it is quite possible that most users of reprographic equipment do make implicit payments for the material they reproduce (the after-market effect) and that proposed revisions of the copyright law would merely switch implicit payment to explicit payment with no gain to the copyright holder. That such may be the case can be illustrated by the following example.

Assume a situation with no reprography in which a journal has 1000 subscribers. Each subscriber values the journal at \$1.00, the subscription fee. Now suppose a library subscribes to the journal and that all of the journal's subscribers have access to the library. Those subscribers with the least cost of using the library will cancel their subscriptions and read the journal in the library. The more subscribers who attempt to switch to library use, the more inconvenient it becomes to obtain the journal in the library. If 20 people cancel their subscriptions, the net substitution effect of having a library is to reduce revenues to the journal publisher by \$19 if the library is charged the same price as individual subscribers.

If the library acquires a reprography machine it will become less inconvenient to use the journal in the library since copies can be made without tying up a journal for extended periods of time. Some subscribers will likely cancel their subscriptions because of the substitution effect — assume that 10 subscriptions are cancelled — which would reduce publisher revenues. This is the impact of reprography most graphically illustrated by publishers and others who fear the impact of reprography. Unfortunately, this analysis neglects several important features.

First, the library need not be charged the same subscription rate as private individuals. Second, individuals who would not have subscribed to the journal will use the journal more in the library with the advent of reprography (exposure effect). Third, a smaller number of journals will reach a larger audience with a lower publication cost. Each of these points will be discussed in turn.

Many journals charge libraries higher subscription rates than individual subscribers, reflecting the fact that publishers feel that libraries place a higher valuation on journals than individuals do. This is an entirely reasonable belief since the journal in the libraries is used by many different individuals, each of whom places a certain value on it. Using the above example, suppose ten people switch from home subscriptions to using the journal in the library once there is access to a reprography machine there. Their valuation of the journal is probably less than \$1 per person since they no longer have the convenience of having it in their own premises. If having the journal in the library is worth \$.50 per individual, then the value of the journal in aggregate to these library patrons (the aftermarket) is at least \$5. Some library patrons, who valued receiving the journal at home at less than \$1 and would not have subscribed, will now use the library journal. Assume this exposure effect is \$3. If the library responds to the valuation of its patrons, it would be willing to pay \$8 for the journal. Thus the total effect resulting from introduction of the reprography machine is to reduce revenue by \$2. However, nine fewer journals need to be published so that the costs of production are lower and profits could potentially increase. When someone cancels a subscription in order to make use of the reprographic facilities in the library, the cost of publication drops by the marginal cost of producing one unit of the journal. If this marginal cost is \$.60, the library only needs to pay an additional \$.40 per subscriber who switched in order for the publisher not to be hurt by the introduction of reprography. Thus focusing on publishing revenues alone is insufficient for a proper analysis. It must be taken into account that libraries and reprography allow publishers to reach a larger audience (with higher or lower revenues) at a lower cost. This cost effect tends to increase the profitability of publishing.

The relative sizes of the cost and revenue effects generally need to be known before one can determine the impact of reprography on publishers. Under certain conditions, the net impact of these effects can be determined a priori. The next section of this chapter develops a model of the impact of reprography on publishers which takes account of the substitution and aftermarket effects.

Machlup and Leeson found variable costs to be 39 per cent of total cost (Machlup and Leeson, 1978). The study by the Committee on Scientific and Technical Communication (COSTC, 1970) found variable costs to be in the vicinity of 26 per cent.⁸ While these figures are not exactly equivalent, they indicate that for every dollar in cancelled journal subscriptions the publisher only loses \$.60 to \$.75. If the library valuation of this new patron is in the range of \$.60 to \$.75, then the publisher will not have suffered any financial harm because of reprography.

Model of the Implicit Aftermarket for Copyrighted Materials

The following discussion is an attempt to analyze the impact of reprography on copyright holders. The term “publisher” will be used to refer to the copyright holder; a “journal” will refer to the physical item sold by subscription to individuals — that is, the copyrighted material. If there are 2000 subscriptions to a given journal title, there would then be 2000 journals in the hands of the public for this one journal title. This model analyzes substitution and aftermarket effects but there is no allowance for the exposure effect. In order to simplify the analysis, the model assumes two periods

⁸ The COSTC found pre-run (fixed) costs ranged from \$40 to \$80 per thousand words in their sample of journals (p. 70). They found the average issue to be approximately 250,000 words, implying that an average journal would have pre—run costs from \$10,000 to \$20,000. The average of \$15,000 represents an estimate of these values in 1968. The task group also found that average runoff (variable) costs were in the range of \$.005 per thousand words per subscriber. Assuming the same size journals, we arrive at a figure of \$1.25 per subscriber as the runoff cost. Circulation figures vary widely from journal to journal, but the average Canadian journal in our sample seems to have a circulation figure in the area of 2800 (2840 in 1978). This would imply, in 1968 dollars, that runoff costs average about \$3500, with fixed costs averaging around \$10,000. This indicates that variable costs averaged about 26 per cent of total costs with 1968 technology. With this as a rough approximation, every decrease in a subscription need only be replaced by 74 per cent of the price of the subscription in order for the publisher to hold his profit position. The shift of the subscription to the library need only increase the libraries’ willingness to pay this percentage.

of time.⁹ In the first, copyright holders sell their journals to the public. In the second period the aftermarket arises—subscribers sell a single photocopy (assuming zero cost of photocopying) of the journal which they bought in the first period to other members of the public. The impact of this aftermarket activity on the publisher will be the focus of the model. These simplifying assumptions will be discussed and made more realistic later in this section.

A first approximation

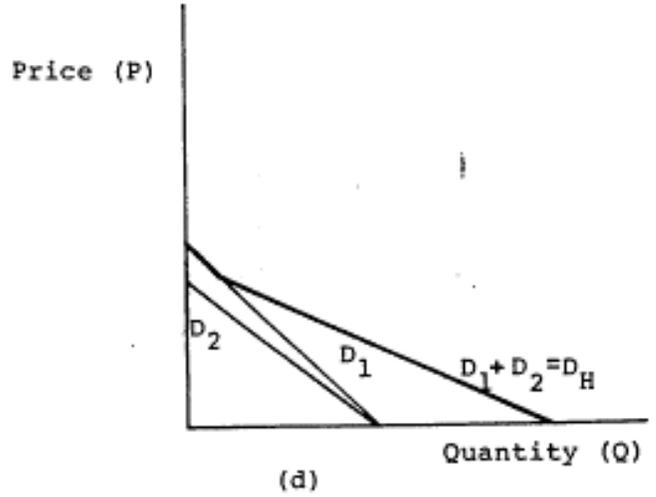
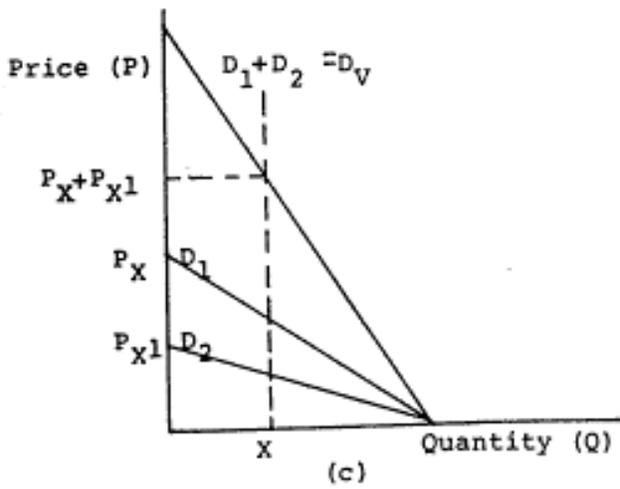
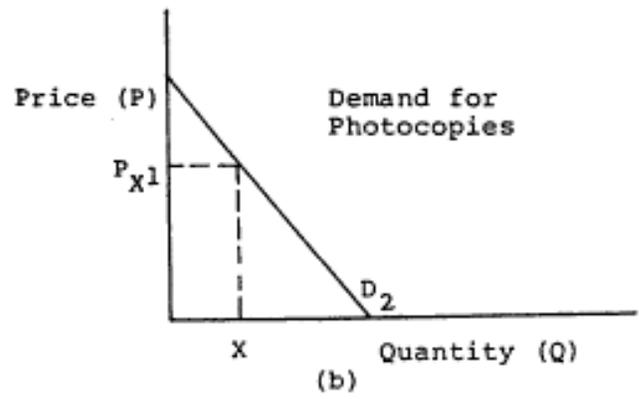
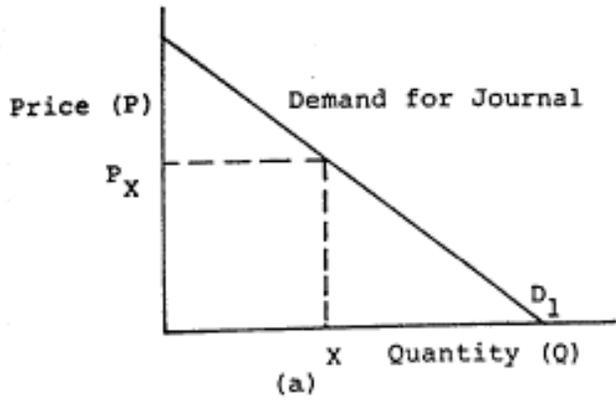
The size of the group of original purchasers (group 1) relative to the size of the group purchasing photocopies (group 2) is one of the parameters influencing the workings of this model. It is easier to assume, at first, that the two groups are of equal size. The demands of the two groups can be represented diagrammatically as in Figures 2(a) and 2(b). Group 1 demands journals for their own use. Group 2 demands photocopies of journals. The price that group 1 users are willing to pay will depend both on their demand for new journals and the price they expect to get from selling a photocopy to group 2. This price depends on group 2's demand for photocopies and the supply of copies from group 1.

This last point is most important. The price paid for a good will often reflect much more than the individual purchaser's valuation of the good. Rock bands, for example, buy extremely large amplifiers not primarily because they value the loud sound, but because their audiences do and express this preference by the amount they are willing to pay to listen to loud music.

Similarly, owners of automobiles will pay more for cars which have good resale value than for cars which don't. The original purchaser takes that portion of other people's valuation which he is capable of capturing (represented by the price of photocopies) into account when the original purchase plan is formulated. This important principle pervades all activities of an economic nature. The phrase "capable of capturing" is underlined because the potential market failure brought about by reprography would be caused by inability of producers to capture these aftermarket values. Assuming that each purchaser of a photocopy must buy it from the owner of a journal and that each journal owner can only make one copy will reduce this

⁹ This model is similar to that used by Benjamin and Kormendi (1974) for the new/used book markets. However, they do not generalize it to the same extent as the model presented here.

Figure 2



appropriation problem in the model (as discussed later in this chapter).

It is now possible to analyze the impact of reprography on copyright holders. First, assume that journals and photocopies are not substitutes. No one in group 2 would subscribe to the journal even if reprography did not exist. In this case, it is obvious that reprography can only be beneficial to the publishers. There is no substitution effect, but there is a positive aftermarket effect. In a world with reprography, the demand of group 1 would be the demand curve which determined the price. With reprography, the demand faced by the publisher would be the vertical sum of the demand curves of group 1 and group 2.

This last point is quite easy to see. Figure 2(a) represents the demand of group 1, Figure 2(b) the demand of group 2. A demand curve represents the highest price per unit that would be paid for a given amount of the commodity in the market. Let X , represented in Figure 2(a), be a given quantity of journals. P_X would be the highest price under which X units of the journal will be sold. The buyers of these X journals can now each make one photocopy and sell them in the market represented by Figure 2(b). X number of photocopies will bring a price of P_{X1} in this market. The buyers of new journals, realizing that they can get P_{X1} for selling a photocopy will be willing to pay P_{X1} in addition to the normal price they would pay for their own use of the journal. This process is the same for any given quantity of journals. The price that buyers of new journals will be willing to pay will be equal to the sum of the prices in the two markets which can be determined by vertically adding the two demand curves to produce D_V in Figure 2(c).

It is beyond question that this type of behaviour does occur in markets which have properties similar to those described here. If, for example, automobiles could not be resold, the price which former new car buyers would be willing to pay for their cars would fall.¹⁰ It would be irrational for the purchasers in group 1 not to take the payments from group 2 into account and economics has demonstrated the usefulness of assuming that economic agents act in rational ways, especially when competition acts as a prod.

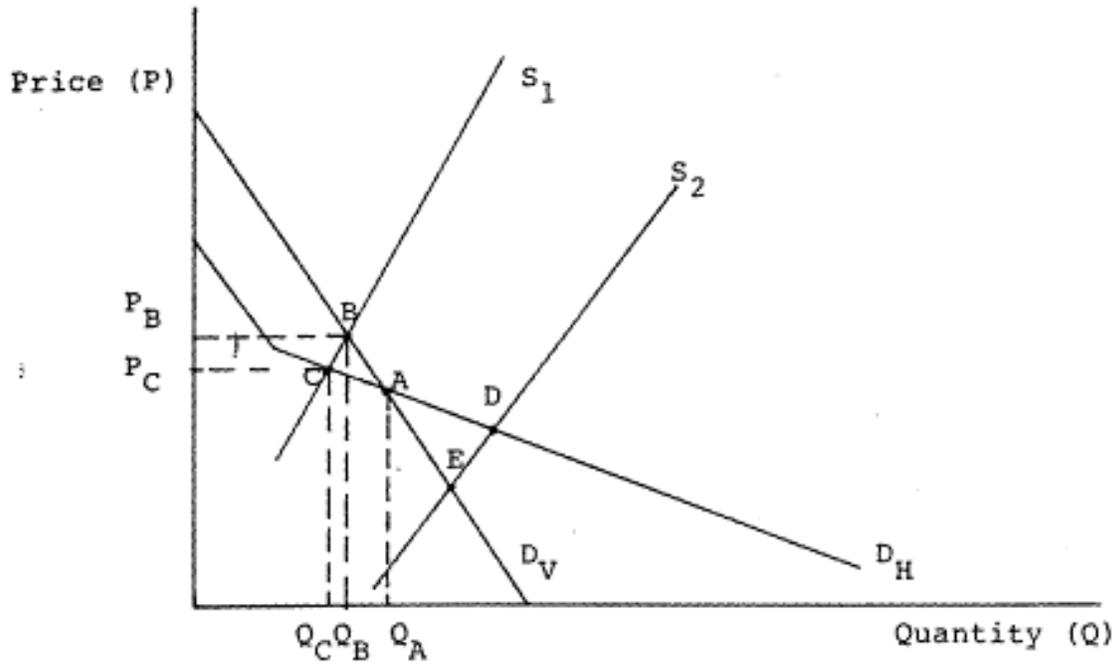
¹⁰ This is not to say that the price would always fall. If new cars are substitutes for used cars, some people who formerly bought used cars would tend to switch to new cars if they were now unable to buy used cars. This increase in demand for new cars might actually raise their price, as discussed later in this section.

The last example was set up such that reprography had to benefit publishers. The assumption that members of group 2 would never subscribe to the journal (assuming that journals and photocopies are not substitutes) will now be dropped. It shall instead be assumed that all members of group 2 would like to subscribe to the journal if they could not get photocopies. Their valuation of new journals is virtually identical to their valuation of photocopies. Journals and photocopies are perfect substitutes. In this case, the absence of photocopying would cause members of group 2 to enter the market for new journals. This can be represented by horizontally adding the two demand curves, as shown in Figure 2(d). The kinked, heavy outer line is the horizontal sum. Horizontal addition of demand curves is common in economics in order to derive a market demand from many individual demands and is much more frequently used than vertical addition.

Figures 2(c) and (d) represent the case of reprography or no reprography respectively. The impact of reprography on a publisher can be derived with the help of these two curves. Figure 3 contains both the vertical and horizontal sums, D_H being the horizontal sum and D_V the vertical sum. Point A marks the intersection of the two curves.

Assuming that the publisher acts as a price taker (or competitive firm), the price and output of the journals will be determined by the intersection of supply and demand. If the supply curve is represented by S_1 in Figure 3, the publisher will produce at point B with reprography and at point C without reprography. Clearly, the publisher is better off at point B since the increase in revenue from point C to point B, $P_B Q_B - P_C Q_C$, is greater than the increase in costs, $CBQ_B Q_C$. This means that reprography has benefited the publisher financially. The explanation for this is that more than twice as many people use the product at point B as at point C because at point B each journal is used twice whereas at point C each journal is only used once. The aftermarket effect is larger than the substitution effect.

This is not the case with supply curve S_2 . In this case, the price quantity combination would be at point D when reprography is not allowed and at point E when reprography is allowed. For the same reasons as before, point D is superior to point E in terms of the publisher's profits. In this case, total use of the journal is greater at point E (although not twice as great) but the additional revenue from the aftermarket is not enough to offset the substitution effect. The key consideration is whether production occurs to the left or the right of point A.

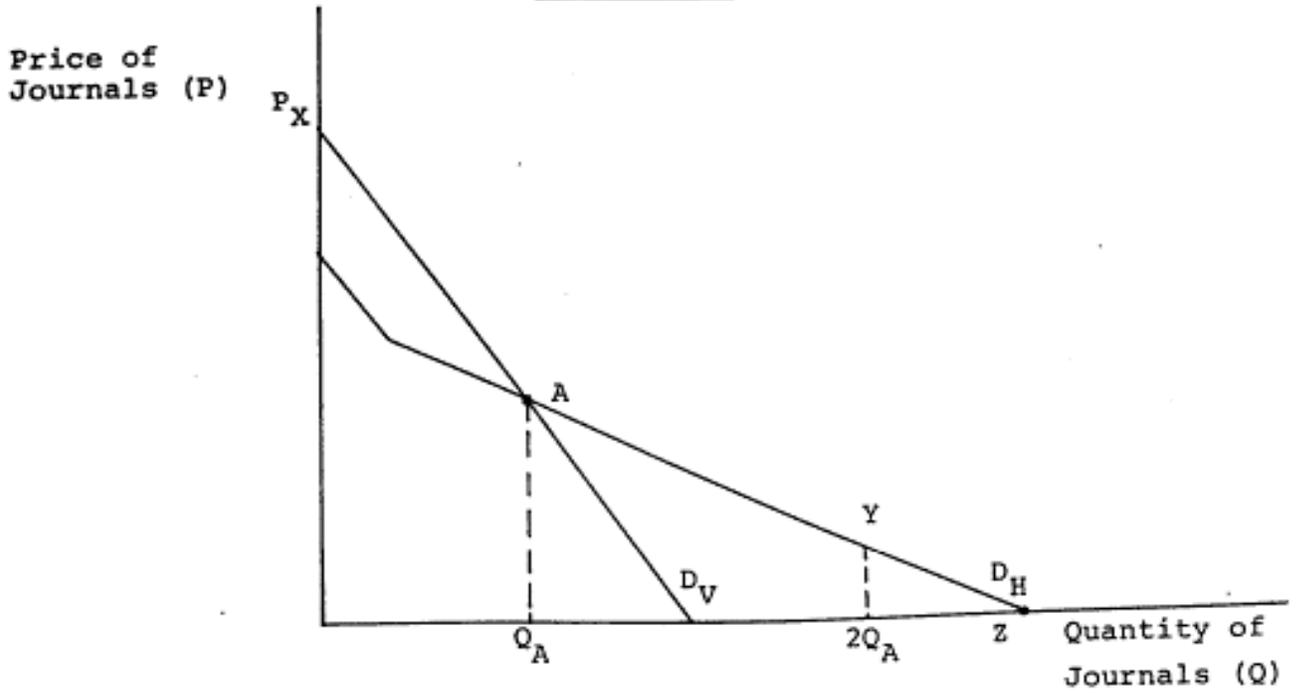
Figure 3

It is clear from the last few paragraphs that a competitive publisher may or may not be better off with reprography. When the publisher is assumed to possess monopoly power the results change. Publishers with monopoly power will always be better off with reprography. This is also the more realistic case since the purpose of copyright is to bestow monopoly power on the copyright holder. This case is analyzed slightly differently than the last case, the major difference being that the monopolist will produce where marginal revenue equals marginal cost (the usual supply curve). If the marginal revenue curves were drawn for each demand curve in Figure 3 it might appear that a marginal cost curve could be drawn which would cause the monopolist to produce an amount of journals greater than Q_A . Such cannot be the case, however, as demonstrated in the following example.

It can be shown that a monopolist's profit-maximizing production must be to the left of Q_A . Assume that the output of journals is greater than Q_A . Since journals and photocopies are perfect substitutes, the quantity of journals on D_H could be cut in half and yet the same number of people could be served if reprography was used. It is always possible to cut the user population in half and make each group just as happy by giving one reproductions instead of originals. By halving production the publisher reduces his costs. His revenues will stay the same since he can serve the same number of people and generate the same total revenue. It must be the case that profits cannot be maximized at output greater than Q_A . This example can be demonstrated more rigorously.

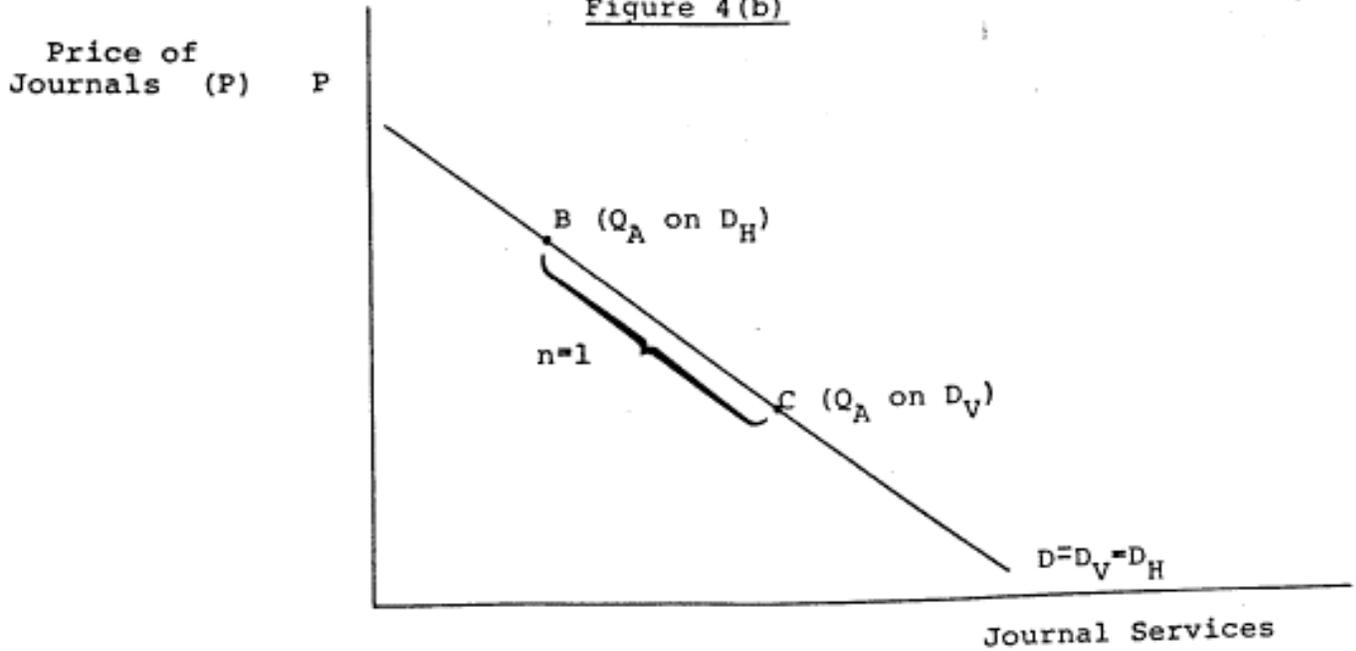
It can be shown with straight-line demand curves that a monopolist would never be better off without reprography. In Figure 4(a), Q_A is the quantity of journals which generates the same revenue with or without reprography, its location being determined by the intersection of D_V and D_H . When reprography exists (so that D_V is the appropriate demand curve) a monopolist will always produce an amount less than Q_A . Since journals and copies are perfect substitutes, they must generate the same services to users. People buy journals for journal services just as they buy light bulbs for light services. Since total revenue is the same at Q_A with or without reprography, the average, or arc, elasticity of journal services between points B and C in Figure 4(b) is one. Since the elasticity of a straight-line demand curve decreases moving to the right along the curve, the elasticity at point C must be less than one. A monopolist would never produce where the

Figure 4(a)



D_V - Demand curve with reprography
 D_H - Demand curve without reprography

Figure 4(b)



elasticity of journal services was less than one.¹¹ Thus, with reprography a monopolist will always produce less than Q_A .

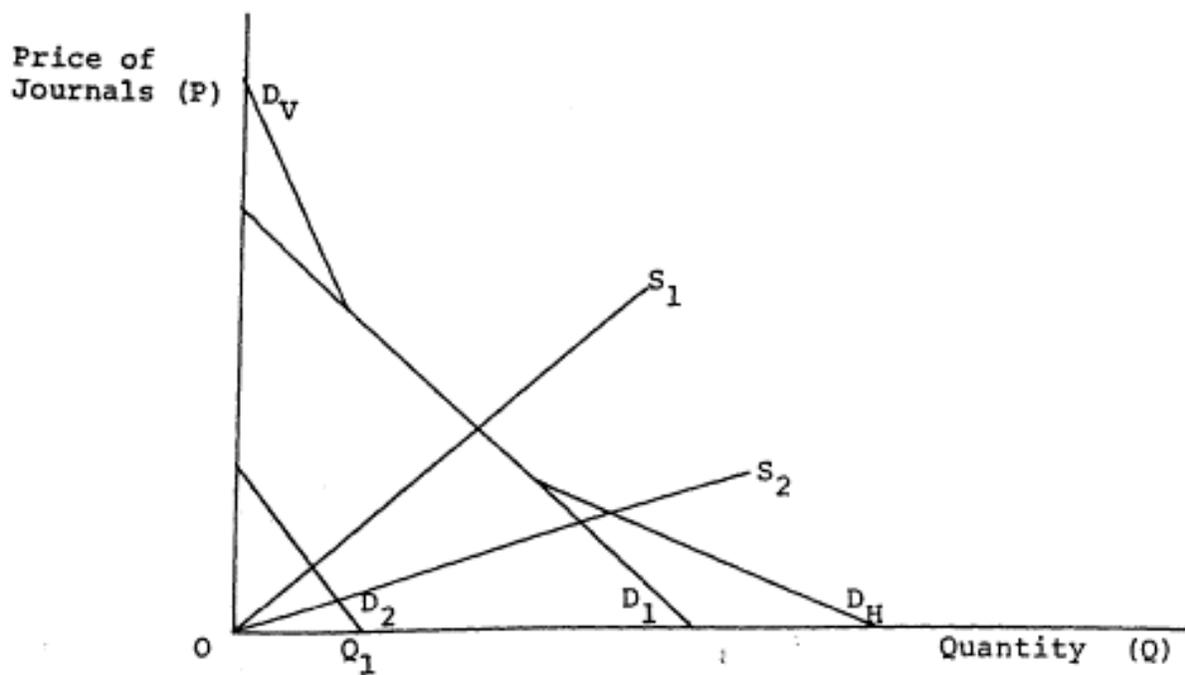
Without reprography, a monopolist may or may not produce less than Q_A . Any quantity on D_H (the situation without reprography) less than Q_A , however, is dominated by points on D_V (the situation with reprography). With regard to points on D_H to the right of A it can be shown that section XA of D_V dominates AZ of D_H . No monopolist would produce more journal services on D_H than Q_A on D_V because it would be an inelastic portion of the curve. In this particular case, given equal sizes of journal and photocopy markets, this occurs at $2Q_A$. Thus a monopolist would never produce to the right of $2Q_A$. Any quantity of journal services created along D_H between A and Y (at $2Q_A$) can also be created between X and A on D_V with a smaller number of journals being produced. When cost is taken into account, X_A dominates AY .

The last examples indicated that, where journals are either perfect or zero substitutes for copies, a monopolistic producer of journals is better off with reprography. The examples contained many strong assumptions, some of which are not realistic. The purpose of the last example was not to arrive at a conclusion regarding the impact of reprography but instead to set up a framework of analysis. So far the assumptions have been that: 1) groups are of equal size; 2) there are two periods of observation; 3) only one copy is made from each original journal; and 4) journals and photocopies are perfect substitutes or non-substitutes. Relaxing these assumptions can have major impacts on the results, as will be seen in the remainder of this section.

Group size and the substitutability of photocopies and journals

The degree of substitution between photocopies and journals is not independent of the relative group size. If photocopies are perfect substitutes for journals, it must be possible to alter the size of the groups by changing the relative prices of journals and photocopies by an infinitesimal amount. The less the degree of substitutability, the larger the relative price change necessary to change the size of the groups by a given amount.

¹¹ Each journal gives a fixed amount of journal services although this amount is different with reprography than without it. If the elasticity of journal services were less than one, in either instance, production of one less journal would reduce journal services, reduce costs and increase revenues. This would increase profits.

Figure 5

- D_V - Total demand with reprography
- D_H - Total demand without reprography
- D_1 - Demand for journals in original form
- D_2 - Demand for photocopies of journals

The relative size of the groups is an important influence in the net impact of reprography. If the demand for photocopies was only a small fraction of the demand for journals, the (implicit) price of a photocopy would be zero since the supply of photocopies (which is a function of the demand for journals) would be greater than the demand for photocopies. Photocopying would not be advantageous to publishers since it would not generate any revenues in this case. Figure 5 represents this case, with D_1 being the demand for original journals and D_2 being the demand for photocopies.¹² D_V represents the total demand when reprography exists. D_V differs from D_1 only over a very small range of output, 0 to Q_1 . Beyond Q_1 , demand in D_2 is satiated and the price of photocopying is zero. Thus, at any quantity of journals greater than Q_1 , reprography adds nothing to the revenues of the publisher.

If reprography is eliminated, users of photocopies must either buy new journals or do without. If some of them are willing to switch to purchasing new journals, their demand can be added horizontally to D_1 and the result is represented by D_H in Figure 5. The degree to which journals and photocopies are substitutes will determine the extent to which members of group 2 are willing to switch to journals. For example, if journals and photocopies are not substitutes at all, no member of group 2 will wish to purchase journals when reprography is banned and D_H will coincide with D_1 . Thus, in order for D_H to lie above D_1 , there must be some degree of substitution between originals and copies. The greater the degree of substitution, the further D_H will lie above D_1 until D_H equals the horizontal sum of D_1 and D_2 . This leads to:

Proposition I: As the cross elasticity of demand between originals and copies increases, D_H increases and this tends to reduce the value of reprography to publishers.

This proposition is based on the fact that, as the substitutability of journals and copies increases, more members of group 2 are likely to switch to journal subscriptions if reprography is eliminated.

¹² Two ceteris paribus demand curves cannot legitimately be included in the same diagram if they represent two non-independent goods because price changes in one good will shift the ceteris paribus demand curve of the other. In this example, it is best to assume either that the two goods are independent or that the demand curves are derived demands, not ceteris paribus demands.

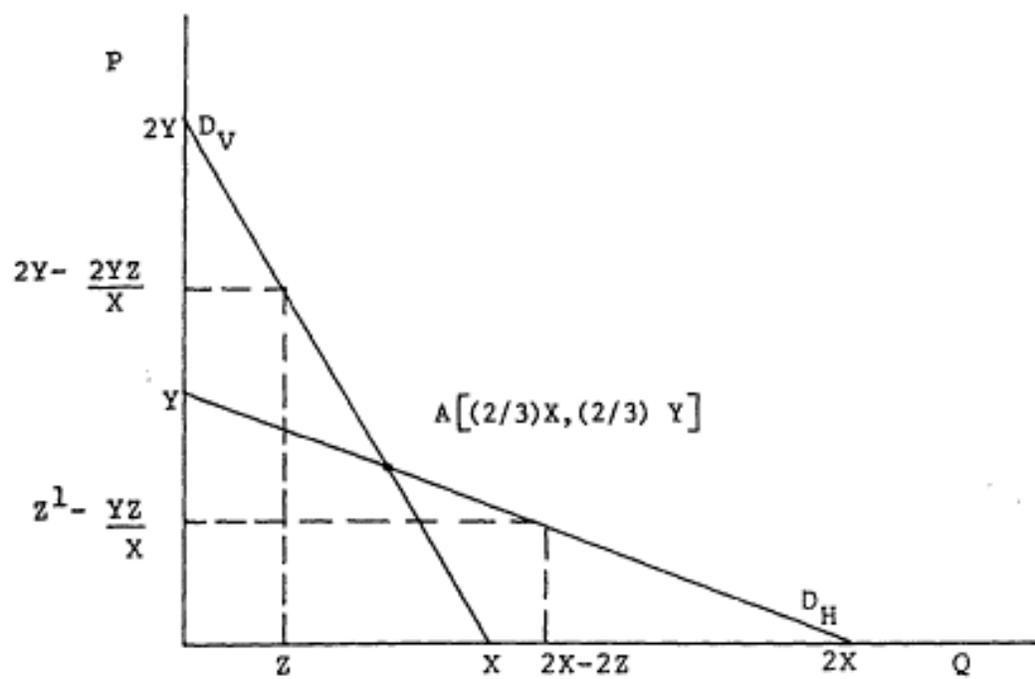
The cross elasticity of demand also affects the underlying demand curves in interesting ways. When some substitution is allowed, there will be an interdependence in the price of photocopies and journals. This leads to the next proposition:

Proposition II: As the cross elasticity of demand between journals and photocopies goes up, the price differential must decrease.

In combination with the assumption that only one copy is made of each journal (so that the supply of photocopies is equal to the quantity of journals), this proposition leads to the conclusion that as journals and photocopies become better substitutes the demand for one becomes more like the demand for the other. When the two are perfect substitutes they have identical demand curves. It has already been demonstrated that, when journals and photocopies are perfect substitutes, a monopolist would always be better off with reprography. Whenever the demand curves are equal, reprography will increase the profits of a monopolist. This is easily understood by referring to Figure 6. If the demand for both photocopies and original journals is equal, the vertical sum will have a Y— intercept at twice the value of the Y-intercept of the horizontal sum. On the other hand, the X-intercept will be twice as great for the horizontal sum. Total revenue equals price times quantity. Assuming an arbitrary quantity, Z , for D_V , the price must be $2Y - 2Y/X * Z$. A price can be selected on D_H , Z' , such that $Z'/Y = Z/X$. The corresponding quantity equals $2X - 2Z$. Since total revenue equals price times quantity, using Z and Z' as specified will lead to equivalent total revenue ($2YZ - 2YZ^2/X$). As noted previously, D_V dominates D_H to the left of A . To the right of A , Z' must be less than $(2/3)Y$. Some values of Z less than $(2/3)X$ can generate the same revenue on D_V as Z' on D_H . Since production costs are less for lower quantities, D_V must dominate D_H . This leads to proposition III:

Proposition III: As D_1 and D_2 become more similar reprography becomes more valuable to publishers.

Taken together, propositions II and III indicate that increasing substitutability makes reprography more attractive to publishers. This is contrary to proposition I. The next subsection will clarify this point.

Figure 6

Equal cross elasticity of demand between the two groups

The propositions on cross elasticity derived in the last section were based on the assumption that the degree of substitution between copies and journals was the same for each of the two groups of individuals discussed. In fact, the two groups need not have the same cross elasticity and allowing them to have different degrees of substitution makes the model more general.

If group 1 has the greater elasticity of substitution, it will be able to switch to the photocopy market more easily than the group 2 members will be able to switch to the journal market. This makes reprography more attractive since raising the price of journals to group 1 will tend to equalize group size without losing disenfranchised members of group 1 from the market entirely. On the other hand, if group 1 has a smaller elasticity than group 2, it would be easier to switch those in the copy market to the journal market, enhancing the abolition of reprography as the profit-maximizing position of the publisher since D_1 would approach D_H .

Imagine the following example. Group 1 is larger than group 2 and values journals but not photocopies, a case of zero substitution. Group 2 considers journals and photocopies to be perfect substitutes. If photocopying is allowed, with the usual assumption of one photocopy per journal, the price of photocopies will drop to zero since the supply of copies (equal to the number of journals purchased by group 1) will be greater than the demand of group 2. The revenue to publishers will be entirely generated by the value group 1 attaches to journals. On the other hand, if photocopying is disallowed, members of group 2 will switch to purchasing new journals. Revenues of publishers will reflect this change in group 2's valuation of journals and publishers will be better off than they were with reprography. This gives rise to:

Proposition IV: Increasing the cross elasticity of demand for group 1 increases the likelihood that reprography will benefit publishers. Increasing the cross elasticity of demand for group 2 makes it more likely that reprography will harm publishers.

It is now possible to understand why proposition I and proposition III were contrary to each other. Increasing the elasticity of substitution for both groups sets up two countervailing forces, the causes of which the earlier analysis could not pinpoint. It should be remembered that equalizing the size of groups 1 and 2 without removing many potential buyers requires that both groups have high cross elasticity of demand.

One Copy per journal

It is this assumption which allows publishers easily to capture the aftermarket price in the original price and therefore it is most important in understanding the potential market breakdown caused by reprography. Violation of this assumption will tend to make the aftermarket effect zero and, since the substitution effect is negative, reprography must be detrimental to publishers (remembering that the exposure effect is assumed to be equal to zero).

In the extreme case where only one purchaser of new journals, such as a library, services the entire market for copies (constituting a monopolistic copy market), the price that will be paid for new journals will reflect only own—use for all demanders except the one who services the aftermarket. Ruling out price discrimination for the moment, the publisher has only two pricing alternatives, neither of which is particularly attractive. The price can be set so that the seller of copies, the library, pays an amount equal to its valuation of the original journal. Or the price can be set with no special attention paid to the seller of copies. In the former case, the subscription price is likely to be so high that all regular subscribers will cancel their subscriptions and only one journal will be sold. The lost revenue from former subscribers will only be made up to the extent that they value copies as they switch to the aftermarket. In the latter case, the publisher loses all possible revenues generated in the after— market, save that of the use value of the seller of copies.

When there are several providers of copies the publishers' predicament is even worse. Competition between these suppliers will drive the price of copies below that which would occur if copies were being provided through a monopoly and the publisher will generate even less aftermarket revenue. In fact, assuming zero copying cost the competitive aftermarket price would be zero, eliminating all aftermarket revenue from publishers. Revenues from the sale of journals for use by members of group 1 will also decrease as people switch to copies at the zero price. This phenomenon most clearly represents the threat reprography poses to publishers.

This market breakdown is caused because the publisher faces two different types of demand and yet can only charge one price. The demand by those who are going to supply the after— market is of a different nature than demands for personal use. The earlier assumption of one copy per journal avoided this situation because the demand for each subscription contained an individual's own—use demand and a single aftermarket demand. This assumption need not, however, be restricted to one copy per journal to avoid the market failure. Two, five or a

thousand copies per journal would be a sufficient assumption, as long as each journal had the same number of copies made. The variability in the number of copies made from each journal is responsible for the market failure. Thus:

Proposition V: The greater the variability in number of copies made per journal, the greater the inability of publishers to capture revenues from both new and aftermarket users.

Two factors can alter this proposition. Both a single price for journals and competition in the aftermarket are necessary conditions for proposition V. If different prices could be charged to different users depending on the number of copies made per journal, the publisher would be able to capture revenue from both group 1 and group 2 by charging a higher price to those who made many copies from their journals. Similarly, if there were no competition among those making copies, the price of copies would not drop to zero and publishers would have some revenues in this aftermarket for potential appropriation. These two factors will prove to be most important in determining the impact of reprography under various institutional constraints.

Two time periods

This assumption simplified the analysis by allowing examination of only two market periods: the journal market and the aftermarket. Such discrete market periods are not likely to be observed in reality. The aftermarket stretches on for many time periods but this complication will not alter the analysis to any significant extent.

The analysis is easily generalized to many time periods. Each aftermarket period will be subject to the forces discussed in the earlier model, but two differences should be mentioned. First, a market breakdown in any period will cause the publisher to lose the values in that market as well as in each market in later time periods. Assuming n number of aftermarket periods with a single market failure in period r , the valuations placed on journals in periods $r, r+1, r+2, \dots, n$ will be lost to publishers.

The second difference from the earlier model is that time can be taken into account explicitly so that it becomes necessary to take the present value of future payments, or valuations, into account. The valuation of a journal by users will now depend on its time pattern of use. A journal used intensively in the early periods of the aftermarket will be worth more than one used intensively in the later stages.

The workings and conclusions of the model are unaffected by this complication.

Summary

This has been a rather long and difficult section. In constructing a model of the impact of reprography on publishers, books could just as easily have been used as journals. There are several parameters in the model which affect the impact of reprography on publishers. These are listed below:

1. The degree of substitutability of originals and copies, influenced by: (a) the size of markets for originals and copies, and (b) homogeneity of substitutability for group 1 and group 2;
2. The variability in the number of copies made from each journal, influenced by:
 - (a) competitiveness in providing copies, and
 - (b) price discrimination in the market for originals; and
3. The monopoly power of publishers.

The next section contrasts various aspects of the model with the actual markets involved in reprography.

The Model Applied

The model in the last section was used to draw various conclusions from different sets of assumptions. In this section, the reality of these assumptions is investigated in order to imbue the model with the properties most likely to be displayed in actual publishing markets.

Monopoly power of the publisher

It seems clear that publishers of copyrighted material do have a monopoly over any given intellectual work. Unauthorized competing editions of the same work are illegal and can survive only to the extent that there is incomplete enforcement of copyright law. Monopoly power is defined here as the ability to produce where marginal cost is equal to the marginal revenue of market demand. This does not mean that publishers necessarily earn large monopoly profits, since there will be competition between various books which appeal to the same audience.

Each publisher has a monopoly over the book he has published, although the demand for the book might be quite elastic so that the marginal revenue need not be much different than the price.¹³

Variability in number of copies per journal

The variability in the number of copies made for each journal is striking even with only a cursory glance. Most journals sent to individuals are rarely photocopied as they are intended primarily for the private use of the subscriber. Journals sent to libraries are frequently photocopied as an aid for research and study. It is more convenient to bring a photocopy home and examine it at one's leisure than to stay in the library.¹⁴ Thus journals owned by libraries are heavily photocopied. It is also the case that the amount of photocopying varies with different sizes and types of libraries.¹⁵ The model in the last section demonstrated that variability in the amount of photocopying per journal could damage publishers by making it impossible for them to capture the value of the intellectual work to those using photocopies. There are circumstances under which the potentially deleterious effects of copying variability can be mitigated. Price discrimination in subscriptions and a lack of competition in selling copies would enable publishers to reap the potential revenues in the after— market even with this variability.

Competition in the sale of photocopies would exist without copyright protection. The cost of access to the intellectual property would be zero and the price of photocopies would

¹³ The historical meaning of the term “monopoly power” comes from a well-known paper by Abba Lerner (1933), who defines it as $(p - mc)/p$. Under his definition, monopoly power was a function of the shape of the demand curve since flat demand curves tend to have small $p - mc$ amounts but steep demand curves tend to have large values. His definition is not appropriate for deciding whether firms act as monopolies since the slope of the demand curve is exogenous to the firm.

¹⁴ Many libraries do not allow users to take journals out of the library for more than a few hours, if at all. In addition, one is not supposed to write on or mark up a borrowed item, which reduces its usefulness. Photocopies do not have these constraints.

¹⁵ See Chapter III for a discussion of the relevant empirical magnitudes.

be driven down to the Cost of producing photocopies, including a “normal” rate of return on investment. The originator of the intellectual property and the first publisher would be unable to capture any revenue from this market. Present copyright law has been effective in prohibiting the competitive manufacture and sale of copies. What it has not prohibited¹⁶ is the photocopying of journals for personal use or non—profit mass photocopying for classroom or library use. This is quite different from the competitive commercial type of photocopying. In a commercial market, customers can go to each of several sellers of a particular item who can therefore never charge more than the competitive price without losing all customers. The photocopying market, as it now exists, is very informal with no central structure and involving high costs in finding someone willing to provide the item. Excluding libraries and personal acquaintances, there is no place to obtain a journal in order to photocopy it.

The “transaction costs,” as these market frictions are usually called, are so high in this non-library market that they easily swamp the benefits of searching for the lowest price among those willing to provide the journals. For this reason, the normal assumption that market forces will push the price of a copy down to the cost of photocopying will not be appropriate. The transaction costs must be included in the cost of the photocopy. This, of course, implies that those who provide journals to be photocopied can capture a portion of the value placed on obtaining a copy by those who wish to have copies made. In non—library transactions this value will be non-pecuniary and journal subscribers will usually benefit by the goodwill earned. This goodwill should be reflected in their valuation of the journal and will increase the price they are willing to pay for a subscription. This valuation probably will not vary much among subscribers.

Since the transaction costs of using libraries are not inordinately high, the above scenario does not apply to them. If libraries can be induced to pay a subscription price related to the valuation of the journal by library users, publishers will not be harmed by the photocopying done in libraries. In order for this to happen two conditions are necessary: (1) publishers must know which particular journal is going to be used by a library; and (2) journals used by libraries must have subscription

¹⁶ The term “prohibit” is being used in a de facto sense. Fair dealing, being a somewhat nebulous concept, may or may not allow some of the practices which are currently in existence but the present law has not had the effect of eliminating these practices.

prices related to the valuation of library patrons. The first condition is necessary to prevent a library from copying a journal from an individual and then letting its patrons make copies of the copy. publishers would not be able to tap aftermarket revenues from libraries if they did not know which journal they mailed out would be used by a library. The second condition ensures that, once a publisher has determined the appropriate price for a journal, he is able to charge that price.

Both of these conditions appear to exist at present. Libraries are charged different subscription prices than individuals.¹⁷ As well, they appear to receive their journals from publishers although there does not seem to be any legal necessity to do so.¹⁸ It thus appears that conditions are such that publishers can appropriate some of the revenue in the aftermarket by price discriminating between individuals and institutions. Further discrimination between institutions of different sizes and types should enable publishers to capture more revenue than they do now.

Cross elasticity of demand

The model presented earlier in this chapter demonstrates that, as the degree of substitutability between journals and copies increases, a monopolist could be better or worse off by allowing photocopying. The actual impact depended on the preferences of journal subscribers and purchasers of copies. In the extreme case of perfect substitutes, however, the monopolist was always better off allowing photocopying.

The cross elasticity of demand for photocopies is an empirical matter. In principle, it is apparent that the intellectual material contained in the original and that contained in the copy are perfect substitutes for one another. This might seem to imply that journals and copies should be perfect substitutes.¹⁹ However, it must be remembered that journals contain a group of articles, some of which may be of little

¹⁷ See Chapter III.

¹⁸ Most libraries order journals through clearinghouses but they pay the institutional price to the publisher.

¹⁹ This is not to say that they would have the same price. It merely implies that the services of each are identical although photocopies may have fewer services, due to lower durability, than originals. Equivalent units of service would have the same price, however.

value to a particular individual, and copies will be made only of selected articles. Thus photocopies of single articles are not perfect substitutes for a journal containing several articles. On the other hand, they are certainly not independent.

The model applied to different copyright mechanisms

Under present circumstances, it is not possible to determine the impact of reprography on publishers on the basis of theory alone. The discussion of the model should have made it readily apparent that the impact of the aftermarket would be difficult to predict a priori. Knowledge of cross elasticities of various groups, the size and preferences of these groups and the nature of photocopying would be necessary to determine the impact of reprography on publishers. In fact, however, it is not necessary to ascertain the absolute impact of reprography on publishers, but merely the impact of reprography under different copyright payment mechanisms. In other words, since no one has suggested banning reprography altogether, it is only necessary to determine the relative position of publishers with different copyright mechanisms. In Chapter III this model will be applied to other payment mechanisms to determine the impact of each on publishers.

The total effect of reprography on copyright

The model has examined the substitution and aftermarket effects brought about by reprography. The total impact of revenues needs to take account of the exposure effect as well. The direction of this effect is clearly positive (reprography will increase total journal use) but its magnitude is uncertain. It will tend to mitigate the reduction in journal subscriptions caused by the substitution effect. Chapter 111 presents evidence of the trend in journal subscriptions.

It is important to remember that revenues are not linearly related to profits. Even if publishing revenues go down due to reprography, publishers may be better off because the total cost of production decreases when the number of subscriptions decreases. The study by Machlup and Leeson (1978) allows us to estimate fixed costs versus variable costs. They found variable costs to be about 39 per cent of the total cost.²⁰ This implies that publishers only need to receive

²⁰ Machlup and Leeson, 1978, vol. 2, Table 3.5.5. For the purposes of this paper, variable costs include paper, printing and binding, promotion, distribution and postage.

\$.60 per dollar for every reader who switches from private subscription to library use. The COSTC study allows us to calculate variable costs of 26 per cent, implying that publishers only need to receive \$.74 on the dollar.

EMPIRICAL MAGNITUDES

The Anatomy of Photocopying: A Review of the Literature

Several studies have been undertaken to discover the magnitude of photocopying usage based on information gathered from libraries in Canada, the United States and the United Kingdom. This section centers on some of the most important of these studies.

Library usage is only a small part of total photocopying use. However, business photocopying largely consists of making copies of internal documents and reports. This paper is only concerned with the photocopying of copyrighted materials and this is most likely to occur at institutions such as libraries, which contain a large number of copyrighted materials.²¹ This makes libraries an important target for study in order to discover the major parameters regarding the extent of photocopying of copyrighted material.

Stuart-Stubbs

An important Canadian study was conducted by B. Stuart-Stubbs (1971) based on the responses of 41 university libraries which agreed to measure various magnitudes regarding the use of photocopying. These libraries reported on both the machines used by the staff and the coin-operated public machines. Machines on the campus but not in the library (79 per cent of the total) were not included in the study.

The first statistic calculated from this survey was the type of material which was being photocopied. The following table is taken from the Stuart-Stubbs survey (Table II, p. 26):

Type of Material	% of Copies
Book	21.5
Periodical	22.4
Government document	4.3
Thesis	3.1
Other published material	33
Nonpublished material	45.4

²¹ Studies attempting to measure the extent of photocopying all seem to have libraries as the unit of observation. The extent of photocopying of copyrighted material in non-library settings is unknown. However, see King Research Inc. (1977).

Books and periodicals each account for somewhat over one-fifth of the photocopying. Almost one—half of the material photo copied was unpublished. Approximately 80 per cent of book photocopying and 90 per cent of periodical photocopying was performed on material owned by the university (Table 12, p. 27).

This study also gives the breakdown by country of origin of the published material which was photocopied. These results are reproduced below (Table 14, p. 28):

National Origin	% of Published Materials Photocopied
Canada	28
U.S.	47
U.K.	11
France	3
Other	11

Seventy-two per cent of published material which was photocopied was of non-Canadian origin. This result clearly implies a deficit position for the balance of payments, although the dollar value of this deficit is unknown. It is clear that the impact of photocopying on the Canadian publishing industry is much smaller than might be thought if one looked only at the amount of photocopying. Stuart—Stubbs finds that Canadian books accounted for 7.2 per cent of total photocopies and Canadian periodicals for 5.3 per cent in his sample of photocopies of copyrighted materials.

To calculate the impact of photocopying in university libraries on Canadian publishers, he used the yearly number of photocopies estimated by librarians to estimate the total number of photocopies of Canadian books and periodicals per year. Canadian books accounted for 4.6 per cent of all photocopies in his sample and Canadian journals accounted for 3.4 per cent. Stuart—Stubbs found that the annual number of copies made in this set of institutions was 14,725,946 in 1971. This means that the annual number of copies and revenue generated from Canadian material was:

	No of Copies	Revenue Generated @ \$.07/copy
Books	677,394	\$47,418
Periodicals	500,682	\$35,048

Stuart—Stubbs wishes to make the case that university libraries did not have a significant impact on the revenues of publishers and authors. If his data are correct his conclusion might be warranted, although photocopying revenues could be smaller than the decrease in subscription revenue.

One other useful piece of information reported by Stuart—Stubbs, which bears on the discussion of the impact of photocopying, is the average number of pages copied per item. He found that for Canadian books 7.7 pages were copied per photocopying use, while for periodicals the figure was 9 pages. With these figures it seems unlikely that photocopying is used as a significant substitute for the purchase of a book since 8 pages is only a very small part of most books. For periodicals the situation is somewhat different since they contain many short articles and the person making the copies might copy one article at a time.

Stuart—Stubbs' figures are likely to understate university photocopying since many machines are not in the libraries. Those in department offices are likely to be used primarily by faculty and graduate students. His figures on library copying indicate that faculty and graduate students are four times as likely to make photocopies as undergraduates. Of course, departmental machines serve many fewer customers than those in the library so that no conclusions can be made regarding total university photocopying of copyrighted materials. The small number of multiple copies may be taken as evidence that most photocopying falls under the rubric of fair dealing.

Barker

Barker (1970) found a somewhat similar situation in a study of photocopying practice in the United Kingdom. He studied the incidence of photocopying in several classes of libraries, including academic, industrial and commercial, government research, technical and learned societies, and public libraries. Librarians were asked to estimate the quantity and type of photocopying they engaged in. For this reason the numbers are probably less reliable than those presented by 'Stuart—Stubbs.

Barker finds that books are much less heavily photocopied than are periodicals. The overall ratio of copied items of journals relative to books is 21:1. Academic libraries had the lowest ratio of journal to book photocopying, at 11:1, with industrial and commercial libraries having the highest, at 55:1. In addition, only six per cent of photocopies were multiple copies.

Barker estimates the average number of copyrighted items copied for each classification of library as follows:

Library Type	Average Number of Copies per Library	# of in Libraries Sample
Academic	3300	105
Public	2725	89
Government	1585	17
Technical and learned societies	2025	59
Industrial and commercial	3280	139

Since academic libraries are only a small percentage of the library population (26 per cent in Barker's sample, 27 per cent in the King study), total library photocopying should be quite a bit higher than that estimated by Stuart-Stubbs. This table indicates that these other libraries photocopy a large volume of copyrighted materials.

Sophar and Heilprin

A U.S. survey was based on six libraries which monitored photocopy machines for one month (Sophar and Heilprin, 1967). Coin-operated machines were not part of the survey. The ratio of journal copies to book copies was found to be 3.5:1. The number of multiple copies was found to be three per cent. Journal articles were usually copied in toto while books were copied in part. One—third of the books copied were published by non—profit publishers.

One rather interesting result concerns the total amount of photocopying of copyright material. It is claimed that total annual copying of published material, as distinct from total annual copying, is very largely but not entirely library copying" (p. 71). This implies that the studies based on libraries are an appropriate gauge of the true impact of photocopying on publishers and authors.

The King study

The King study was conducted for the National Commission on Libraries and Information Science in 1977 by King Research Inc. (see King Research Inc., 1977). This study based some of its results on a survey of about 350 libraries of various types as well as on an analysis of interlibrary loans from the MINITEX system of 132 libraries in Minnesota.

The results are in basic agreement with those of Stuart— Stubbs. The overall ratio of pages photocopied of journals to books was 1.45:1, although for academic libraries it was found

to be .64:1. The total number of photocopies made in the United States in 1976 in libraries was 906 million. The ratio of journals to books for the number of items photocopied was 3.23:1 and 3.04:1 for total and copyrighted items respectively. Thus more journal items were photocopied although the number of pages copied per item was less for journals than for books.

The following table is compiled from Tables 3.1 and 3.2 and Figure 3.4 of the King report. It is clear that the reliance on academic libraries (as in Stuart-Stubbs) greatly understates the total impact of library photocopying.

Library Type	# of Items	# of Copyrighted Items	# of Pages
Public	64	24	377
Academic	17	8	219
Special	26	18	238
Federal	7	4	72

The King report allows us to calculate a very valuable piece of information. In their study of interlibrary loans for 1976, they found (Table 5.6) that 4.4 items were copied per journal title on material less than six years old. They also report that interlibrary loans are responsible for about 12 per cent of library staff photocopying (Table 3.11) of journals. If interlibrary loans are indicative of total library use, this would mean that 37 items per journal title less than six years old would be copied by library staff. Stuart-Stubbs found that staff copying accounted for 51.8 per cent of total library copying (Stuart-Stubbs, 1971, p. 25). This means that, for all photocopying machines in an average library, 73 items per year would be made from a given title less than six years old. This is an annual average of 3 copies per issue if journals are published quarterly, leading to 18 copies in the first six years. Over half the photocopying is performed on journals less than six years old so that the number of items copied over the life of a journal would be approximately 36. They found that the average number of pages per photocopy item for journals is 6.1 (King Research Inc., 1977, Table 3.6). The net result of these calculations is that the average journal issue will have 220 (6.1 x 36) pages copied over its life in the average library. Precise statistics on the average number of pages per issue for a typical journal are not available, but it seems likely to be close to 220 pages per issue. It thus appears that each page of a journal is photocopied once in its life in a library.

This number was generated with several strong assumptions which may not be realistic. For example, interlibrary loans may not be indicative of normal journal use and staff photocopying may be different than private copying. Still, the final figure may not be far off. If journals are completely copied once, on average, the value of the journals to library patrons may be several times greater than the value of the journal to subscribers. This latter result holds for two reasons. First, subscribers don't value every article in a journal. photocopying of the entire journal indicates a greater total interest than is possessed by most subscribers. Second, some users of journals in libraries do not make photocopies.

The Blackburn study

Blackburn examined staff use of copiers for two weeks in the University of Toronto Library in 1970. (Blackburn, 1973). He found that 11 per cent of published material copied was of Canadian origin. Journals accounted for 76 per cent of the copied materials and outnumbered books in a ratio of 3.6:1. The average number of pages copied from books was 8.5 and from periodicals 9.5 for Canadian materials only. Only 1 per cent of sample copies were duplicated over the two-week period.

The Blackburn study also quotes a study done at the University of British Columbia. Photocopy users were asked what they would do if they could not obtain photocopies. Seventy—two per cent said they would hand—copy, 19 per cent said they would forget the whole matter, 6 per cent said they would purchase the material and 4 per cent said they would tear out the desired pages. Of course, such surveys are not to be trusted since individuals often do not know what they would do and might not be telling the truth anyway.

The Blackburn study, like the Stuart—Stubbs study, seems to want to reach a certain conclusion. Since both were commissioned by groups representing libraries and librarians, the emphasis is on attempting to downplay the impact of libraries on publishers, still, they do contain interesting and useful information.

Summary

These studies tend to give one an idea of the nature of photocopying in libraries. Journals are copied more than books but the studies disagree as to the exact extent of the copying. Multiple copies appear to be made infrequently. Canadian copyrighted material is a very small percentage of the total photocopying in Canadian libraries. Academic libraries are responsible

for only a small percentage of library copying of copyrighted material.

The Behaviour of Journal Subscriptions: A Review of the Literature

Up to this point no evidence has been presented regarding the impact of photocopying on subscriptions or sales. The evidence of the last section indicated that journals were more often photocopied than books, especially in commercial and learned society libraries. The average number of pages photocopied was greater for journals than for books. A small number of photocopied pages is less likely to replace the sale of a book than the sale of a journal. These reasons provide a justification for focusing attention on journals in the empirical sections which follow. Another factor shifting the focus to journals is the availability of data. Journals have been examined more thoroughly than books and data are therefore more readily available.

Measurement of a causal linkage between photocopying and journal subscription changes would be optimal but is not observable. Instead, it is necessary to rely on data relating the number of subscriptions to the passage of time. Since photocopying has increased during the last two decades, its impact should be reflected in subscription data. Unfortunately, other factors besides photocopying influence the number of subscriptions and these factors, such as the population of potential readers, the number of competing journals and the changes in production costs, are difficult to measure.

An important variable which is unavailable is the amount of photocopying per journal per year. Without this variable it is impossible to determine the impact of photocopying on subscriptions in a rigorous fashion. Instead, it is necessary to rely on imprecise secondary evidence consisting of subscription trends and journal prices. It is often asserted that journals have had to raise prices to compensate for decreases in the number of subscribers, with increased use of reprography being responsible for part of this reduction. In fact, the number of subscriptions has increased during the decade of the 1970s.

Evidence on the behaviour of journal subscriptions has been particularly sparse. Several studies have attempted to delineate the trend in journal subscriptions, with varying degrees of success.

Asser

The least successful attempt was by Mier, who discussed a survey by the International Group of Scientific, Technical and Medical Publishers (Asser, 1978). The survey was based on 403 journals published in seven countries (not including Canada) over the period 1971—1977. Asser's conclusion is that:

The survey does not offer proof that the prophets of doom were correct when they predicted an overall drop in journal subscriptions. But the experience of these established journals—all international in scope...offers little reason for optimism. An annual global average increase of 1.5% in subscriptions does not approach the growth in the number of scientists in the market area during the same period.

These conclusions are not justified by the evidence which was used to support them. The survey was conducted on journals which were at least ten years old. In the period 1971—1977 there was a 29 per cent increase in the number of journals published by this sample of publishers. New journals (commencing after 1971) composed 35 per cent of the total but 6 per cent of the journals stopped publishing during the period. The ratio of births to deaths was nearly six to one hardly indicative of a bleak market.

Subscriptions for journals which were at least ten years old grew by 9 per cent for the entire sample and by 15 per cent for journals published in the United States during the period 1971—1977. Asser does not substantiate his claim that the growth in potential readers was greater than the increase in subscriptions. We can bring some data to bear on his assertion.

Table 1 lists scientists and engineers in various job categories by year for the United States.²² It is quite clear from these figures that the number of scientists and engineers did not rise dramatically over the time period in question. The journals in Asser's sample would seem to be addressed to this group of individuals so that these numbers seem appropriate. On the other hand, statistics on the number of

²² U.S. data were used because of their availability and because the United States is so similar to Canada. In addition, U.S. sales abroad were much lower than for other countries so that changes in the U.S. population of scientists are more reliable for U.S. subscriptions than, say, changes in the U.K. population of scientists since 75 per cent of U.K. journals were sold abroad while only 19 per cent of U.S. sales were foreign.

doctoral scientists and engineers indicate a much larger increase in this group over this period. Figures for this category are spottier than those in Table 1 but between 1973 and 1975 this group increased by 13 per cent. It may thus be the case that the ratio of subscriptions to ten—year-old journals did not grow quite as fast as the potential population.

Table 1

Numbers of Scientists and Engineers by Job Category (000's)

	Research and Development	Government	Higher Education
1971	—	208	274
1972	522	217	—
1973	521	—	—
1974	527	211	281
1975	530	222	293
1976	538	—	303
Last year/ First year	103.1	106.7	110.6

Source: U.S. Statistical Abstracts, 1972, 1973, 1974, 1975, 1976.

This result is not at all surprising and does not support Asser's conclusions. It must be remembered that in this sample there was an increase of 29 per cent in the number of journals over this period. If the new journals were only one half the size of previously existing journals, this would imply that total journal subscriptions had risen 14.5 per cent in those fields due to the addition of new journals. Asser completely disregards this aspect in his calculations. It thus seems reasonable that there was in fact a larger growth in journal subscriptions in this period and that the growth of the scientific population was smaller than Asser would have one believe. It cannot be stated categorically that subscriptions per capita are up but it appears that there has been no dramatic decline.

The COSTC study

A superior study was carried out by the Committee a Scientific and Technical Communication in the United States to measure the behaviour of subscriptions (COSTC, 1970). This is important document presents evidence that during the period for 1958 to 1968 the number of journal subscriptions increased. These results are particularly persuasive because of the care which was used in generating them.

Changes in circulation were compiled for over two dozen journals in various fields. All journals were published by scientific or technical societies. A journal subscription was not a requirement for membership in these societies so that these subscriptions are, in fact, indicative of the true demand for the journals. Over the period 1958—1968 it was found that subscriptions to institutions rose by approximately five per cent per year whereas subscriptions to individuals rose by between four and five per cent per year. The annual growth among Ph.D. level personnel was four per cent per year during this period so that subscriptions to these journals grew faster than the population of potential readers. Unfortunately, this report does not perform the most natural test of all comparing subscription growth rates with the growth in membership of the scientific and technical societies.

This report reveals other interesting aspects of journal publishing. The growth rate of journal titles (being careful to eliminate title changes) was found to be 2.5 per cent per year for the period in question. The fact that this is somewhat lower than that found in the study used by Asser could be due to the different time periods used, the different sample of journals or the quality of the research.

Another statistic of interest is the change in the size of journals over time.

The report states:

The data show that nearly all journals have been growing in size, the median rate being about a factor of two in a decade (about seven percent a year), with most individual rates lying between twice this and zero. (p. 101)

It goes on to say:

The rough data...suggest a doubling in the volume of published literature in the last decade, and this figure must be augmented...to take into account the birth rate of new journals. Available figures on numbers of scientists in various fields, number of Ph.D.'s, or total scientists and engineers in research and development give (extrapolated) increases over the last decade of only 1.46 to 1.66. (p. 101)

The evidence thus seems contrary to common belief. The amount of subscribed journal material has increased per potential user. There does not appear to be any evidence to support the contention that photocopying has reduced the sales of journals.

Report of the National Enquiry

The most recent study, a large undertaking costing \$600,000, was performed by the Report of the National Enquiry into Scholarly Communication, 1979). This American study attempted to examine many facets of the author—publisher—user relationship.

Since 1973, the number of scholarly journals is estimated to have been increasing at a rate of two to three per cent a year (p. 37). The study discusses the rapid increase in the number of journals which occurred in the 1960s and early 1970s. It goes on to predict:

Since the boom in the establishment of new journals occurred during the period of most rapid rise in university graduate enrollment and faculty and the expansion of federal funds for library purchases, it seems reasonable to expect the growth rate in the number of journals to fall in response to the leveling of enrollment and the retrenchment in spending for higher education. (p. 42)

This conclusion seems reasonable although it says nothing about the relative growth of journals versus potential readers.

Another interesting piece of information in the National Enquiry comes from a survey of journal readers, subject to the same caveats as all surveys. Those who cancelled subscriptions were asked why they had done so and 30 per cent cited an increase in price, 24 per cent a change in research interests and 10 per cent a decline in the journal's quality. The report also goes on to state that "the number of individual subscriptions per scholar has not changed in recent years." If this statement is true, its ramifications have not been fully appreciated. It clearly implies that total subscriptions have grown as fast as the scholarly community and does not indicate any erosion due to the influence of reprography.

The National Enquiry continues:

From 1972 to 1977 the number of subscribers to literature journals...rose 44% for individuals

and 13% for institutions. In the social sciences, the gains were only 7% for individuals and 12% for institutions. In philosophy, individual subscriptions dropped 9% but institutional subscriptions rose 8%. Over the 1966—75 period, a survey of forty—three journals by Machlup and others shows a 17% increase in circulation. (p. 59)

These data are similar to those previously discussed and merely reinforce the view that subscriptions have not fallen in the past two decades. The numbers, however, are not precise enough to determine with certainty if circulation has kept pace with population trends. They can also be criticized on the same grounds as those in the other studies discussed here.

Nasri

Nasri attempted to measure the impact of reprography on subscriptions by asking journal subscribers, including former subscribers, what impact reprography had on their decision to subscribe (Nasri, 1976). He concluded "that photocopying, despite the claim of publishers of scientific journals, has little to do with the loss of subscriptions." His conclusions are problematic at best because of his procedures. First, his sample was small, based only on subscribers to four medical journals. Second, and more important, the subscriber may not be fully cognizant of the reasons why he cancelled his subscription to a journal. People quite often behave in ways they do not fully comprehend, especially in making economic decisions. For example, polls of people's expectations usually indicate elasticities of demand for gasoline which are far lower than measured elasticities. Businessmen often deny maximizing profits and consumers deny maximizing utility and yet they appear to perform these calculations when we measure their behaviour in the economy.

Fry and White

The final study to be examined is an important contribution by Fry and White which studies the interaction between publishers and libraries over the period 1969—1973 (Fry and White, 1976). Several of their results are of interest.

The growth of new journals between 1969 and 1973 was found to equal 16 per cent. With journal deaths calculated at 8 per cent, the net growth was found to be 8 per cent (or 2 per cent annually). Pages per journal over this period were found to increase as well. The percentage increase in the number of

pages is given for four categories of publishers. If these values are averaged and weighted by the number of titles in each category, the result is an increase of 4 per cent in the number of pages per journal over this period.

Of special interest is the behaviour of humanities journals during this period. The start of new humanities journals during 1969-1973 accounted for 11 per cent of the humanities journals publishing in 1973. At the same time, the average number of pages per journal jumped 16 per cent. Fry and White state that this last statistic "is particularly interesting in view of the indication that journals in the humanities are in the most consistent financial difficulty of all disciplines." (p. 74). The large increase in published material in humanities journals may, by increasing competition for subscribers, have made this set of journals the least profitable and therefore most prone to claim that outside influences, such as reprography, were harming the journal publishing industry.

Fry and White also give the breakdown between the number of individual and institutional American subscribers. Their figures are rearranged in the following table:

	Ratio-of Institutional to Individual Subscriptions			
	Commercial (34)	Society (65)	University Press (24)	Other Non-Profit (25)
1969	1.28	.29	1.01	1.03
1971	1.30	.32	1.02	.73
1973	1.32	.34	1.15	.74

Source: Fry and White, Tables 8-2 to 8-4.

Reprography should have the impact of increasing these ratios and this is the result for all but the mother non-profit" group. There is some suspicion expressed in Fry and White that this group's data are bad.

The total change in domestic circulation from 1969 to 1973 for these journals is very small. Commercial publishers suffered a .9 per cent decrease in domestic circulation, society publishers a .3 per cent decrease, university publishers a 3.6 per cent decline but other not—for—profit publishers registered a suspiciously large increase of 26 per cent. The increase in foreign subscribers was quite large (12 per cent, 21 per cent, 75 per cent and 4 per cent respectively).

The change in institutional price versus individual subscription prices reported by Fry and White is portrayed in the following tables

% Increase in Price from 1969 to 1973

Source: Fry and White, Table 9-10.

<u>Commercial</u>		<u>Society</u>		<u>University</u>		<u>Other</u>	
Ind.	Inst.	Ind.	Inst.	Ind.	Inst.	Ind.	Inst.
34.8	70.6	42.0	40.4	25.1	32.5	42.8	45.6

These results indicate that the spread between individual and institutional prices grew over the period-with most of this growth accounted for by commercial publishers. This conforms to the expectations of this paper's model.

Fry and White also find that the percentage of journals charging multiple prices has remained essentially unchanged with figures of 35 per cent, 37 per cent and 36 per cent for 1969, 1971 and 1973 respectively. This is surprising since this paper's model predicts that more publishers will find it beneficial to switch to this pricing scheme as reprography be-comes more prevalent.

The final result of Fry and White's study concerns library expenditures. Tables 3—4 and 3—5 from Fry and White's study are reproduced in Tables 2 and 3. The increasing relative importance of periodicals to libraries is demonstrated by the increasing proportion of library budgets being allocated to them. Since journals are photocopied more than any other library holdings, the model in this paper would predict that journals should go up in value to library patrons more than any other library expenditure. This is due: to both the aftermarket and exposure effects. For academic libraries, growth in serials budgets has been two to three times that of the overall budget and nearly ten times that for book acquisitions. For public libraries, growth in serials expenditure has been greater than overall budgets but not to the extent of academic libraries. This conforms to expectations since journals are more important to users of research (academic) libraries than to users of public libraries and photocopying increases the value of journals to library users. The fact that the increase in serials expenditure is greater than the increase in journal prices indicates the exposure effect at work.

Table 2

Academic Libraries' Budget Breakdown) by Category,
Median Percentage Increase, 1969—1973

Strata(a)	Budget	Salary	Other(b)	Materials	Materials Distribution		
					Serials	Books	Other(c)
500-1,000 (N=25)	21.27	28.12	47.03	6.85	62.17	7.49	1.92
1,001-2,000 N=29	38.65	45.7	28.68	28.81	66.61	15.38	15.42
2,001-5,000 N=52	40.78	44.42	43.1	34.75	89.31	7.5	3.2
>5,000(N=73)	36.8	41.51	40.07	29.91	75.46	3.11	1.76

Source: Fry and White, Tables 3-4 and 3-5.

(a) Based on number of periodicals held.

(b) Equipment, supplies, etc.C

(c) Audiovisual, nonbook, microforms, etc.

Table 3

Public Libraries' Budget Breakdown by Category, Median Percentage Increase, 1969-1973

Strata(a)	Budget	Salary	Other(b)	Materials	Materials Distribution		
					Serials	Books	Other(c)
75,000-150000 (N=27)	53.57	51.74	60.65	41.29	59.71	36.7	156.7
150,001-300,000 (N=35)	53.23	49.16	81.16	48.63	70.07	38.48	123.46
>300,000 (N=46)	47.4	45.26	43.85	37.99	73.05	27.78	77.31

(a) Based on number of periodicals held.

(b) Equipment, supplies, etc.C

(c) Audiovisual, nonbook, microforms, etc.

Summary

Many studies and a wide range of information have been covered in this section. It will be worthwhile to summarize the main findings here. Over the last two decades:

1. the number of journals increased;
2. the number of journal subscriptions increased;
3. the size of journals increased;
4. because of the magnitudes of the above increases, it appears that the growth in journal pages subscribed to has been equal to the rise in population;
5. institutional subscription prices have risen relative to individual subscription prices; and
6. libraries spend a larger proportion of their budgets on journals.

Change in Journal Prices, 1970—1978

In an attempt to measure the change in journal price⁸ precisely, data were collected for both Canadian and non-Canadian journals. The procedure consisted of selecting journals (according to criteria given below) and determining the price charged to institutions and individuals for the years 1970 and 1978. Prices from 1978 were found on the journals and 3970 prices came from Ulrich's International Periodicals Directory and Faxon's Librarians Guide for 1978. Circulation figures came from Ulrich's Directory.

The sample of Canadian journals was composed of two parts. The first group were more academically inclined journals which librarians at the University of Western Ontario considered to be the most heavily used and photocopied, while the second group consisted of journals of a more general content. The list Of these journals can be found in the Appendix. The group of non—Canadian journals (also found in the Appendix) consisted of the leading academic journals in several academic disciplines as perceived by these same librarians.

The first matter investigated concerned the relative price spread between individual and institutional subscription rates over the period 1970—1978. As reported earlier, Fry and White found this differential increasing over 1969—1973, especially for commercial journals. The results of the research carried out for this paper are portrayed in Table 4.

It is readily apparent from this table that the price charged to institutions has gone up relative to that charged to individuals. For all three samples of journals this is true. The t-value for rates (row 7) gives the statistical significance of this difference. In each sample, the increase in the

Table 4: Institutional and Individual Prices, 1970-78
Less Scholarly

	All Canadian	Canadian	Non-Canadian
1970 individual	8.95	8.78	13.2
1970 institutional	11.25	9.89	16.46
1978 individual	17.1	14.78	25.17
1978 institutional	22.65	20.89	36.61
1970 ratio, institutional to individual	1.23	1.11	1.26
1978 ratio, institutional to individual	1.36	1.49	1.66
T-value, 1970 spread versus 1978 spread	3.03 (98%)	3.64 (98%)	4.43 (99%)
T-value, 1970 ratio versus 1978 ratio	1.47 (68%)	2.82 (96%)	3.21 (99%)
Number of Observations	20	9	54

difference between institutional and individual prices over this nine-year period has been statistically significant at the 95 per cent level of confidence. The non-Canadian journals have had the most significant and largest absolute increase in the price spread.

Looking at the arithmetic difference between these prices may be somewhat misleading due to the inflationary forces prevalent during this period. If inflation impacted on both individual and institutional prices to the same extent, the absolute value of the price spread would increase over time. For example, assume that individual subscription prices averaged \$10 in 1970 and institutional prices averaged \$15. With 20 per cent inflation between 1970 and 1978, the prices charged to these groups would rise to \$12 and \$18 for individuals and institutions respectively. The difference between the groups will have risen from \$5 in 1970 to \$6 in 1978.

To determine the change in relative prices independent of inflation, the ratios of institutional to individual, prices were formed. These are presented in rows 5 and 6. Observation reveals that these values have increased during this period of time. This increase has been significant (row 8) for the group of non—Canadian journals as well as the less scholarly Canadian group. The total Canadian group had an increase in the ratio from 1.23 in 1970 to 1.36 in 1978, but it should be noted that statistical confidence in this result is quite low. The group of scholarly Canadian journals (not reported) is apparently responsible for this small increase. There is evidence, however, that, this group will radically alter its pricing practices in the immediate future.²³ If, as suspected, these pricing practices are altered such that institutional prices are raised relative to individual prices, future tests should show greater statistical significance for the set of Canadian journals.

The results found with the international data are not free from regulatory influences. There is a limit on the ratio

²³ Conversations with Mr. Parsons of the University of Toronto Press in the fall of 1979 have indicated that a major pricing change will occur. Mr. Parsons stated that journals with prices controlled by the University of Toronto Press will attempt to equate the ratio of institutional to individual prices with their American counterparts. In particular, he believed this ratio to be close to two. Mr. Parsons, who is in charge of journal pricing, claimed that the University of Toronto press is a leader in the industry and that when its prices change many other journals will follow suit.

that publishers can charge due to postal regulations in the United States. The COSTC study states:

Even non-society publishers sometimes discriminate in price between institutions and individuals. United States postal regulations limit such discrimination to a factor of two, for second class mailing in the United States. (COSTC, p. 52)

If such regulations are still in effect, the data are likely to be distorted in such a way that the price differential will be understated compared to the free market price differential.

Overall, the results indicate that institutional prices have risen compared to individual prices. This finding corroborates those of past studies (particularly Fry and White) and is in agreement with the hypothesis that reprography increases the value of journals to libraries, given the aftermarket effect.

As well, changes in the number of subscriptions for these journals have been measured over the period 1970-1978. For the group of less academic Canadian journals, subscriptions had risen by 27 per cent or an annual rate of 3 per cent. For the sample of non-Canadian journals, subscriptions rose by 20 per cent or a 2.3 per cent annual rate. These results are in overall agreement with those of previous studies. Due to time and resource constraints as well as the uniformity of the results of previous studies, no effort was made to measure the increase in journal size, number of journals or potential readership of these journals so that one cannot determine how journal pages per capita has changed over this period. It certainly does not appear, however, that there has been a precipitous drop in journal subscription pages per potential reader.

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Chapter IVPROPOSALS TO DEAL WITH THE IMPACT OF
REPROGRAPHY ON COPYRIGHT

Many proposals have been put forward to deal with what has been perceived as the problem of reprography.²⁴ Most of them attempt to recover copyright payments thought to be lost because of the impact of reprography. Three of these proposals appear to deserve close examination either because of their merit or because of their popularity. These are: (1) strict copyright payment; (2) compulsory licensing of photocopy machines; and (3) allowing price discrimination. Each will be discussed in turn.

Equating revenues of copyright holders to the degree the work is used is an important goal of copyright policy but it is not the only goal. The needs and values of users of the copyrighted work are also of great importance. A proposal which is beneficial to publishers cannot be judged without examining its impact on the use of intellectual property.

Removing obstacles to intellectual research is a noteworthy and justified goal of lawmakers concerned with promoting scientific advancement. There is little doubt that reprography increases the dissemination of knowledge once knowledge has been created. Researchers can get copies of articles much more quickly and cheaply. An ideal proposal would be one which promotes the creation of knowledge without handicapping the dissemination of knowledge. These two goals are somewhat contradictory, however, and must be balanced when examining these proposals.

There are several principles which are important in assessing the efficiency of proposals to restore revenues to copyright holders: (1) the efficient allocation of revenues to publishers requires that different journals cost different amounts in proportion to the number and values of the photocopies made; (2) the costs of collecting these payments, including enforcement, should be kept to a minimum; (3) while it might be desirable to ensure the monopoly power of each copyright holder over his intellectual product, competition between copyright holders in an industry should not be reduced; and (4) the access problems of users should be minimized.

²⁴ See King Research Inc. for a long list of such proposals.

Strict Copyright Payment

The model presented in Chapter II is applicable to many copyright systems. In the presentation of the model, it was assumed that copyright payments were made based on sales of journal subscriptions. Another possible copyright mechanism would include additional payments for each photocopy of copyrighted material, ignoring for the moment the monitoring and transaction costs. Such a system would appear to take the form of strict adherence to present copyright law with no doctrine of fair dealing. Analysis of such a system is straightforward and similar to that of Chapter II.

The number of copies that will be made is a function of the copyright royalty payment, as well as other parameters. A royalty will be picked which maximizes total profit. The number of copies made will also depend upon the number of subscriptions sold, since the two are substitutes. The various possibilities can be diagrammed in a virtually identical manner to previous diagrams. In Figure 7, D_S stands for the demand for journals (subscriptions), D_P is the demand for photocopies, D_H is the horizontal sum and D_V is the vertical sum.²⁵ If photocopying is allowed, D_V is the appropriate demand. If photocopying is banned, the demand for journals will lie between D_S and D_g . Figures 8(a) and (b) illustrate the workings of the aftermarket and the journal market separately. The analysis is more easily followed when journals and copies are assumed to be independent—that is, to have zero cross elasticity of substitution.

First, assume that it is impossible for the copyright holder to collect royalty payments on photocopies. The copyright holder sets a price equal to P_{S1} in the subscription market, Figure 8(a), since this price maximizes his profits in this market. If the aftermarket, Figure 8(b), is competitive, the price will be driven down to zero (since $MC=0$) and Q_C will be the quantity produced. The aftermarket cannot provide revenue to the copyright holder. On the other hand, if the aftermarket is monopolistic the supplier of photocopies will move to point C where the price is P_M and the quantity Q_M . Profits to the monopolist are $P_M C Q_M O$. If the copyright holder can appropriate these profits by charging a higher price to the producer of photocopies, his total profits will be maximized.

²⁵ These are not ceteris paribus demand curves; rather, they are derived demand curves, each of which takes into account the price in the other market.

Figure 7

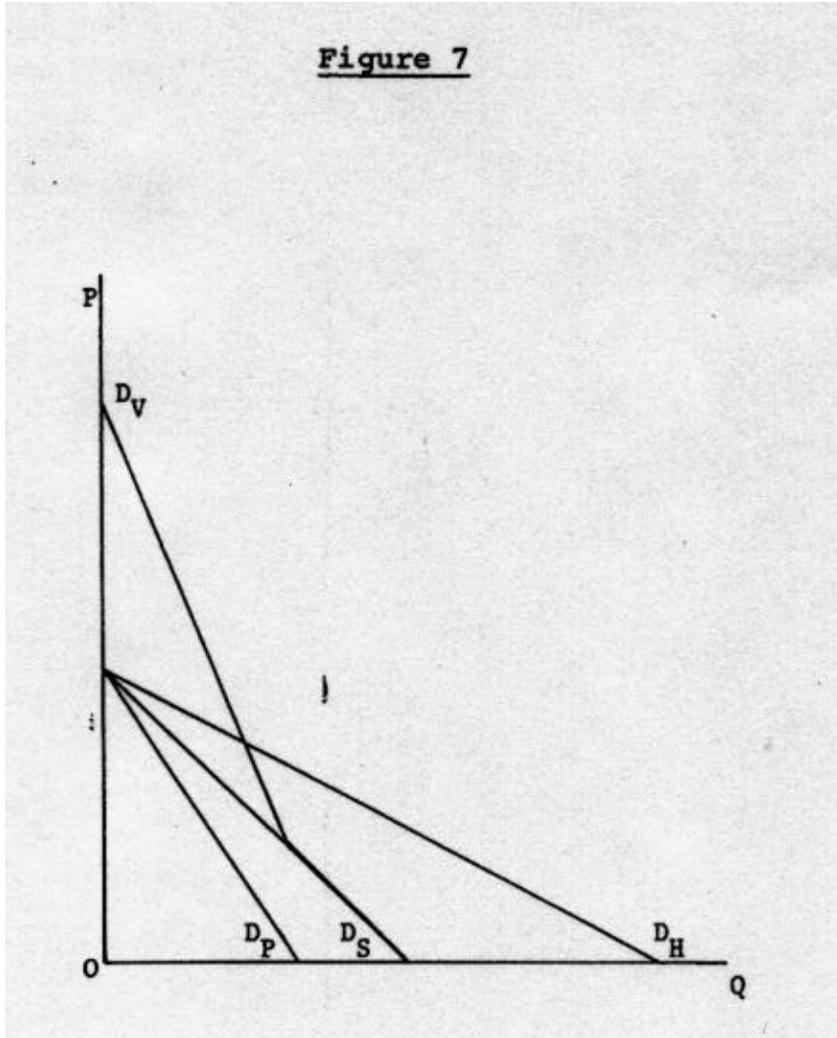


Figure 8(a)

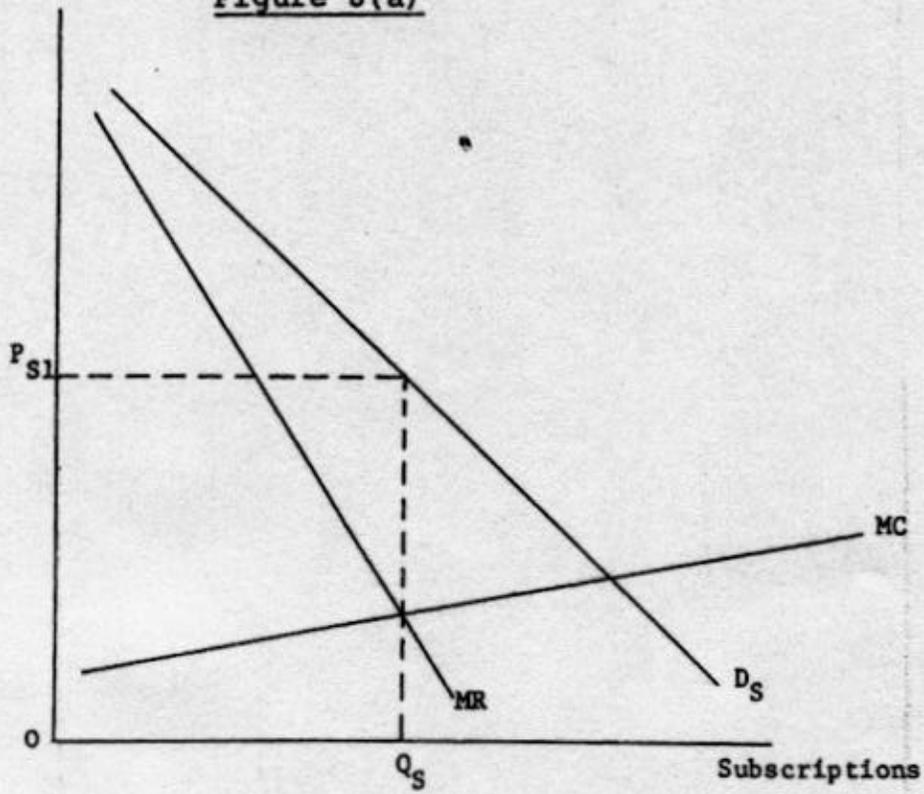
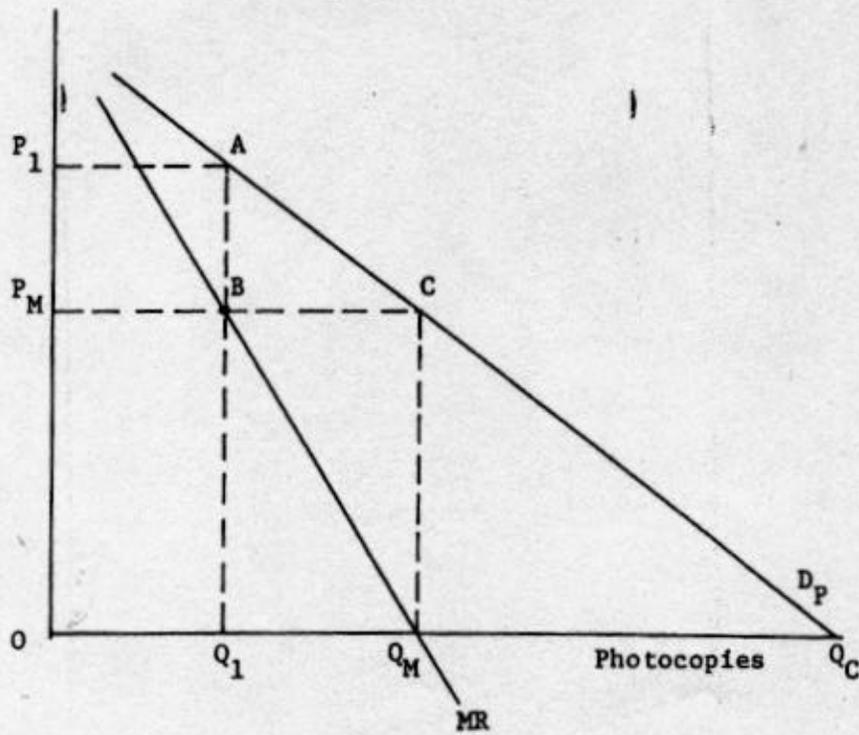


Figure 8(b)



Now assume that royalty payments can be collected by the copyright holder. If the aftermarket is competitive, a royalty fee of P_M will generate maximum profits ($P_M C Q_M O$) for the copyright holder. If, on the other hand, the aftermarket is monopolistic a royalty of P_M will yield smaller revenues of $O P_M B Q_1$ since the producer of photocopies would consider R_M to be a marginal cost of production. With monopolistic production of photocopies, the copyright holder cannot earn royalty payments as large as he could earn with a competitive aftermarket.

The monopoly power of the photocopy sellers is an important parameter in this model. When monopoly power exists in the aftermarket the copyright holder cannot earn the maximum profits, whereas appropriation of rents by charging discriminatory prices can earn maximum profits. Combining appropriation and royalty payments, of P_M would generate $P_1 A Q_1 O$ but this is still smaller than $P_M C Q_M O$. When monopoly power does not exist, royalty payments are capable of generating maximum revenues whereas appropriation cannot.

When the commercial sale of photocopies is outlawed, as is the case with the present copyright legislation, suppliers of photocopies are not likely to be competitive. Libraries, the headquarters for most photocopying of copyrighted materials, have a certain degree of monopoly power over their patrons and could charge them more than the competitive price. It thus appears likely that the copyright holder will not be able to collect the full aftermarket revenue through use of a royalty. Other aftermarket appropriation techniques may prove superior.

The costs of a royalty system would appear to be quite high. There are two distinct methods of collection which will impose different costs on the system: private collection and a copyright clearinghouse. They differ mainly in that the latter entails a centralized collection agency for all publishers whereas the former requires each publisher to provide, for his own collections. This difference is only significant if there are economies of scale involved in 'the collection of royalty payments.

A non-profit copyright clearinghouse has recently been set up in the United States. At present, it is only administering copyright payments for journals. Examination of its behaviour will be instructive in determining the likely effects of a Canadian copyright clearinghouse. Publishers register titles with the clearinghouse. Lists of these titles, along with copyright payment schedules, are sent to user organizations, including libraries, corporations, government agencies

and information services. These groups voluntarily register with the Copyright Clearance Center (CCC) and report on their photocopying practices, making the appropriate payments. The CCC keeps 25 cents per reported photocopy as payment for its collection services. The important aspects of this system are the voluntary payments and the payment fees determined by the publishers.

The largest costs associated with strict liability relate to the monitoring of users by copyright owners. The CCC, by abrogating this responsibility, avoids the serious problems associated with effective policing of users. However, such a policy engenders other problems, particularly the risk that users will not report their photocopying activity. It also eliminates the single greatest need justifying a centralized agency, which is that such an agency cuts out the duplication in monitoring costs, which would occur if publishers tried to monitor users independently. A centralized agency could save on costs if there were economies of scale in processing forms and/or collecting payments. Disbursing payments is not necessary if publishers collect directly from users, so that it must be the case that a centralized agency increases disbursement costs.

The performance of the CCC, to date, has not proven the practicability of the clearinghouse concept. Over 3800 publishers were solicited to register their serial publications. After 21 months of operation, 335 publishers had enrolled in the system. These publishers accounted for 2785 journal titles. Currently, 923 user organizations are registered and the CCC now has an average of 14,750 copies reported per month. The projected break-even point is estimated at 85,000 copies per month—in other words, almost a six-fold increase. The CCC has made up this deficit by attracting contributions from various organizations and withholding some of the royalty payments to publishers, effectively charging them 50 cents per copy. The average fee paid by users per reported photocopy is \$1.53. CCC's paid staff totals three people.

The projected break-even point reported by the CCC is somewhat suspect. In June 1979, it claimed to be approaching 50 per cent of the self-sustaining volume of photocopies. Its November 1979 report claimed it was at the 17 per cent level, invalidating the earlier projections. For example:

The approximate rate of growth during 1978 in the number of photocopies...was an increase of 10% over each previous month....This same growth rate has continued into 1979....Projections indicate CCC can become self-sustaining by 1980...if the monthly growth rate remains at the present level. (CCC, 1979, p. 11)

The figures, reported six months later, indicate that it will take six years for the CCC to break even, assuming costs remain constant.

Clearly, the CCC believes that certain users are not accurately reporting their photocopy totals. Only 30 per cent of the registered users reported any photocopy activity. Seventy-one per cent of users reporting activity were in private industry. On the other hand, only 15 per cent of academic libraries registered with the CCC and only 7 per cent of these registered reported making copyright payments (see Table 5, reproduced from a CCC summary, 1979). In fact, the CCC estimates potential revenue by finding the heaviest private users in various industries and extrapolating from their payment profile for other firms in the industry (see Table 6, also taken from the CCC summary). The variance in payments among users would be quite astounding ordinarily but is not surprising given that there is no monitoring agency and that users are on an honour system. It is interesting that a higher percentage of private organizations signed up as users than nonprofit and public organizations.

Would a copyright clearinghouse work in Canada? The evidence from the United States would seem to indicate that it would not. Most economic magnitudes in Canada are about ten per cent of their U.S. counterparts. The cost of the clearinghouse would likely be similar since a staff of three, as in the United States, does not seem likely to be reduced easily. If Canadian users signed up at the same rate as U.S. users have, the clearinghouse would never break even. The total copyright payments would be less than the deficit of the clearinghouse. Such a result would be unacceptably inefficient.

The only way that a clearinghouse might work in Canada would be if users reported a much higher level of activity than is presently reported in the United States. However, there is no reason to expect this. Strict enforcement of copyright law would likely increase participation but the costs of enforcement would probably be quite high.

The origin of the CCC is also indicative of its value. If it were possible for centralized agencies to profit by collecting and disbursing copyright payments, one would expect profit-making firms to try to enter that activity. The CCC was organized in a different manner. From the summary:

Organized principally by the efforts of for-profit and professional society publishers with help from a few large photocopy user organizations, CCC was initially funded by gift monies

Table 5

1978 Activity of the Top Ten Industrial Firms in Four Major Industries
 Using Permission to Photocopy Service of the
 Copyright Clearance Center, Inc.

Industry	Number of Firms Registered with CCC in 1978	Number of Firms Reported Photocopy Transactions	Highest Fees Reported per \$ Million R&D	Lowest Fees Reported per \$ Million R&D	Combined 1977 Top-Ten \$ Spent for R&D
Petroleum	8	6	\$ 75.00	\$0.47	\$750,000,000
Chemicals	6	5	6.40	.049	1,227,000,000
Personal care products	2	2	192.00	.48	369,000,000
Drugs	1	0	0	0	936,000,000

Table 6

User Organizations Registered with the Copyright Clearance Center, Inc.

Type of User Organization	Locations Registered with CCC in 1978	Locations Reporting any Photocopy Transaction	Reporting an Average of 10 Copies or more per Month in 1978
Industrial corporations	516 (62%)	141 (71.2%)	36 (73.5%)
College and university libraries	128 (15.4%)	14 (7.1%)	0
Research (major) libraries	64 (7.7%)	8 (4%)	5 (10.2%)
Government agencies	17 (2%)	5 (2.5%)	4 (8.1%)
Public libraries	10 (1.2%)	0	0
Other information services and professional institutions in law and medicine	97 (11.7%)	30 (15.2%)	4 (8.1%)
<u>Total</u>	— 832 (100%)	198 (100%)	49 (100%) ^a

received from publishing organizations of all types. Nearly half were non-profit organizations seeking to strengthen the principles of copyright and to help establish a system to uphold their publication income. (CCC, 1979, p. 10)

The Center's viability appears uncertain, its own optimism notwithstanding. The viability of a similar organization in Canada appears most improbable.

Such a system probably would not greatly restrict the use of copyrighted materials as long as the payments could be made after the photocopying is performed. If photocopying could only be done after permission was received by the publisher -- a possibility if publishers do not state photocopy royalty fees in the journals -- a great burden would be placed on users of intellectual property. Publication of price lists, as has been done by the CCC, helps reduce costs but it is clearly more expensive to find the price on a list than it is to find it on the journal. However, the CCC reports that among the reasons for publishers' reluctance to register with the CCC, "the most frequent serious objection related to printing unique article fee codes on individual articles" (CCC, 1979, p. 4). Thus the least cost system for users imposes costs on publishers which many do not wish to bear.

It should be pointed out that a centralized clearinghouse could be set up for a somewhat different purpose. Conceivably, it might not let individual publishers determine the copying fees but would instead assume this responsibility itself. Performing arts societies, representing copyright holders in music, exercise such control. Allowing such control is tantamount to allowing the reduction or elimination of competition between copyright holders, a violation of one of the principles set forth in the beginning of this chapter. When this principle is violated, copyright holders are given monopoly power unnecessary for the efficient creation of their works and detrimental to the public well-being. The Economic Council of Canada was correct to point out the dangers in allowing such collectives, although it argued for the increased use of such collectives along with strict government regulation of the price collectives could charge (Economic Council of Canada, 1971, p. 151). Because of these problems caused by collectives, other methods of achieving the same goals are to be preferred when their costs are no higher.

The final important result of strict copyright liability is that most of the payments would flow out of the country. It

was shown in Chapter III that only a small proportion of photocopied works are of Canadian origin. Copyright payments are governed by international agreements to which Canada has acceded. These agreements require that the foreign copyright material of nationals in those countries belonging to these conventions be treated in a manner equivalent to domestic copyright materials. Thus the majority of payments would have to be made to foreigners under strict liability.

Compulsory Licensing of Photocopy Machines

Under this system owners, or renters, of photocopy machines would pay a yearly fee into a fund to be distributed among copyright holders of intellectual property. Payment of this fee would enable users of these machines to make photocopies without further concern about copyright violations.

This system has the virtue of imposing no transaction costs on users. The only costs to users are that there will be fewer photocopying machines because they will cost more when the fee is included and that the price of a photocopy is likely to rise somewhat to reflect the higher price of the machine. Moreover, this mechanism need not depend on the voluntary cooperation of users of photocopied material. Identification of photocopy machines should be relatively inexpensive, making enforcement of the payment fee quite simple. If, however, owners of photocopy machines claimed that they were never used to make copies of copyrighted materials, enforcement costs would be considerably higher since it would be necessary to monitor the use of these machines. Since it seems unlikely that many machines never copy copyrighted material, this should rarely be encountered.

Compulsory licensing is not without serious flaws, however. First and foremost is that this mechanism does not allow different copyright fees for different journal articles. Some journal articles are worth more to users than others and higher payments should be made for the more valuable articles if the principles of copyright are to be upheld. This is a serious drawback. When a single price must be paid for each journal photocopy, independent of consumer valuation, a distortion is created whereby some journals are paid more than their value while others are paid less. This leads to a misallocation of resources in the production of journals so that some are overproduced while others are underproduced.

Many different payout schemes are possible to allow for the distribution of copyright fees among copyright owners. The funds could be disbursed equally among all copyright holders or they could be based on either the size of the copyright holder,

perhaps in terms of subscriptions, or something as arbitrary as the colour of the copyright holder's eyes. A relatively efficient scheme would be to estimate the number of photocopies of various journals made in a year and disburse payments based on this estimate. This, of course, incurs the cost of estimating photocopy use.

Various machines will be engaged in varying degrees of copying of copyrighted material. Under compulsory licensing they need not all be charged the same fee. Machines in libraries could, for example, be charged larger fees than machines in business firms. An analysis of photocopying practices would seem appropriate before such distinctions could be made.

There is an aspect of compulsory licensing and the clearinghouse concept which could be detrimental to the public well-being.. Each copyright owner has been given a monopoly over his intellectual property by the government. As pointed out earlier, this monopoly fits into a framework best described as monopolistic competition since there is free entry into the production of intellectual property. The monopoly power of a given title is limited by the fact that there are usually many titles serving as substitutes. If the price of any one title were to be raised, consumers would shift to the other, now less expensive, titles. Similarly, the price charged for a photocopy of a particular journal could not be much higher than the prices for competing journals.

When journal or photocopy prices are controlled by a single agent, the forces of competition no longer work to limit the monopoly price. Copyright holders, acting in unison, can raise the price of copyrighted material well above the level which prevailed when they competed with one another. A compulsory licence fee is an implicit price for photocopying copyrighted material. If publishers and copyright holders were allowed to determine this fee in unison, they could set the price such that they could capture more revenue than they would with strict copyright and zero transaction and monitoring costs. Since the latter situation appears to be close to the ideally efficient solution, departing from it by allowing copyright holders greater monopoly power would be harmful to society. Competition between copyright holders should be preserved, if possible. One positive aspect of the CCC is that this competition is preserved when individual publishers are allowed to set the royalty payment.

If compulsory licensing appeared to be a form of copyright protection, it would have to be applied to both foreign and domestic copyright holders. Since the payment mechanism is one of the great uncertainties of such a system, it is unclear how much of the payment would have to leave the country.

Price Discrimination

Price discrimination occurs when firms charge different prices for the same item to different individuals. Publishers now charge libraries higher prices for journal subscriptions than individuals are charged. This has been perceived as increasing revenues to publishers but, surprisingly, has not been perceived as a method for handling the copyright problem. Previous researchers have failed to realize that the subscription price will reflect the value of the journal in the photocopy market.

Price discrimination is frowned upon by the law. Economists, as well, treat price discrimination as a welfare-reducing activity because it is indicative of monopoly power. A market with price discrimination will usually produce a smaller quantity than a competitive market.²⁶ However, in the case of copyright holders, price discrimination must be evaluated against the monopoly model which is the prevailing situation as a result of government legislation in this area. If price discrimination allows both greater output and greater returns to copyright owners, copyright policy and economic welfare will be enhanced. It is clear that price discrimination increases the returns to copyright holders; the impact on output is less certain. In the case where only two discriminatory prices are charged, output may increase or decrease depending on the shape of the demand curves for the two groups. As the number of different prices charged increases, so that more intense discrimination occurs, output will increase until perfect price discrimination is achieved. (See Scherer, p. 320 for a fuller discussion of price discrimination.)

The existence of reprography provides publishers with an additional incentive for allowing price discrimination. Price discrimination enriches producers at the expense of consumers while reprography, if the aftermarket valuation is not reflected in the subscription price, enriches consumers at the expense of publishers (producers). In Chapter II various conditions leading to a breakdown in the aftermarket appropriation were discussed. One of these was variations in the number of copies made per journal. Price discrimination allows publishers to capture revenues in this situation.

²⁶ Except in the theoretical case of a "perfect" price discriminator who can sell each unit of the commodity at the maximum price which a consumer in the market is willing to pay. In this case, the output of the perfect discriminator is identical to that of a competitive market (assuming equivalent costs and no wealth effects).

Price discrimination allows copyright holders to compensate for more than just their losses caused by reprography. It also enables them to compensate for losses caused by the existence of libraries. The effect of libraries on copyright holders is virtually identical to that of reprography. Few people would be likely to find it inappropriate for copyright holders to be compensated in this way.

The proposal recommended here is that the ability of publishers to price discriminate be enhanced. Since different institutions engage in different amounts of photocopying, it may be worthwhile for publishers to charge different prices to various classes of institutions. In Chapter III, it was demonstrated that publishers are already price discriminating in a simple way between individuals and institutions. This proposal merely advocates accepting the natural market forces already in motion.

Academic and public libraries are not the only institutions which should be charged different prices. Schools, private businesses and government are also institutions which publishers may want to distinguish between. For example, music publishers may wish to charge high prices to schools if they think that schools do a large amount of photocopying, although it seems unlikely that they do more photocopying than other purchasers of music. Publishers of poetry may wish to charge higher prices to schools for similar reasons. The educational goals of the government may conflict with the desire to help publishers, but analysis of that dilemma is outside the purview of this study.²⁷

Price discrimination imposes no transaction costs on users. There are no forms to fill out or payments to make and the number of photocopy machines is not affected. It also allows various publishers to receive different payments for photocopying by charging different premiums over individual price to institutions. The monopoly power of publishers as a group is not increased since they are still in competition with one another. If one journal publisher raises prices well above the level of other journals, libraries can shift to the less expensive journals which are to some extent substitutes.

The only costs incurred will result from the fact that in order to price discriminate effectively, publishers need to have some idea of the relative values placed on journals by various classes of subscribers. This knowledge might be gained

²⁷ The issue of exemptions for educational purposes will be examined in another study

by conducting surveys of photocopying practices similar to those discussed in Chapter III. Since it would be inefficient for each publisher to conduct his own survey, a natural development might be for some central agency to conduct the survey and charge various publishers for the service (just as the A. C. Neilson Company conducts surveys used by advertisers and broadcasters).

The policy implications for promoting price discrimination are few. The only foreseeable snag would be the attempt by institutions to buy journals at the price charged to individuals. This would be rather easy to monitor in the case of public institutions since it is not difficult to determine if a journal is on the shelves of the institution and, if so, to check to see if that institution has a subscription. Enforcement would be very difficult, however, since it would be virtually impossible for publishers to track down the individual subscription which is actually going to an institution at an individual rate and raise the price. More important, publishers cannot prevent institutions from using many false names in an attempt to pay the individual fee. For this reason it is recommended that the government use its powers to prohibit institutions from subscribing under false pretences. Fines greater than any possible savings in subscription rates would seem to be adequate punishment.

In some instances it will be difficult to monitor an institution's compliance. Teachers may use their personal subscriptions in order to make copies for a class. It would be virtually impossible for the publisher to capture this use of his product since he would have to charge the teacher a higher price for the subscription. Schools could be asked to enforce a rule that only school materials be photocopied in the school but the probability of such a policy succeeding is questionable. Other proposals for dealing with the effect of reprography do not provide much greater protection. A copyright clearinghouse agency would also rely on teachers' honesty. compulsory licensing would do a somewhat better job if teachers used the school's machine to make copies, but if a machine outside the school was used this mechanism would not collect the appropriate revenues. None of these proposals is perfect. The other advantages of price discrimination, however, are such that it would appear to be the preferable policy.

Whether it is possible to design a system which allowed Canadian institutions to avoid paying the institutional price for foreign copyrighted works is unclear. Since this proposal is quite different from normal copyright enforcement legislation, it is conceivable that the legislation could be introduced outside the Copyright Act. In that event, the possibility of a Canadian-only approach to price discrimination should be investigated more closely.

Price discrimination has an interesting impact on the concept of fair dealing. Since libraries are charged higher prices as a result of photocopying, the publisher is being reimbursed for this copyright infringement. The defense of fair dealing, which states that reimbursement is unnecessary, is circumvented. However, the rationale for fair dealing is destroyed when copyright payments can be made indirectly with no transaction costs between copyright holders and infringers, eliminating a potential impediment to research and study. With price discrimination, the concept of explicit copyright payment is unnecessary. In the interests of eliminating confusion as to the boundary of fair dealing, it is recommended that all photocopying in libraries performed for the groups they service be viewed as equivalent to fair dealing.

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1. List of Non—Canadian Journals

Alternatives
American Anthropologist
American Antiquity
American Economic Review
American Historical Review
American Journal of Occupational Therapy
American Journal of Science
American Journal of Sociology
American Mineralogist
American Political Science Review
American Psychologist
American Society of Civil Engineers T
American Society of Mechanical Engineers T
Argewandte Chemie
Annals of Internal Medicine
Antipode
Archives des lettres modernes
Archives of Physical Medicine and Rehabilitation
Biochemica et Biophysica check Acta All Sections
Bulletin of Physical Education
Communications in Statistics A and B
Comparative Politics
Computer Journal
Contributions to Mineralogy and Petrology
Earth and Planetary Science Letters
Econometrica
Economic Geography
Eighteenth Century Studies
Electronics
English Literary History
Exceptional children
Faraday Society Transactions
The French Review
French Studies
Geochemica Cosmochemica Acta
Geographical Review
German Life and Letters
German Quarterly
Germanic Review
Gerontologist
Government and Opposition
IEEE Transactions:
Acta Metallurgica
Oil and Gas Journal
International Journal of Mathematical Education

Journal of Communication
 Journal of Computations and Applied Mathematics
 Journal of Economic History
 Journal of English and German Phylology
 Journal of Experimental Psychology
 Journal of Fluid Mechanics
 Journal of Health, Physical Education and Recreation
 Journal of Learning Disabilities
 Journal of Molecular Biology
 Journal of Organic Chemistry
 Journal of Personality and Social Psychology
 Journal of Petrology
 Journal of Political Economy
 Man
 Microbiology
 Phi Delta Kappan
 Philosophy and Public Affairs
 Physical Review
 Physical Review Letters
 Population Bulletin
 Problems of Communism
 Psychological Bulletin
 Psychological Review
 Quarterly Journal of Economics
 Rehabilitation Literature
 Review of Economic Studies
 Revue d'histoire littéraire de la France
 Science
 Scientific American
 Social Education
 Southwestern Journal of Anthropology
 Topology
 Victorian Studies
 Yale French Studies

2. List of Less Scholarly Canadian Journals

Arctic
 Canadian Children's Literature
 Canadian Ethnic Studies
 Canadian Geographer
 Canadian History Review
 Canadian Public Administration
 Canadian Public Policy
 Canadian Tax Journal
 Canadian Theatre Review
 International Journal
 Journal of Canadian Fiction

Journal of Canadian Studies
Ontario History
Our Generation
Plan Canada
Revue d'histoire de l'Amérique

3. List of Scholarly Canadian Journals

Anthropological Journal of Canada
Canadian Review of Sociology and Anthropology
Journal of Canadian Association for Health, Physical Education, and Recreation
Canadian Journal of Economics
Canadian Journal of Psychology.
Canadian Journal of Occupational Therapy
Canadian Journal of Political Science
Canadian Geographer
Canadian Journal of Philosophy
Canadian Journal of Biochemistry
Canadian Journal of Genetics and Cytology
Canadian Journal of Microbiology
Canadian Journal of Public Health
Canadian Journal of Surgery
Canadian Journal of Mathematics
Canadian Mathematical Bulletin
Canadian Food Industries (Food in Canada)
Education Canada
Canadian Journal of Chemistry
Geoscience Canada
University of Toronto Quarterly