

Working Paper

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Tackling the journal crisis

When authors pay with money instead of copyrights

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Preface

Nowadays publishers face many challenges. New technological possibilities change their role. ‘Tackling the Journal Crisis’ addresses the crisis in scientific publishing. The most pressing problem in this market is the reduced access to scientific knowledge, caused by ever-rising prices for journals and limited library budgets. The journal crisis is a logical result of the current set-up of the market. Publishers who obtain copyrights on high-quality papers (their most important input) are able to charge monopoly prices, since papers are not interchangeable like jars of peanut butter. Recent changes in ICT enable a reform of this market setup.

This study is part of the larger study ‘Publishers Caught in the Web?’ which also includes the working papers ‘Publishers Caught in the Web?’ (Working Paper 119), ‘Magazine Publishing - A Quiet Life?’ (CPB Working Paper 120) and ‘Copyright protection: not more but different’ (CPB Working Paper 122). The broader aim of this study is to describe the characteristics and business strategies in the information economy, and more importantly, to suggest a new framework for assessing market performance.

It is no coincidence that this study on electronic publishing is also available as CPB’s first electronic publication. CPB is eager to exploit new possibilities of disseminating its research output. This Working Paper is available from: www.cpb.nl/nl/pub/pubs/werkdoc_121/.

‘Tackling the Journal Crisis’ was conducted by Maarten Cornet and Ben Vollaard. Efforts to improve the study by CPB colleagues and the members of the steering committee are highly appreciated. Co-financing by the Ministry of Economic Affairs is kindly acknowledged. Special thanks are due to all interviewees and external experts.

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1. Introduction

1.1 Rationale

As part of the project on publishers in the information economy, this case study illustrates the variety and impact of publishers' strategies on a specific market. We have two reasons to choose the market for scientific journals as a case study.

First, this choice gives us the opportunity to apply the new methodology of assessing market performance introduced in CPB (2000). The current institutional setting of this market implies that publishers are active in more than one market. They compete for scientific papers in the market for content, and they compete for subscribers in the market for journals. Possibly publishers are able to leverage market power from the one market to the other. It is important to note that, in the language of economists, scientific publishers have market power by definition, since the presence of fixed costs make that they have to charge prices (subscription fees) higher than marginal costs to stay in business.

Second, the choice for the market for scientific journals enables us to analyse strategies of publishers in a market which is in a transition towards electronic publishing. Currently, electronic journal publishing is dominated (in volume of material) by traditional printed journals that also have electronic versions ('shovelware'). Further penetration of electronic publishing may fundamentally change the nature of scientific journals and the role of publishers. Publishers will try to secure their future through influencing the process of transition, thereby revealing what the foundation of their current position is.

The analysis of the market for scientific journals has value of its own as well. Over the last twenty years (or so) concerns have been expressed that the market is not performing well. It has been claimed on several occasions that there is a 'journal crisis'. Publishers are said to provide services of poor quality to both readers and authors.

The current spiral of journal price increases and cancellations of titles by university libraries hampers readers' access to scientific knowledge (Branin and Case, 1998). This development aggravates the limitation of access which is inherent to the current set up of the market: publishers have to charge subscribers prices above marginal costs to recover their fixed costs. In some cases all interested readers already have access to information through working papers and the like, but the libraries pay an extremely high price just to have this information published in scientific journals (ARL et al., 1998). The only added value seems to be the quality signal that journals provide. One may

wonder whether attaching a quality sign to a paper is worth so much money. Moreover, competition does not seem to drive low quality journals out of the market. Libraries complain that they pay a high price to add a few useful articles per year to the university collection (Noll and Steinmueller, 1992).

Authors are confronted with long publication lags because of the slow process of peer review. A recent survey shows that this is of serious concern to the authors: scientists are concerned that someone else will publish very similar work first, while authors from the arts fields are worried that their work may be out of date by the time it is published (Swan, 1999).

Innovations in information and communication technology like electronic journals and e-print archives, that could ease some of the above-mentioned problems, only spread slowly. New technology for electronic publishing is already there for some time, but it is not used to its full potential (Odlyzko, 1997). In a healthy market, producers that are slow to adopt efficiency enhancing technologies are driven out of the market. This process of competition does not seem to work very well in this market.

A weak performance of the market for scientific journals is alarming because of its high economic and social importance. Publication in journals is an important instrument in the advance of knowledge (Dasgupta and David, 1994), and advance of scientific knowledge is a driving force behind many technological and non-technological innovations (see Stephan, 1996: 1226-29). The social return of publication warrants attention of policy makers to the performance of the market for scientific journals.

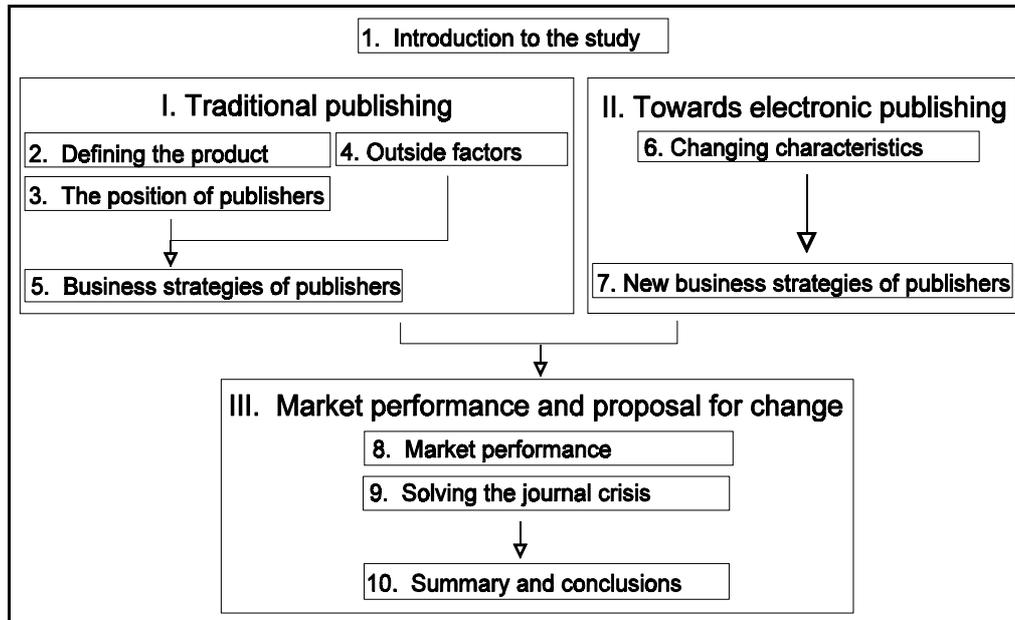
1.2 Aim

Aim of this case study is to assess the performance of the market for scientific journals and, if the analysis points at underperformance, identify the reason and possible remedies. Put differently: (i) Is there a journal crisis? and, if so: (ii) What is the cause of this crisis? (iii) Which policy options can enhance the current performance of the market?

1.3 Structure

Figure 1.1 divides the study into three parts. First, we analyse market behaviour of publishers in traditional hard-copy academic publishing. Second, we discuss strategies of publishers in the transition towards electronic publishing. Third, we assess the performance of the market for scientific journals and formulate possible options for policy. For a summary, see chapter 10.

Figure 1.1 Structure of the study



Part I Traditional publishing

In the first part of the study we explain strategies of publishers of traditional journals by matching them with factors inside and outside the market for scientific journals. We pay close attention to the current situation to make changes as a result of the introduction of new information and communication technologies as clear as possible. As a result of this method, we only need to identify changes in the framework in part II.

In the first two chapters, we discuss factors inside the market for scientific journals that explain the behaviour of publishers in *chapter 2*, and the role of publishers in the realisation of the product in *chapter 3*. In *chapter 4*, we discuss factors outside the market for scientific journals that influence strategies of publishers.

After defining the factors inside and outside the market of scientific journals that structure the behaviour of publishers, we discuss business strategies of publishers in *chapter 5*. We explain why publishers choose their strategies.

Often, we use examples from the field of economics to illustrate the part on traditional publishing. Because of our background of economists, we have better knowledge of

developments in this field of science. Our analysis covers the scientific journals in general and not specifically economics journals. We leave the readers to surmise examples from their own particular areas of research interest.

Part II Towards electronic publishing

The second part of the study focusses on changes in market behaviour of publishers brought about by the emergence of new information and communication technologies. In *chapter 6* we discuss the changes in the setting of scientific publishing relative to the factors inside and outside the market for scientific journals dealt with in the chapters 2, 3 and 4. *Chapter 7* examines the new strategies that publishers pursue in the era of electronic publishing, in addition to the strategies of traditional publishing discussed in chapter 5.

Part III Market performance and proposal for change

In the last part of the study we use the analysis of strategies of publishers in part I and II to assess the performance of the market for scientific journals and to formulate proposals for change. In *chapter 8* we answer the questions: (1) Is there a journal crisis? and (2) If so what is the cause of this crisis? Then we discuss which policy options can enhance the performance of the market in *chapter 9*. We present our conclusions in *chapter 10*.

Part I Traditional publishing

We set the stage for traditional scientific publishing. Scientific journals perform a number of important functions in the system of scientific research. Journals have some typical characteristics which are distinct from standard goods. Publishers have a central position in the production and distribution of journals. They employ a range of strategies to create and appropriate a surplus from publishing scientific journals.

2. Defining the product

2.1 Introduction

We define the product ‘scientific journal’ according to its functions in academic communication. Then we discuss two typical features of scientific journals: the specific nature of production costs and the importance of network effects and path dependence in reputation-building.

2.2 Functions of scientific journals

The traditional scientific journal - the typical bundles of individual articles in issues - performs three functions in academic communication. A scientific journal is a medium which couples dissemination of scientific knowledge with claims on priority of discovery and a quality signal.

(i) Dissemination of scientific knowledge

In a world without scientific journals, an information asymmetry exists regarding the research efforts of academics outside the circle of immediate colleagues of a researcher. It is an old problem, as Michael Faraday¹ complained back in 1826 ‘that scientific men do not know more perfectly what has been done or what their companions are doing’ (in: Meadows, 1993). To alleviate this information asymmetry, scientific journals serve as a platform to make the results of research efforts known. Moreover, each journal provides a specialty-specific ‘information-filter’. There are general-purpose journals on a whole discipline like the *American Economic Review* and more narrowly focussed journals on sub-specialities like the *Journal of Economic Growth*. As a result, academia only need to know which journals they have to read. Surveys show that scientific journals are not only widely read, but are extremely useful and important to academics’ work, whether it be research, teaching, or other activities (Tenopir and King, 1998).

Public disclosure of new findings provides three important social benefits (Dasgupta and David, 1994). First, it widens the span of application in the search of new knowledge. It raises the social value of knowledge by lowering the chance that it will reside with persons and groups who lack the resources and ability to exploit it. Second, disclosure enables peer groups to screen and evaluate the new finding. The result is a new finding

¹Faraday is famous for his contributions to electrochemistry.

containing a smaller margin of error. Third, disclosure prevents duplication of research efforts.

(ii) Claims on priority

Publishing in a journal enables academics to establish claims on priority of discovery by being the first to communicate an advance in knowledge (Dasgupta and David, 1994). The ‘discovery’ can be of various nature, it may concern the codification of some part of the human genome but also the results of an analysis on the effect of benefits on the incentive to work. The ‘pioneering’ authors will be honoured through citation by others (see Goff et al., 1987 on the incentive to cite), leading to new research funds, promotion, etc. Therefore, academics have a strong incentive to share knowledge by publishing. Thus dissemination of scientific knowledge through journals goes hand in hand with establishing claims on priority of discovery.

(iii) Signalling quality

There is also a lack of information regarding the quality of the research between members of the academic community. Research projects can differ widely in quality, where quality stands for aspects such as relevance, use of appropriate tools and data, originality, efficiency in project design, and so on. Several actors are confronted with this information asymmetry for different reasons:

- Academics looking for input to their own research only have limited time available to evaluate the quality of papers and are sometimes not able to assess quality as they miss the special knowledge in sub-specialties other than their own. Therefore, they will appreciate devices to save time spent on these activities.
- Academics competing for status need some indicators on someone’s position on the scientific ladder.
- Employers of academics such as universities and related institutions have to base their reward in some way on (‘objective’/measurable) achievements, since in general they cannot observe an academic’s effort (Dasgupta and David, 1994: 499). Financiers of projects like the National Science Foundation (NSF) need indicators of the quality of a researcher as well.
- Employers of academics competing for status also need an indicator where they stand on the scientific ladder (Dusansky and Vernon, 1998).

Journals are able to fill this gap through signalling quality of someone’s research efforts. A journal gives a ‘quality stamp’ to an article. Therefore readers can expect an article in the field of financial economics that is published in the *Journal of Financial*

Economics to be of higher quality than an article in the *International Journal of Finance and Economics*. Authors are able to rank the work of themselves and other researchers. Employers and financiers are able to get an indication of the quality of someone's work by collecting data on the number of publications in journals with a high reputation. The so-called 'impact factor' is the commonly used indicator for journal reputation (see Seglen, 1997, on the imperfectness of this indicator). It is equal to the mean citation rate of all the articles contained in the journal. The citation rate of an article is equal to the number of references to the article in other articles (in the same or another journal).

Signalling quality through journal reputation requires two things. First, there should be a proper match between the quality of papers and the reputation of a journal. A proper match is secured by the incentive of authors to publish in the journal with the highest reputation possible. Often, authors overcharge. Consequently, the rejection rates are highest at the most prestigious journals. Editors and referees can be deployed to guard a certain level of quality of the journal, a process which is known as peer review. Second, a reliable quality signal is only possible when journal reputation is stable over time. If reputation changes too much, the readers still have to assess the quality of an article themselves. In other words: the hierarchy of journals should be inert. For the field of economics, Table 2.1 shows that high journal reputation is a long-lasting feature. Five out of the ten most prestigious economics journals in the 1970s enter the 1990s top-ten as well. The average age of the top ten did not change much: from 54 years in the 1970s up to 57 years in the 1990s.

Table 2.1 Ten most prestigious economics journals: 1970s vs 1990s^{a, b}

1970s	1980s	1990s
J. of Political Econ. (1892)	J. of Political Econ.	American Econ. Review
Rev. of Econ. Studies (1933)	★J. Financial Econ. (1974)	J. of Financial Econ.
American Econ. Rev. (1911)	American Econ. Rev.	Econometrica
Quarterly J. of Econ. (1886)	★J. of Monetary Econ. (1975)	J. of Political Econ.
Rev. of Econ. and Stat. (1920)	J. of Finance	Quarterly J. of Econ.
J. of Finance (1945)	★J. of Econ. Literature (1962)	J. of Monetary Econ.
Econ. J. (1890)	Econometrica	★J. of Econ. Theory (1910)
Economica (1933)	★Rand J. of Econ. (1970)	J. of Finance
Econometrica (1930)	★Brookings Pap. Econ. Act. (1970)	Rev. of Econ. Studies
J. of Business (1928)	Rev. of Econ. Studies	Rand J. of Econ.

Source: Laband and Piette (1994: 663, Table A2).

Notes: (a) rankings based on impact adjusted citations per character, (b) between brackets: year of foundation of the journal.

2.3 Typical features of the product

We discuss two typical features of scientific journals: the specific nature of production costs and path dependence and network effects in building a reputation.

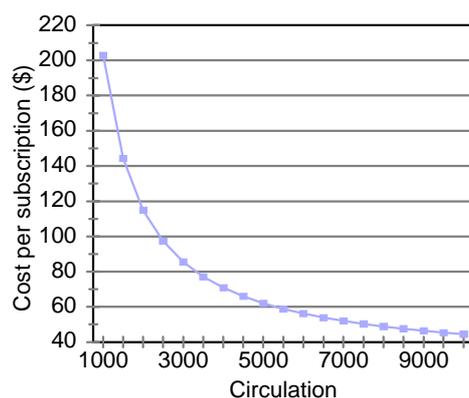
(i) High fixed, low marginal costs

Production costs of journals are characterised by high fixed costs to produce the original and low marginal costs to produce and distribute copies:

- *Fixed costs to produce the original.* The costs of producing the original include overhead costs of running a publishing organisation and the deployment of a variety of specialists involved in typesetting a paper, editing it before and after typesetting, proofreading, and so on. The annual costs of producing the originals of a typical quarterly journal are about \$175,000 (Fishwick et al., 1998).
- *Marginal costs to produce and distribute copies.* Production and distribution of copies costs on average \$30 per journal subscription (Fishwick et al, 1998).

This cost structure implies that there are increasing returns to scale in the production of a journal, i.e. circulation affects costs per unit (see Figure 2.1). Fixed costs make up by far the largest part of total costs (about 85 per cent, Fishwick et al., 1998) as most scientific journals have a low circulation. In 1995, the median number of journal subscribers was only 1,900 (Tenopir and King, 1998).

Figure 2.1 Circulation and costs per subscription



Source: Calculations based on Fishwick et al. (1998).

There are not only increasing returns to scale in publishing one journal, but also in publishing a set of journals. The available evidence suggests that they hold only for a fairly limited range of outputs however. Baumol and Braunstein (1977) conclude that 'it would hardly seem plausible that journal publication is a hitherto undiscovered natural monopoly'. To our knowledge, more recent analyses of economies of scale and scope in journal publishing are not available.

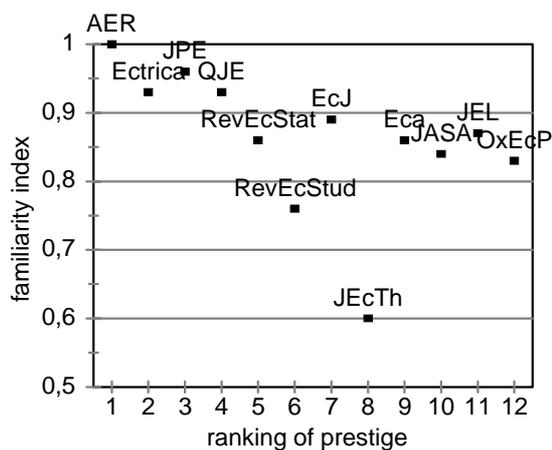
(ii) Network effects and path dependence in journal reputation

As stated above, reputation of journals is used to signal quality of individual papers. The variety in reputation results in a hierarchy of journals. Reputation is something that has to be built over time. The building of a reputation is characterised by path dependence and network effects.

First, we deal with path dependence. Cabral (1992) shows that although the quality of the editorial board and other exogenous factors may have some influence, the reputation of a journal is mainly endogenously determined. What makes a good journal is the quality of the articles that it publishes. Authors send their good papers to the journals they believe to be better, usually the journals that have published good papers in the past. In that way they are able to improve the signal of quality. Even a person unfamiliar with the standards in a discipline, usually knows the 'best' journals, and so infers something about the quality of an academic's publications from the journals in which he/she publishes (Noll and Steinmueller, 1992). As a result, reputation is an increasing function of a journal's past ability to publish 'good' articles. The reputation of a journal converges to some value which depends on the pattern of submissions during the journal's first periods of life. Thus, journal reputation is to some extent characterised by path dependence. Consequently, the first issues of a journal have a very strong influence on the reputation. In other words: the first period of existence is crucial to the further development of a journal.

Second, reputation building is characterised by network effects. The chance that an article is cited depends on the number of authors that read the journal. Therefore, academics - aiming at high citation rates of their articles - have a strong desire to publish in journals that are widely read (Noll and Steinmueller, 1992). In other words: they benefit from the use of others of the same journal. Thus, reputation depends on the ability to position a journal in the centre of a communication network: there is a clear correlation between perceived journal prestige and 'network congruence' - the extent to which journals cite other journals in proportion to the number of times they are themselves cited by those journals (Eagly, 1975). Indeed, when we set familiarity of (general-purpose) journals and their prestige alongside each other, we find a clear correlation (Figure 2.2).

Figure 2.2 Familiarity and prestige of some general-purpose economics journals^{a,b}



Source: Indices based on Hawkins et al. (1973).

Notes: (a) Data are based on a survey among academic economists. Prestige of a journal reflects average from individual rankings (1 to 20). Familiarity of a journal reflects the percentage of respondents that were familiar with the particular journal. (b) AER: American Economic Review, Ectrica: Econometrica., JPE: Journal of Political Economy, QJE: Quarterly Journal of Economics, RevEcStat: Review of Economics and Statistics, RevEcStud: Review of Economic Studies, EcJ: The Economic Journal, JEcTh: Journal of Economic Theory, Eca: Economica, JASA: Journal of the American Statistical Association, JEL: Journal of Economic Literature, OxEcP: Oxford Economic Papers.

2.4 Conclusion

The traditional scientific journal performs three functions in academic communication. It disseminates the results of research, enables academics to claim priority of discovery and provides a quality signal. Typical features of the product are high fixed, low marginal costs of production and path dependence and network effects in reputation-building.

3. The position of publishers

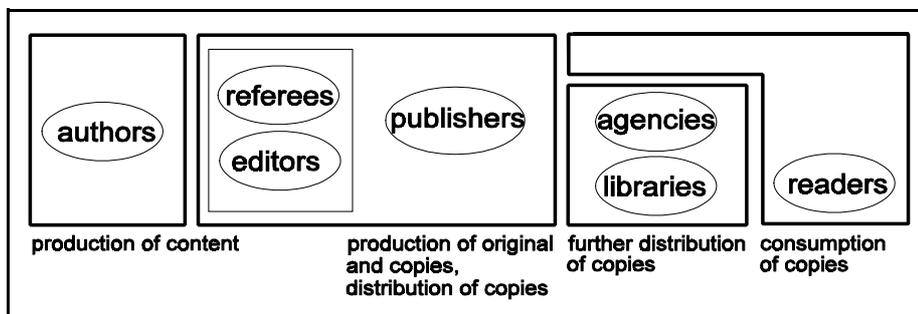
3.1 Introduction

Publishers have a central position in academic communication through traditional scientific journals. In section 3.2 we discuss the position of publishers in the supply chain. In section 3.3 we discuss the economic transactions that follow from the technical functions of the different actors. Then we show that high journal reputation is the key to success for publishers.

3.2 The position of publishers in the supply chain

In this section we describe the function of academic publishers and related actors in the supply chain. Publishers are the co-ordinators of academic communication through scientific journals. Figure 3.1 presents an overview of the process covering the entire range of activities from the author, publisher, distributor, mediator to the end user.

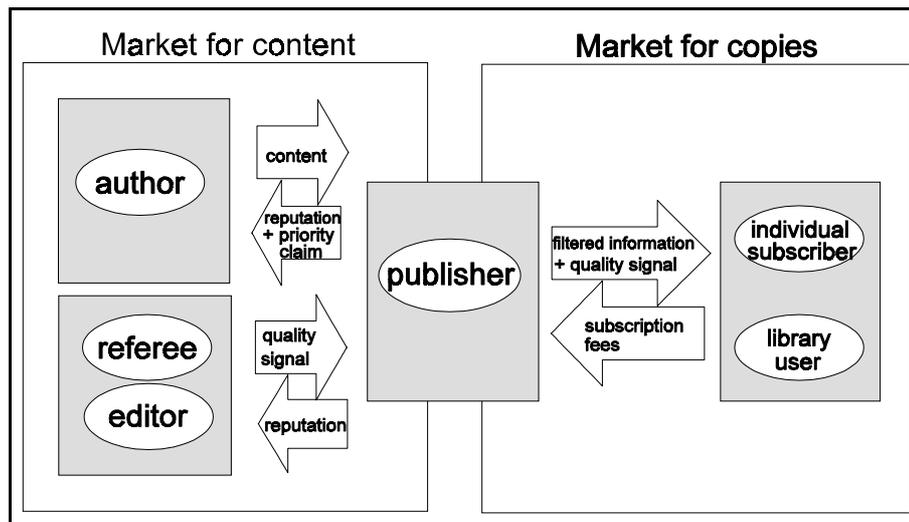
Figure 3.1 *Role of actors in the communication through scientific journals*



The content is fully produced by academics. Authors produce papers which they submit to a journal to be published. To select suitable papers for their journal, the publisher calls in the help of an editorial board. The editors guard the quality and scope of the journal. Referees assess the quality of the paper upon invitation of the editors. The editors combine a set of accepted papers into an issue on a regular basis. Thus academics produce the content of a journal, under supervision of the publisher. Then the publisher produces an original through the deployment of a variety of specialists involved in typesetting the issue, editing it before and after typesetting, proofreading, and so on. To produce copies of the original the publisher calls in the help of printers. After printing, the publisher distributes the copies either directly to the reader or to the library. The subscription agencies are intermediaries between publishers and libraries.

They act as a one-stop shop for a whole range of journals and perform supplementary functions like claiming and billing.

Figure 3.2 Transactions in the publishing process



3.3.1 The market for content

In the market for content, the publisher concludes contracts with authors on the one hand and editors and referees on the other hand.

Publisher and author

The publisher puts a quality signal to a paper and establishes a priority claim through publishing it in a journal. The author offers his copyrights in exchange. To the author, this represents a good deal. They are more interested in the indirect rewards from publishing (the net present value of future raises in income, moves into more interesting research positions and improvements in status) than in direct financial rewards from publishing. Publishers are highly interested in the copyrights on papers: the content only represents value when the publisher obtains exclusive rights on the paper. Through the transfer of copyrights, journal articles become a commodity that can be sold. Therefore, the transaction between the publisher and the authors does not imply *direct* financial

transfers of any significance.² The publisher has exclusive ownership of the journal title as well. Not even the editorial board of the journal concerned, is allowed to start a journal with the same title.

Publisher and editors and referees

A similar transaction proceeds between the publisher and editors and referees. The publisher offers them a reward in terms of reputation and the editors and referees pay back by reviewing and selecting papers suitable for publication in the journal. Usually, this transaction does not imply direct financial transfers as well. Therefore, editors and referees act as ‘volunteers’.³ Only the managing editors and the co-editors receive some financial compensation for their work (including secretarial work and postal expenses). However, as one editor-in-chief puts it: ‘when you go for the money, you’d better take a newspaper round’. The incentive to serve as a volunteer referee is generally seen as insufficient. One response to this problem is that most editors rely heavily on authors of articles (under review) in their journal to act as referees (see Hamermesh (1994: 156) for empirical evidence). In the instruction to authors, the *Canadian Journal of Economics* presents this as a ‘norm’.

3.3.2 The market for copies

The publisher sells the copies of the journal either directly to the reader or to the library by levying a subscription fee. The individual subscribers and libraries are prepared to pay for this service as it addresses their need for filtered and quality-indexed information on developments in academic research. Subscription fees are the main source of financial revenues of the publisher. They make up about 90 per cent of total revenues (Page, 1993: 72). Revenues from advertising are not substantial for most

²Sometimes authors pay to publish a paper in a journal through page charges or submission fees. In economics, submission fees seem to be more of a threshold for authors so as not to submit a lower quality paper to a journal than a financial compensation to the publisher. Current submission fees are about \$50. Not every journal requires levy on submission however. See Rosenbluth (1979) for a model of the submission problem including submission fees.

³Engers and Gans (1998) present payment of referees as a trade-off: the advantages of payment in terms of eliciting speedier review or a greater review rate must be weighed against the disadvantages in terms of the reduced need for referees to incur private costs in enhancing the quality of refereeing.

scientific journals.⁴ The revenues from subscriptions will have to cover the fixed costs of publishing as well. Therefore, to break even publishers will have to charge subscription prices above marginal costs. Only the deterrence of entry of competing journals *in the market for content* could give them the market power to do so. Then a reader has no choice but to accept a high price other than to cancel the subscription, since he cannot choose between substitutes. Each journal article is unique: articles in the same field cannot be substituted like jars of jam from different brands.

Since university libraries levy no use fee, journals are shared goods when offered to the reading public through libraries and are, at the same time, private goods to individual subscribers. So there is a simultaneous existence of separate but linked markets for private and shared use of the good (Ordover and Willig, 1978). Libraries subscriptions are paid for by public funds. The private market serves those consumers who value the good above its price and who either have no access to a shared unit or who choose not to share the good because the cost saving to them is outweighed by the inconvenience. The users of shared units have little reason to care about prices of journals as they are able to free ride on the shared good (abstracting from congestion). The users fall into two groups. The first group is comprised of those who would not purchase a unit of the good for themselves even if the sharing option were not available to them. The second is the group of users of shared units of the good who would switch to private consumption if their sharing option were foreclosed. The sharing option enables the former group to enjoy services they otherwise would not, while it benefits the latter group by reducing their expenditures on the commodity (Ordover and Willig, 1978).

⁴Content of economics journals is scarcely sponsored by advertising. Some 20 per cent do not even include any advertisements (Chressanthis and Chressanthis, 1994: Table 2). If any, advertisements are paged separately and placed in the back of the journal. Most advertisements concern books or other journals of the same publisher and computer software. Advertising revenues are likely to be positively correlated with journal circulation. An explanation for the limited use of advertising in even widely circulated economics journals is the limited range of work-related products that are 'channelled through' economists. Specific products are limited to specialised journals and monographs and, indeed, computer software. There are better communications channels available in terms of circulation for non-specific products like word processing software. Academics in the medical profession are much more interesting to influence through advertising, because of their use of drugs for their patients. That could explain that advertising is more popular in medical journals than in economics journals. The American Economic Association brings in some \$190,000 from advertising in three journals with a high circulation (27,000) (Getz, 1997: Figure 2), whereas one medical journal with a similar circulation leads to more than \$1 mln. in advertising income (Hunter, 1997).

3.4 Conclusion

The traditional setup of the market for scientific journals implies that competition is all about bidding for the author's favour. Authors are prepared to transfer the copyright on their paper to the publisher offering the most prestigious publication outlet. To obtain the exclusive right to sell a high-quality paper, publishers compete for the first place in the journal rankings. By the time a paper is published in a journal the game is played. Then the reader has no choice but to accept a high price other than to cancel his subscription, since he cannot choose between substitutes. Each journal article is unique: articles cannot be substituted like jars of jam from different brands.

4. Outside factors

4.1 Introduction

In this chapter, we discuss three outside factors that have direct implications for the business strategies of publishers, which we will discuss in chapter 5. We go into the growth and specialisation of academia, the increased pressure to publish and the general trend for tightening of library budgets. These developments concern all fields of science and not only economics.

4.2 Growth and specialisation of academia

The number of academics has been growing and this growth is expected to continue. The number of US Ph.D.s granted in six disciplines in periods of ten year grew at 136 per cent from 1954-63 to 1964-73 and at 35 per cent from 1964-73 to 1974-84 (Joyce, 1990: Table 1, 1128). From 1973 to 1991 the number of employed doctoral academics in the US grew with 80 per cent. The rate of growth in the US is slowing: the growth in the beginning of the seventies was approximately twice as high as at the end of the eighties (Stephan, 1996: 1212, Table 2). There is scope for continuing exponential growth in countries such as China and India in the next decades (Odlyzko, 1995). A similar growth rate is detectable in economics: the number of economist has increased over 75-fold in the last 100 years (Stigler et al, 1995: 333). The growth in the number of academics increases the demand for new, specialised journals for two reasons.

First, on the side of the readers, academics have to keep up with developments in their sub-specialty. They are constrained in their desire to keep up with developments outside their sub-specialty, as they have only limited time to read. The average amount of time spent reading scholarly articles and the average number of scholarly article readings per year has remained relatively constant from 1977 to 1998 (Tenopir and King, 1998). At the same time, the amount of recorded scientific knowledge is doubling approximately every fifteen to twenty years (Price, 1962 in Lovell, 1973). Economics is no exception to this rule: the cumulative stock of journal articles doubles every 14 years (Lovell, 1973). Therefore, their valuation of more narrowly focussed journals that use a specialty-specific 'information-filter' is likely to increase (Stigler et al., 1995: 334, Laband and Piette, 1994: 657).

Second, on the side of the authors, as the number of academics increases, the demand to publish in a fixed number of best journals grows, and a smaller proportion of scholars succeed in publishing at the top of the hierarchy. When deciding where to submit, authors take the probability of acceptance into account apart from the journal's

reputation (see Rosenbluth, 1979: Appendix 1 for a model of the submission problem). As a result of growth in the number of academics, the trade-off between publishing in prestigious journals and probability of acceptance worsens. Academics are able to shift the trade-off curve upwards through creating new publishing outlets that create a new hierarchy of journals (Noll and Steinmueller, 1992: 33, 34).

4.3 The increased pressure to publish

Some of the growth in demand for journals has been occasioned by university and college personnel processes that make publication in peer reviewed journals the *sine qua non* for jobs, grants, tenure and promotion (ARL et al., 1998). The culture of 'publish or perish' has placed increased pressures on academic staff to publish their findings in order to boost their own (and their university's) research credentials. Parker et al. (1997) argue that the emphasis on publication rates is based on the general trend to performance management in the public sector, which includes allocation of funds based upon measurable output indicators.

Until the 1960s, the number of articles published by each author was relatively small, and many members of academic societies did not publish at all (Walker, 1998). Since then, article output per author has increased. For instance, over the period 1983/84 to 1995/96 the article output of Dutch academics increased almost 70 per cent, whereas research expenditures stayed constant or declined and the number of academics started to decrease in 1994. Other West-European countries have mirrored this trend (NOWT, 1998). To determine the exact impact of the increased pressure to publish on article output, we need an empirical analysis of growth in article output per author correcting for a number of other factors like the availability of publication outlets.⁵

4.4 Tightening library budgets

An important exogenous factor is the general trend for tightening of library budgets. As discussed, the academic community has grown exponentially. This leads to an upward pressure on the number of scientific journals. Therefore, libraries will have to subscribe to more journals and their work load will increase. However, for the median library in the United States, average percentage growth of total library expenditures is only 8 per

⁵Empirical research on the development in article output over a long period is not an easy task. For a set of finance journals, Zivney and Bertin (1992) show that the increased pressure to publish did not lead to an actual increase in the number of articles published. Although the number of manuscripts submitted increased, the acceptance rate decreased over the period 1964-1990. Adams and Griliches (1996) discuss difficulties in measuring relevant article output.

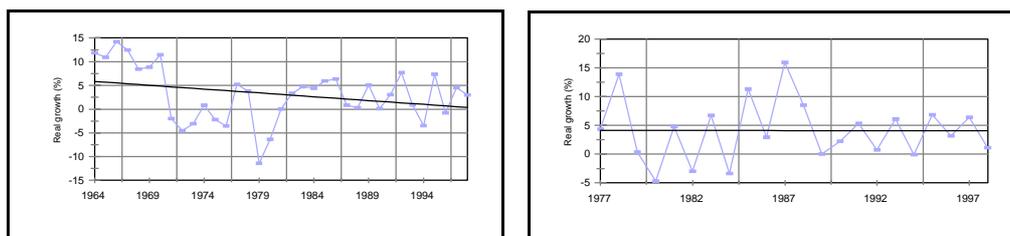
cent annually (and 3 per cent when corrected for inflation) over the period 1963-1998 (Figure 4.2).

Of course, very strong improvements in efficiency of libraries could offset the broadening gap between budgets and increasing expenditures, but if we look at the expenditures on journals only, the picture is more or less the same: over the years 1976 to 1998, average percentage growth of expenditures for serials (including all serial publications) is only 9 per cent annually (and 4 per cent when corrected for inflation) (Figure 4.2).

The budget tightening is the more pressing since prices of journals have risen much faster than the consumer price index (CPI). For instance, prices of science and technology journals have risen about twice as fast as the CPI (Walker, 1998: Figure 2).

Another indicator is the part that library expenditures make up of university education and general expenditures. From the mid-1960s through 1971 - the period of most rapid expansion of academia - US libraries increased their share of education and general expenditures from under 3 per cent to nearly 4 per cent. During the 1970s, the libraries' share stayed more or less constant. Then, starting in 1980, the libraries' share fell every year but one during the 1980s. Now it has reached a level that is just slightly higher than the level in the mid-1960s (Mellon Foundation, 1992: Chapter 3).

Figure 4.2 Real annual growth in total library expenditures (left) and in expenditures for serials (right)



Source: ARL Statistics (see www.arl.org/stats/arlstat/index.html).

4.5 Conclusion

Growth and specialisation of academia increases the demand for new, specialised journals. Readers ask for more specific 'information-filters' and authors ask for new publishing outlets. This trend is further strengthened by the increased pressure to publish. Notwithstanding the resulting pressure on library expenditures, their budgets have not been increased equally.

5. Business strategies of publishers

5.1 Introduction

Now that we have identified the factors that structure the behaviour of publishers, we discuss their business strategies. We analyse the way how publishers are able to raise barriers to entry in the market for content (i.e. scientific papers) so as to appropriate the surplus from publishing. The surplus is equal to the sum of revenues (subscription fee) minus costs per sold product. As argued in chapter 3, only a secure position in the market for content enables publishers to appropriate some part of the surplus. In section 5.2 we deal with barriers to entry in the market for content. We go into ways to appropriate the surplus in section 5.3.

5.2 Raising barriers to entry in the market for content

Publishers pursue a strategy of horizontal product differentiation to establish a prestigious journal in a market which is characterised by high entry barriers. Reputation building is supported by a range of additional strategies, which we discuss in section 5.2.2.

5.2.1 Establishing a high reputation

Establishing a high reputation enables publishers to gain market power. We show this by using the method of defining the relevant market cluster presented in CPB (2000). Let us call the market for journals in a discipline (say, economics) the ‘pivotal market’. Entry in the market for journals is deterred as soon as a publisher seizes market power in the connected market for scientific papers. Market power in the market for content is based on reputation. A high reputation enables a publisher to capture some part of the fixed supply of high-quality papers. After all authors do not want anything else than to publish their papers in a prestigious journal. To realise a publication, authors are prepared to transfer their copyrights to publishers (see section 3.3.1).

An entering journal is almost by definition left with lower-quality papers, which threatens to lock it into a low reputation path (see section 2.3 on path dependence), unless the market accommodates another top journal. Therefore, an entering journal does not represent a real threat to the existing prestigious journal. In a mature, stable market for journals in some discipline successful entry would approach zero.

However, the growth and the trend towards specialisation of academia propels a specific mode of entry. We explain this process with the use of Figure 5.1. A publisher which

starts publication of the new journal *A* in an existing hierarchy is not likely to have much success. As discussed the title ‘most prestigious journal in the specialty’ is almost an impregnable fortress to competing publishers. Somehow a publisher has to break the monopoly on high-quality inputs of the existing top journal, i.e. he has to come up with a strategy to by-pass occupied positions.

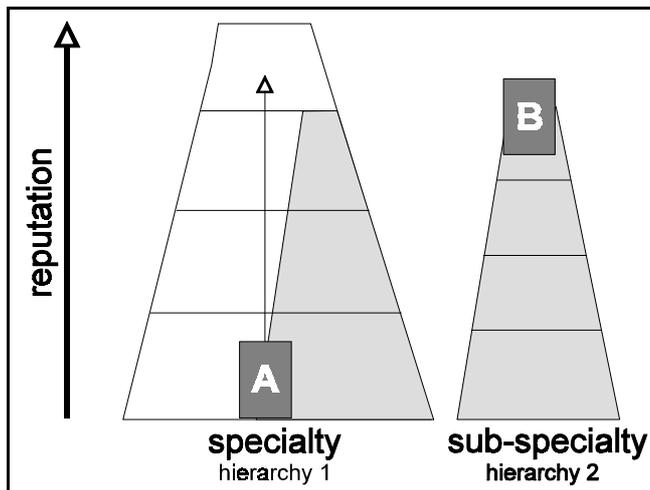
In stead of introducing journal *A*, he introduces journal *B* in a sub-specialty (see Noll and Steinmueller, 1992). As discussed in chapter 4, academic authors and readers are keen to form a new club round the more specialised journal *B*. An own journal increases the status and publishing opportunities for their sub-specialty. Readers are willing to pay for a new information-filter which supplies high-quality material on the sub-specialty they are interested in. To the authors, journal *B* is the second best place to publish for that sub-specialty. As a result, the new specialty journal is in a good position to compete for papers with ‘second-tier’ general-purpose journals (Laband and Piette, 1994: 657). If all works out well, journal *B* achieves the title ‘most prestigious journal in the sub-specialty’. A new hierarchy is established.

Eagly (1975) presents empirical evidence showing that the subject content and network function of economics journals is undergoing increased specialisation since 1961. Only some of the growth in research output is absorbed by more voluminous issues of the existing journals. Comparing 41 economics journals that appeared in both 1970 and 1990, the number of articles per journal published increased by 23 per cent and the number of pages per journal published by 50 per cent between the periods 1965-69 and 1985-89 (Laband and Piette, 1994: 643).

Of course, this strategy of horizontal product differentiation is most successful, when the publisher is the first to establish a journal in a new, growing field (see Cabral, 1992: 17 on first mover advantages). Therefore, a publisher is very keen to know whether a subgroup of academics has reached the minimum size required for operation of a journal at an affordable cost. To that purpose, all publishers have a network of agents with close connections to academia.

The type of market that develops is one of monopolistic competition (Noll and Steinmueller, 1992). Success means having a large number of subscribers with a low price elasticity. Success of a journal in a specialty breeds entry of journal *B* that attempts to become an outlet for a narrower sub-specialty. If successful, the effect of such entry will be to cut subscriptions to the journals in the specialty (the shaded part of the specialty in Figure 5.1). This goes for individual subscriptions in the first place: academics value a more specialised journal higher when the percentage of articles of direct personal interest is higher than for a general-purpose journal.

Figure 5.1 The strategy of horizontal product differentiation



Libraries are not able to replace general-purpose titles for more specialised titles so easily however. The demand for the general-purpose journal will increase as a result of entry of a more specialised journal. After all, people who cancelled their individual subscription to the general-purpose journal will switch to the library as the source of their reading. Above that, it is not likely that use of a brand new journal will be high. The sub-specialty is probably still in its beginnings, which means that there are not many readers at the time of entry. Therefore, the cost-use ratio for a new journal tends to be relatively unfavourable. Assuming that the library budget stays constant, only one journal can be subscribed to. The choice is dependent on the cost-use ratio ranking of journal *A* versus *B*. If journal *B* is successful, the total number of subscriptions to the more general-purpose journals will partly be shifted to the more specialised journal *B* eventually. However the shift may take a couple of years, considering the fact that it usually takes five to seven years to break-even (Page, 1993: 81).

Only secondary journals are under threat of entry of more specialised journals. Note that the shaded part in Figure 5.1 does not include the top of the hierarchy. The most prestigious general-purpose journals in a discipline are likely to be immune for a foundering subscriber base. They have captured some part of the market for inputs. Whatever new journal commences publication, these journals will continue to include the influential articles by leading academics in the field. The continuous stream of high quality papers in these journals makes them 'must-haves'. Therefore, top journals are able to sustain their monopoly positions. Each of them constitutes a distinct relevant

market (McCabe, 1999). The only limit to the publisher's capacity to achieve monopoly returns is the threshold cost-use ratio that libraries use in their cancellation policy.

However, in practice we see scientific journals which are not at the top of the hierarchy, but are still able to survive. The reason is that entry of competing, more specialised journals occurs only after a period of profit-making. In other words, the time needed to achieve an acceptable return on investment (say, eight years) is shorter than the time over which further specialisation of science takes place. These journals are 'temporary cash cows'.

Therefore, we can make a distinction between two layers of the hierarchy in a field. The first layer exists of top journals which are immune to entry. The second layer exists of journals which are free from competition pressure because of the slow process of entry. In practice, the distinction between the two layers is not absolute. Therefore, the relation between journal reputation and profit margins is gradual. We would expect that an increase in journal reputation enables the publisher to charge higher prices, corrected for all other relevant factors like non-profit status, frequency of the journal, etc. Indeed, in an empirical study on 90 economics journals, Chressanthis and Chressanthis (1994) find a highly significant correlation between a comprehensive journal prestige measure (similar to the one used by Durden et al., 1991: 174, Table 3) and library subscription fees.

The process of monopolistic competition based on growth and specialisation of academia, combined with the increased pressure to publish (section 4.3), has to result in a downward pressure on average circulation figures. After all, the rise of a 'publish or perish' culture strengthens the incentive to start a more specialised journal as soon as the market accommodates it. Indeed, empirical research by Tenopir and King (1998) shows that the 1995 median number of scientific journal subscribers is approximately 1,900 subscribers, down from 2,900 in 1975. The number of individual subscriptions per scientist declined from 5.8 in 1977 to approximately 2.9 in recent years.

Fewer subscriptions require higher prices to recover costs (section 2.3). Chressanthis and Chressanthis (1994) analysis indicates an increase of \$12 - \$20 in the library subscription fee as a result of an decrease of circulation by 1000. This is quite substantial with an average library subscription fee of \$70. Combined with stagnant library budgets (section 4.4), these price increases forced libraries to cancel titles. Moreover, the less endowed relative to the larger and the better-funded research libraries have begun to rely more heavily on interlibrary loan services and resource sharing among libraries. This trend places greater economic burdens on a smaller set of the better-funded research libraries to pay for journal subscriptions (Chressanthis and Chressanthis, 1994).

Partly, the decrease in circulation and the subsequent rise in costs per journal explains the journal crisis, i.e. the vicious circle of higher prices, more cancellations, lower circulation, further increase in prices, etc. However, Chressanthis and Chressanthis (1994) show that other factors like profit or non-profit status are more important. The spiralling journal prices do not seem to be based on cost considerations but rather on profit considerations. This empirical evidence provides another indication that publishers have considerable market power to raise prices. In section 5.3 we go into the way publishers try to maximise their profit margins.

5.2.2 Strategies supporting reputation-building

Apart from the strategy of horizontal product differentiation as discussed above, publishers pursue strategies to support reputation-building of their journal. As discussed in chapter 2, reputation-building is characterised by network effects and path dependence: the fortunate introduction of a journal is characterised by a ‘flywheel’ effect. Therefore, creating mass in combination with establishing a good reputation in the first period of existence of a journal is crucial. We make a distinction between strategies primarily aimed at creating mass and strategies aimed at signalling quality.

Creating mass

Publishers have to deal with networks effects in demand. The following strategies are primarily aimed at gaining market share:

- *Sampling.* Generally, publishers give away free samples of the first issue of a new journal to potential subscribers. Publishers of an existing journal provide a free copy of an ‘average issue’ upon request.
- *Revealing parts.* By revealing the titles of (forthcoming) articles, name of the authors, and sometimes abstracts of their articles, publishers try to ‘appetise’ customers. Media are the Internet homepage of journals and, increasingly, ‘alert-services’ via e-mail.
- *Low initial margins.* As the cost-use ratio of new journals is generally unfavourable, publishers hold the initial price for at least the first three years of publication, regardless of subscription level, and sometimes for up to five years, engendering losses that must be made up in time.⁶ Prices for succeeding years

⁶This concerns margins, not absolute prices, since increases in journal age is associated with lower library prices, confirming the view that newer journals have higher advertising and market-entry costs than older, established journals do. A one-year increase in journal age will decrease library prices by about \$0.43 - \$0.55, all else equal (Chressanthis and Chressanthis, 1994).

are adjusted to the actual number of subscribers once a maximum is judged to have been reached, a point that can be 5-7 years after inception (Beschler, 1998).

- *Bundling*. Publishers can bundle subscription to a new journal with subscription to an existing journal. An example is the combined subscription to the *American Economic Review*, *Journal of Economic Literature* and *Journal of Economic Perspectives* (JEP), all published by the American Economic Association. This bundling strategy provided a head start for the *JEP*, which commenced publication in 1987. Another example is the combined subscription to *Applied Financial Economics* (commenced in 1990) with *Applied Economics* (1968). Routledge extended this bundle of subscriptions with *Applied Economics Letters* in 1994.
- *Linkup with professional association*. Through linking up with a professional association, a publisher obtains a journal with a wide subscription base since membership of the association is usually combined with subscription to the home organ. Thus the number of individual subscriptions will be significantly higher than for a non-linked journal. As long as the individual subscription fee exceeds marginal costs, a strategy of maximising the number of individual subscriptions is profitable. The abovementioned *American Economic Review* has 27,000 subscriptions for instance, whereas the average circulation of an economics journal is about 4,000 (Chressanthis and Chressanthis, 1994: Table 2). Generally, there are further reductions in the individual subscription fee for members of the association, so that members can clearly see the reduced price as a benefit of membership (Hunter, 1997). An example of a ‘sneaker’ - an originally independent journal brought in as association journal - is the *European Economic Review* (EER), owned by Elsevier. This journal was founded in 1969 and became the journal of the European Economic Association in 1986. Journals like *EER* have to be distinguished from journals which are published by a publisher as a called-in jobber. In the latter case, the publisher is not an independent owner (and residual claimant) of a title which bundles subscription with ownership of an association for strategic reasons.

Signalling quality

Because of the path dependence in reputation building, the first blow is half the battle. Publishers use several strategies to set initial conditions as favourable as possible by signalling superior (future) quality. This is also of direct benefit to the editors, who would like to see ‘their’ journal as prestigious as possible.

- *Editorial board*. An editorial board consisting of a row of ‘big shots’ gives a quality signal to authors. After all, it is the editorial board which should guard

the quality of the journal. To secure the reputation of a journal, publishers have influence on the appointment of members of the editorial board.

- *High-quality papers in first issue.* Because of path dependence in submission, high quality of the first issue is likely to set a trend. Thus by aiming high in the beginning, a publisher is able to influence the reputation building of a journal. The number of ‘well-known’ names in the first issue is often considerably higher than in the average issue (for instance, the all-stars first issue of the *Journal of Economic Growth* included Barro, Mincer, Aghion, Howitt, Durlauf, Quah, and Benhabib). The reliability of this signal will weaken when most journals follow this strategy.
- *Brand building of publishers.* A publisher can use his good reputation - based on his portfolio of prestigious journals and/or its reputation as organisation (think of the American Economic Association) - to provide an implicit guarantee of product quality to potential subscribers. This serves to attract greater number of subscribers than a journal started up by an organisation (such as some unknown economics department) with less reputational capital at stake (Laband and Piette, 1994: 653). An example of this strategy is the powerful market penetration of the *Journal of Economic Perspectives* started in 1987 by the prestigious American Economic Association, which had already two top-journals in its portfolio: the *American Economic Review* and the *Journal of Economic Literature*. To strengthen the quality-signal, Elsevier uses the same lay-out of the covers of their portfolio of economics journals.
- *Twigging.* A publisher can use the good reputation of a specific journal title to support the reputation of another, new journal (like *Applied Economics* and the later started *Applied Economics Letters* or the *Journal of the Royal Statistical Society Series A, B, C and D*). To provide a head start to a journal, some publishers use a combination of bundling and twigging.

5.3 Price strategies

Barriers to entry enable publishers to set prices higher than marginal costs. Now we know how publishers can raise barriers to entry through positioning their journal. In this section we discuss how they pursue price strategies to appropriate the surplus. We make a distinction between price strategies related to one journal and to a portfolio of journals. After dealing with the price strategies we go into differences between non-profit and for-profit publishers in the exploitation of their market power.

Price discrimination

As institutions and individuals have different price elasticities of demand, publishers can charge higher rates for library subscriptions than for individual subscriptions. This

strategy is called price discrimination. In 1984, the average price discrimination ratio for a range of disciplines was 2.6, i.e. library subscription fees were 2.6 times higher than individual subscription fees (Joyce, 1990: Table 4). To illustrate this fact, we show both rates for five top economics journals in Table 5.1.

Table 5.1 Price discrimination of five top economics journals (1999, prices for US, in US dollars)

Journal	Individual annual subscription rate	Institutional annual subscription rate	Discrimination ratio^e
Journal of Political Economy	46	159	3,5
Quarterly Journal of Economics	40	140	3,5
Econometrica	59 ^a	171	2,9
American Economic Review ^b	56 ^c	180	3,2
Economic Journal	86 ^d	284	3,3

Notes: (a) including membership of The Econometric Society, (b) including subscriptions to the Journal of Economic Perspectives and the Journal of Economic Literature, (c) including membership of the American Economic Association, annual income of subscriber \$37,000 or less (d) including membership of The Royal Economic Society, (e) the discrimination ratio is the institutional subscription price divided by the individual subscription price.

Price elasticity of library demand is low relative to individual demand for five reasons. First, the relation between use and price of a journal is distorted since library subscribers are able to free ride on a public good as opposed to individual subscribers. Second, individuals can switch to library subscriptions when prices go up, whereas cancelling titles is the only solution to libraries. This is reflected in prices: a \$1 increase in the individual subscription fee will increase the library subscription fee by about \$1.25, all else equal (Chressanthis and Chressanthis, 1994). Third, libraries are primarily concerned with completeness of their collection of journals since they cannot usually anticipate future usage of their holdings by patrons, given them a lower elasticity than individuals (Joyce, 1990: 1128). Fourth, librarians have a strong desire to maintain the continuity of a journal subscription (Chressanthis and Chressanthis, 1994), ‘once they get volume 1, number 1, they are hooked until the end’. Fifth, individual document delivery services as alternative to a subscription is considered a poor and often expensive substitute for journals ‘on the shelf’ (Page, 1993: 85). Thus, since the margin between marginal costs and subscription fee depends on the degree of price elasticity of demand, publishers are highly dependent on library subscriptions to recover their fixed costs.⁷

⁷A back-of-the-envelope calculation based on Fishwick et al. 1998 cost data learns us that fixed costs per subscription are about \$88 and marginal costs \$27 (circulation of 2,000). Assuming an individual subscription fee of \$50 to 60, 30 to 40 per cent of fixed costs are recovered. With 25

Effective price discrimination requires little or no leakage of subscriptions from the higher to the lower priced market segments. The existing literature indicates that institutions are very unlikely to use individuals to subscribe to scientific journals. Librarians follow their code of conduct. Moreover, this type of arbitrage can be relatively easily detected, e.g. by comparison of library catalogue and subscription details, and brought to court.

*Manipulating prices of a portfolio of journals*⁸

McCabe (1999) presents empirical evidence that publishers are able to increase their profits through manipulation of prices of a portfolio of journals within a discipline. Given a set of similar titles, libraries do not subscribe only to the journal offering best value. Rather, journal cost per use is minimised across a broad field of study, e.g. economics, subject to a budget constraint, and the result is a demand for a portfolio of titles.

Given libraries' portfolio demand, McCabe demonstrates that, all else equal, publishers set prices so that higher use (or quality) journals exhibit lower cost/use ratios. Thus, higher use journals (that have lower cost/use) are purchased by most libraries. Conversely, lower use journals (that have higher cost/use) are purchased by fewer, relatively high budget libraries. The intuition for this particular ordering is that higher use imparts a 'cost advantage' that makes it more profitable to price high and sell to fewer, relatively high budget libraries. Note that although the latter firms could match the 'low cost' firms' prices, this strategy is less profitable than targeting the smaller base of high budget customers.

Using this model, McCabe shows that, in some cases, mergers are profitable for journal publishers. A corollary is that the merged firm's journal prices increase. The idea here is that the merged firm is able to internalise certain pricing externalities that the merging parties fail to consider when they act independently. In other words, in one firm raises the price of its journals, it is profitable for other firms to increase the price of their journals. Larger portfolio firms are better able to capture these benefits and therefore, all else equal, set prices at a higher level.

per cent of circulation being individual subscriptions, more than 90 per cent of total fixed costs is recovered by library subscriptions.

⁸In this paragraph, we make use of an update on McCabe's latest findings, which includes a convenient summary of his approach, see <http://www.econ.gatech.edu/~mmccabe/index.html>

Using data from 194 medical libraries, McCabe shows that mergers between Pergamon and Elsevier and Lippincott and Kluwer were associated with substantial price increases; in the case of the Elsevier deal the price increase was due solely to increased market power. For example, compared to pre-merger prices, the Elsevier deal resulted in an average price increase of 22 per cent for former Pergamon titles, and an 8 per cent increase for Elsevier titles. This asymmetry probably reflects the corresponding asymmetry in pre-merger journal portfolio size for the two firms. That is, Pergamon's relatively small biomedical portfolio prevented it from profitable setting prices at the same level as Elsevier.

Differences between for-profit and non-profit publishers

Non-profit and for-profit publishers do not seem to exploit their market power to the same extent. They both have an incentive to achieve a high reputation for their journals, but have different price strategies. We have three indications that point in this direction.

First, let us consider journal prices in general. Comparing subscription fees for economics journals that for-profit publishers charge, Chressanthis and Chressanthis (1994) conclude that subscription fees for journals published by universities or university presses are between \$22 - \$24 lower, all else equal. Subscription fees for journals published by foundations are even \$34 - \$42 lower. The difference between the prices that for-profit and non-profit publishers charge is quite substantial, considering the average library subscription fee of \$72.

Of course, it is not surprising that for-profit publishers charge higher prices than non-profit publishers. They cannot rely on implicit subsidies as non-profit publishers are said to be able to and, most important, they have to achieve an acceptable rate of return on investment. However, as said, they clearly outstrip non-profit publishers, whereas non-profit publishers are said to make already substantial profits on their activities. Net returns of 30 per cent and more have not been uncommon (Lustig, 1997, in Odlyzko, 1998). Therefore, it is not surprising that the return on equity of for-profit academic publishers is considerably higher than that of most companies in other sectors. Wolters Kluwer provided a higher return on equity in 1997 than 482 of the Standard & Poor's 500 companies, Reed Elsevier higher than 448, Plenum higher than 361, and Wiley higher than 302 (Wyly, 1998).

The rate of price discrimination between individual and library subscriptions differs between for-profit and non-profit publishers as well. In 1984, the average discrimination ratio in a range of disciplines is two times higher for journals published by for-profit publishers than for non-profit publishers: 4.36 compared to 2.20 (Joyce, 1990).

Third, only for-profit publishers are able to increase their profits through manipulating prices of a portfolio of journals. Non-profit publishers do not have wide portfolios of journals and amalgamation of associations is not a very common policy either.

In sum, differences in price strategies between for-profit and non-profit publishers reveal that profit considerations play an important role in the level of journal prices. On the basis of their market power in the market for content, for-profit scientific publishers are able to set their prices considerably higher than average costs.

5.4 Conclusions

We have analysed how publishers are able to gain market power in the market for scientific journals. Positioning a journal at the top of the hierarchy in a certain specialty translates into barriers to entry. Additionally, publishers pursue a set of strategies to strengthen the reputation and circulation of their journal like sampling, and signalling quality of new journals. On the basis of this market position, publishers are able to charge prices higher than marginal costs and to appropriate the surplus through price discrimination and manipulating prices of a portfolio of journals. The available empirical evidence suggests that private publishers actually exploit their market power, much more so than non-profit publishers. The results suggests that the spiralling journal prices are largely due to profit considerations rather than cost considerations.

The rise of electronic publishing could change the fundamentals of the market for scientific journals and therefore the strategies that publishers pursue. Their relatively secure market position in traditional publishing might be threatened. Therefore, we move on to the transition towards electronic publishing.

Part II Towards electronic publishing

New information and communication technologies bring about important changes in the business of academic publishing, both in the characteristics of the product and in the business strategies available to publishers.

6. Effects of changes in information technology

6.1 Introduction

The secure position of academic publishers in traditional publishing may be challenged by changes in information technology. In this chapter, we discuss effects of technological changes on (1) costs of publishing, (2) the functions of journals, (3) the nature of subscriptions, and (4) the possibilities to add services to journals.

6.2 Costs of publishing

Technological changes effect the several stages of the publishing process differently. Therefore we analyse the production of content, production of the original and the production and distribution of copies separately.

(i) Production of content

The costs of the production of content (scientific research and refereeing) have not changed dramatically. Editors and referees remain unpaid volunteers. New information technology could lead to more efficient communication between authors, editors, referees, and readers. New referee mechanisms are being developed. E-print archives offer readers the opportunity to review papers by attaching virtual notes. Using the evaluation of those readers, the archive can construct a quality ranking. Currently, E-print archives generate a rating of a paper by counting the number of times a paper has been 'hit' and downloaded. This rating gives some indication of the quality of the paper.

The top-ranked journal *Behavioral and Brain Sciences* applies such a new referee mechanism. Papers are first refereed in the traditional way, but are thereupon subject to solicited and refereed comments of peers. Those comments are published together with the author's reply (Harnad, 1996). Currently, *The Medical Journal of Australia* (<http://www.mja.com.au/>) performs a controlled experiment that assesses the traditional review process against a process consisting of an online discussion between editors, selected reviewers, authors, and a wider group of selected consultants, followed by an open online discussion between readers and authors. Discussions are non-anonymous and they are published together with the edited paper. Still, also in these new assessment procedures, publishers do not offer financial compensation to referees.

(ii) Production of the original

Technological progress has decreased some of the costs of production of the original, but costs may increase as new product dimensions come up and new technological infrastructure is needed.

Advanced computer applications have reduced the costs of typesetting. Some of those costs have been transferred to the author. However, there are new fixed costs associated with the production of the original. New technological infrastructure (hardware and software, plus supporting human capital) is needed.⁹ Keywords have to be assigned to make papers searchable. Electronic links to related work - both backwards and forwards in time - must be implemented and kept up-to-date.

Electronic publishing provides opportunities to develop different versions of a paper. One version might be a one-page non-technical executive summary, another one may include a 3D rotating model, a third one may provide access to the database and report in detail on the technical analysis and a final one may include a video of the author, allowing for interaction with readers.¹⁰ For examples of electronic journals which reformed the traditional appearance of scientific journals, see the *Journal of Molecular Modelling*, <http://www.ccc.uni-erlangen.de/jmolmod/>, and *Contributions to Zoology*, <http://www.uba.uva.nl/ctz/>. Those new product dimensions result in higher costs, but some of the costs may be transferred to the author in the same way as the costs of typesetting.

(iii) Production and distribution of copies

The costs of production and distribution of copies decrease significantly with the introduction of electronic journals. Storage and Internet transport is cheap. There may be limited per-user administrative costs (billing, handling complaints and technical problems).

⁹ According to an investment analyst, Elsevier's ScienceDirect initiative requires annual investments of € 15m (Rabobank International, 1999). The new requirements for technological infrastructure may increase economies of scale in publishing. Small publishers, including most of the learned societies may be put at a cost disadvantage. HighWire Press of Stanford University (<http://highwire.stanford.edu/>) offers scientific societies technical advice and guidance.

¹⁰ There is a need for detailed information on the underlying empirical analysis. For instance, Goffe and Parks (1997) argue that replication of empirical economic research is difficult due to lack of public information about data, dataprocessing, and data analysis. Usually, referees do not review data sets, and the profession is unable to do so because it is not published.

Table 6.1 Some guesstimates of the production costs of edited and refereed electronic journals

Study	Journal	Costs per article	Cost reduction
Bot, Burgemeester and Roes (1998)	Electronic Journal of Comparative Law ^a	\$ 2,500	75%
Brandsma (2000)	Contributions to Zoology ^a	\$700	55%
Fisher (1995)	Chicago Journal of Theoretical Computer Science ^b	\$3,500	40%
Getz (1997)	American Economic Review, Journal of Economic Literature, Journal of Economic Perspectives	-	23%
	Journal of Statistics Education ^c	\$2,500	-
Goffe and Parks (1997)	No specific journal	-	>50%
Harnad (1995a)	No specific journal	-	70%
Marks (1995)	No specific journal	-	<20%
	MRS Internet Journal of Nitride Semiconductor Research ^d	\$ 275	-
	New Journal of Physics	\$ 400 - \$ 500	-
Odlyzko (1998)	No specific journal	\$ 250 - \$ 1,000	-

Notes: (a) Bot, Burgemeester and Roes (1998) and Brandsma (2000) argue that potentially important costs, e.g. IT-infrastructure, are negligible if a journal can make use of existing infrastructure e.g. at universities. This holds for the *Electronic Journal of Comparative Law* and *Contributions to Zoology*. (b) Fisher (1995) argues that the electronic journals need to be marketed intensively 'to encourage contributions and reassure researchers that their articles will be broadly distributed'. These additional costs are not incorporated in her estimate of cost reduction. (c) The *Journal of Statistics Education* was freely available thanks to an NSF grant. The costs per published paper have been set equal to the grant divided by the number of published papers. (d) The *MRS Internet Journal of Nitride Semiconductor Research* and the *New Journal of Physics* charge authors rather than readers. The costs per published paper are assumed to be equal to these charges.

Conclusion

Fixed costs to produce the original may increase. The marginal costs, i.e. the costs of production and distribution of copies, decrease. Varian (1998) concludes that break-even prices will not go down substantially, since electronic publishing only saves on marginal costs, which for most journals are very low compared to average costs.

The available costs estimates for edited and refereed electronic journals vary substantially.¹¹ Table 6.1 reports overall estimates of cost reduction ranging from less

¹¹The estimates hold for refereed and edited journals. Indeed, when journals refrain from refereeing and editing, costs drop substantially. Odlyzko (1998) estimates that Ginsparg's 20,000-papers-a-year e-print archive, which does not offer added value such as refereeing and editing, processes papers at \$5 each. The free *MRS Internet Journal of Nitride Semiconductor Research*,

than 20 per cent up to 75 per cent, and estimates of the costs per published paper going from \$250 to \$3,500.

6.3 Functions of scientific journals

In recent years, many traditional journals have been made available in electronic form without a major change in the tasks performed by their paper-based version, nor in the way these tasks have been accomplished (see section 2.2). In essence, the only change has been the way of distribution.

However, E-print archives may deprive the more traditional journals of the tasks of granting priority rights and dissemination of results. An E-print archive will be a stronger competitor to journals as it succeeds to attract the complete research community active in a field (the producers and consumers of results) and comes to notice of practitioners (network externalities). The task that is left over is the production of a publicly trusted assessment of the quality of papers: is the paper correct and interesting enough to warrant the attention of the field (Varian, 1998).

New information technology makes the journal less useful as topic-wise information filter. Researchers can easily browse within a large set of electronically available papers for those articles that fit their personal needs. As a result, the journal title becomes more of a pure quality-indicator. The quality assessment is produced on a paper-by-paper basis: the notion of 'issue' has become meaningless, since articles are published on-line when ready for publication.

Hence, we conclude that electronic publishing challenges the bundling of services as traditionally performed by journals. Granting priority claims and dissemination of papers is being processed by E-print archives. As a result of those developments, the journal title becomes more of a pure quality-indicator.

6.4 The nature of subscriptions

A subscription to a traditional journal transfers the ownership of a journal issue from the publisher to the subscriber. Ownership includes the right to use the content of the journal and the right to lend the journal, but it usually excludes the right to reproduce the content other than for private and educational purposes. The subscriber obtains these rights for an unlimited period of time.

processing about 50 papers a year, offers authors a \$90 discount to the \$275 submission charge if the paper does not need any editing.

New technology offers opportunities to restrict the length of the period of ownership. In particular, if journals are distributed on-line, then readers' access to a set of articles can be limited to a certain period.¹² Basically, the nature of a subscription then shifts from perpetual ownership to temporary access: a subscriber obtains the right of access to an article, an issue, a volume, or a set of volumes for a given period. In addition, the right of access can be broken up in access to the current volume (plus e.g. the previous two volumes) and access to the archive of past volumes (see e.g. Elsevier's ScienceDirect initiative at www.sciencedirect.com/science/page/static/splash_abouthowtosub.html). In the extreme, publishers may limit access to a once-only view of a single article, turning the notion of 'subscription' into 'pay-per-view'.

In traditional publishing, institutional subscribers are entitled to offer the journal for shared use to a limited set of readers, in particular those who visit the library of the institution (see section 3.3). More importantly, traditional technology imposes limits to shared use: scholars who draw heavily upon a journal prefer a personal subscription to circumvent many costly walks to the library. With electronic publishing, these costly limits disappear. Researchers do not need an individual subscription if they have access to the electronic library of their university. Also, a library will not subscribe to a journal if it has electronic access via a subscription held by another university library. Clearly, in order to limit shared use of electronic journals, publishers have to incorporate new legal and technological constraints in subscription conditions.

In sum, new technology may restrict the nature of a subscription from perpetual ownership to rights of access. On the other hand, without further legal and technological conditions, traditional restrictions on shared use - which used to link a subscription to a specified group of potential readers - may disappear.

6.5 Adding services to content

In electronic publishing, there are new opportunities to bundle journal content with other services. *ChemWeb*, initiated by Elsevier, is a good example, see www.chemweb.com. It bundles access to a set of journals in chemistry with a job market for chemists, a shopping mall of books and software, advertisements for e.g. laboratory equipment, and so on. *ChemWeb* is an example of a meeting place for researchers in a field of science

¹² Hence, a reader has to pay for access to an article, even if he has already paid for access to that article at some point back in time. Clearly, in order to induce payment for continuous access, the terms of subscription must preclude systematic downloading of papers for future use.

with access to relevant journals as part of the service. Another example is the site of the Association for Computing Machinery, see www.acm.org.

6.6 Conclusions

New information and communication technologies change several aspects of academic publishing. First, marginal costs decline. However, as marginal costs are only a small part of total costs and fixed costs are not expected to decrease, average costs may not be reduced substantially. Second, different functions of scientific journals are no longer performed by one channel. E-print archives process priority claims and dissemination of papers (including browsing services), the 'traditional' journal becomes more of a pure quality-indicator with the title as a carrier of reputation. Third, new technology enables publishers to sell access to rather than ownership of scientific journals, implying a change in the concept of a subscription. Fourth, journal content can be combined with additional services like job markets, shops, etc. In the next chapter, we discuss how academic publishers deal with those technological changes which provide challenges but also possible threats to their position.

7. New business strategies of publishers

7.1 Introduction

New technology changes several aspects of academic publishing, as we discussed in chapter 6. Consequently, publishers reconsider their strategies, reshaping products and prices in a way that serves their interests best. This chapter explores these new strategies, i.e. strategies additional to the traditional ones identified in chapter 5. We discuss strategies of incumbent players aimed at preserving or improving their market position (section 7.2) and entrants' strategies challenging incumbents' power (section 7.3). The discussion is not restricted to those strategies that can be observed in the market today; we also discuss strategies that are available but not (yet) implemented, and strategies that publishers may pursue in the near future. Section 7.4 summarizes the discussion.

7.2 Incumbents' new business strategies

In this section we discuss new business strategies of incumbent players. First, we study the strategy of 'tying' (selling subscriptions to a portfolio of journals). Then, we move on to new strategies to create mass. Enhanced opportunities for price discrimination are discussed next, including the increased countervailing opportunities to neutralize price discrimination. Superior information about demand and new standards of publishing may further strengthen incumbent publishers' position. Finally, we reformulate many of these new strategies as strategies that raise entry barriers.

(i) Tying journals

Currently, publishers strongly encourage libraries to subscribe to a portfolio of electronic journals, rather than to hold a portfolio of subscriptions. This strategy is referred to as tying, bundling or packaging of products. The portfolio often entails a publisher's complete set of journals, including journals the library did not yet subscribe to. The typical contract that we observe in the market applies for three years. It sets the content fee equal to the previous year costs of the subscription holdings of the library, plus a (relatively low) charge for access to previously non-subscribed journals and a charge for the convenience of electronic access. Also, an upper bound to price increases during the contract period is specified.¹³

¹³ See e.g. Hunter (1997) and Prior (1999). See also an announcement of Kluwer at <http://www.wolters-kluwer.com/wwwsite/ir/kluwer-online.ppt>, and the conditions of Elsevier's

For what reason do publishers offer portfolios? Getz (1997) argues that the price elasticity for a portfolio of journals is smaller than the price elasticity for an individual journal, let alone for a pay-per-view journal. Subscription to a portfolio deprives libraries' ultimate action to curb publishers' market power: cancellation.¹⁴ Although libraries can offer substitutes for cancelled journal subscriptions, for example through interlibrary loans, it is difficult to compensate for the inconvenience if a subscription to a large set of journals, that includes top-ranked journals, were to be cancelled. Indeed, publishers may integrate high-elasticity top-journals with low-elasticity journals in order to leverage market power with respect to the former journals to the latter ones (Tirole, 1988:172).

Interestingly, tying may even induce exit or deter entry in the market for low-elasticity journals. A publisher who considers introduction of a new journal that will compete with the incumbent's low-ranked journals, has to price the journal very attractively, since libraries are very keen to purchase the incumbent's bundle because of its must-have journals. If the price the entrant can charge cannot make up for fixed costs, entry will be deterred (Whinston, 1990).

This mechanism of entry deterrence is of interest, since the prices of incumbent journals seem to deviate from the costs of publishing the journal electronically (see section 6.2). In order to fight potential electronic entrants that are attracted to the rents on low-ranked journals, incumbent publishers may have chosen to tie their low-ranked journals to their must-haves.

Still, the question arises why most publishers did not bundle their paper-based journals in the pre-electronic era (see for some exceptions section 5.2.2). In fact, traditional publishers did accommodate extensive entry. One explanation could be that the long-run predatory effects make tying profitable, even though tying is still not profitable in the short run. Another explanation might be that in traditional publishing the entrant was typically a journal rather than a publisher, and that entry therefore should be seen as product differentiation in stead of competition.

ScienceDirect service at www.sciencedirect.com/science/page/static/splash_abouthowtosub.html.

¹⁴ Hunter, senior vice president of Elsevier Science, clearly recognizes this absolute source of bargaining power from the consumer side of the market (Hunter, 1997).

(ii) Creating mass

Network effects are even more abundant in electronic publishing than in traditional publishing (see section 2.3). Extensive cross-reference links between articles in different journals enlarge the value of the set of journals, benefiting publishers with many related titles in their portfolio. Recently, twelve publishers, commercial and non-commercial have announced that they will provide such a reference-service (see <http://www.wolters-kluwer.com/pressreleases/991116.html>). Improved search opportunities further increase the value of a large portfolio.

Moreover, some large commercial publishers start to favour contracts with consortia of libraries rather than with individual libraries (see e.g. Prior, 1999). In particular, these consortia include libraries that traditionally did not subscribe to scientific journals, e.g. schools for higher vocational education.¹⁵ In this way, publishers extend the consumer base and reduce break-even prices, even though these new consumers clearly pay far lower rates than the traditional ones. As a consequence, barriers to entry become higher, since potential entrants lack such an installed consumer base. Also, publishers further counter the threat of cancellation of individual journal titles, since there will always be at least one consortium member that insists on access to the journal. Hence, this strategy could also be interpreted as an attempt to leverage market power with respect to a specific library to all members of the consortium.

(iii) New opportunities for price discrimination

Traditional publishers of scientific journals do not have much information about demand. They do know the number of individual and institutional subscriptions, and they probably have an educated guess about the number of students and researchers that have access to the journal through a specific library. But a publisher does not know the number of students and researchers at a given university that are working in the field served by a journal, nor does he know the number of times the journal has effectively been consulted or the number of consults that have been fruitful to those readers. The intricate process within universities that leads to a decision about an institutional subscription further blurs the revelation of the true valuation derived from the subscription.

¹⁵ Examples include OhioLINK, <http://www.ohiolink.edu>, the consortium of all college and university libraries in the state of Ohio, and the UK National Site Licensing Initiative, <http://www.nesli.ac.uk>, the consortium of UK institutes for higher education.

Many information asymmetries between publisher and readers will disappear in the digital era. When a consumer logs on to a publisher's site to view and download a paper, the publisher learns the IP-number of the user's computer, he learns the type, subject and quality of the papers uploaded to that computer, and so on. This information allows for increased price discrimination:¹⁶

- Publishers may implement extended third degree price discrimination based on the information an IP-number reveals: different subscription fees for graduate students, undergraduate, and researchers; different fees for researchers familiar with the journal and for new consumers; different fees for researchers already publishing in the field and those who do not; different subscription fees for downloads to computers in the library and those to the individual's desktop.
- Publishers may charge self-selecting prices, i.e. second degree price discrimination. For example, downloads to a library terminal may be priced according to use (price per download) or, even more advanced, according to access and use (a fee for access and a fee per download). Consequently, libraries that derive a large value from a journal will exhibit more downloads and will pay more. According to Kluwer, this pricing model is becoming more popular, see www.wolters-kluwer.com/wwwsite/ir/kluwer-online.ppt.
- Third, publishers may learn the willingness to pay of each user. This enables perfect price discrimination, i.e. personal prices that transfer any consumer surplus to the publisher. Several publishers use the number of copies a library subscribed to in the paper-based era as an indicator for willingness to pay in the digital era, since they set the price of the portfolio of electronic versions of traditional journals equal to the total value of subscriptions to traditional journals (see the discussion on tying above, and e.g. Getz, 1997 and Odlyzko, 1999). Moreover, a switch from posted subscription fees to negotiable prices could be interpreted as an adoption of perfect price discrimination. Such a swap is expected by Elsevier (Hunter, 1997), among others.

It is important to note that the new nature of a subscription - a right of access instead of ownership, see section 6.4 - is consistent with these types of price discrimination. Indeed, publishers need to record readers' behaviour, hence consumers must be invited to visit publisher's database rather than a cd-rom at the library. Furthermore, the de-bundling of ownership into limited-period access to current and archived (sets of) articles and journals brings forward flexibility in the pricing system, which is needed for price discrimination.

¹⁶ See Tirole (1988) for an overview of the theory of price discrimination.

The empirical evidence does not yet suggest that publishers implement price discrimination in the full-fledged way discussed above. On the contrary, publishers tend to favour a contract that fixes a combined price for access to a large portfolio of journal and a large consortium of libraries. This can be explained, however, by the fact that only very recently publishers started to learn about demand via electronic delivery of journal content. Clearly, publishers have to learn about demand before they can implement extensive price discrimination.

Summing up, the argument here is that new technology drains away consumers' opportunities to hide their willingness to pay, and accordingly invites publishers to increase their surplus through price discrimination. This hurts incumbent consumers with a high willingness-to-pay, since part of the increase of the producer surplus is at the expense of the consumer surplus. But it benefits consumers with a low willingness-to-pay who are not served in the absence of price discrimination, since the other part of the increase is at the expense of the deadweight loss.

(iv) Tighter controls to secure price discrimination

Price discrimination is feasible only if publishers control redistribution of information by users. In traditional publishing, arbitrage between libraries and individuals is difficult for reasons dealt with in section 5.3. In electronic publishing, on the other hand, arbitrage is extremely simple and cheap: just download a journal issue and redistribute it via E-mail. This deludes any attempt to price discrimination in principal.

However, arbitrage may be restricted due to technical and legal constraints. Technically, publishers may offer access to journals from their website and may make articles downloadable only by means of a hardware-innate password.¹⁷ Legally, publishers may forbid customers to redistribute the product. Obviously, copyright law gives publishers such rights, but it is unclear to what extent these rights will be enforceable. It seems to be reasonable to postulate that libraries will obey to restrictions on redistribution, since non-compliance to access restrictions is readily verified. Individual users, however, may

¹⁷ Interestingly, the music industry is dealing with the same type of issues, and quite successfully, at least from a technical point of view. The Secure Digital Music Initiative, www.sdmi.org, a global coalition of music and computer firms, has developed a technological standard for players of on-line music files that implements restrictions on copying and uploading to the Internet. Intertrust, www.intertrust.com, has developed software that wraps content in a virtual container that can be opened for examination (provided your computer has the right key) but not for copying. Not surprisingly - at least not in view of our analysis on arbitrage and price discrimination - Intertrust also offers a technology to set tailored prices (The Economist, 17-07-99).

easily forward downloaded articles to friends, students, professors and colleagues without being traced.

It has been observed that publishers enforce tighter controls over copyright, dissemination, and pricing than they used to do in the traditional world (Bachrach et al., 1998). A clear example is the restrictions on interlibrary loans imposed by electronic publishers in order to prevent that interlibrary loans become as attractive compared to an institutional subscription as new technology could facilitate. In particular, publishers require that copies are not to be lent in electronic form: the lender has to print the article on demand and send it to the borrower by regular mail (Odlyzko, 1999).

In summary, whereas in the traditional era transfer costs limited the scope of arbitrage, in the digital period arbitrage must be curbed through technology-driven copyright enforcement and legal action.

(iv) Building up informational advantages as a barrier to entry

Incumbent publishers may also take a competitive advantage of the increased opportunities to learn about demand. Superior information about consumers enables them to deliver tailor-made products (e.g. sets of journals for libraries and personalized journals for researchers) with associated pricing schemes. Potential entrants lack the information to serve the market that well. Hence, they have to stick to relatively homogeneous products at soft pricing schemes in first instance. In sum, informational advantages of incumbent publishers may act as a barrier to entry.¹⁸

(v) Standard setting

New publishing technologies ask for new standards. Currently, most online journals simply adopt standards from traditional publishing (e.g. layout standard) and from document downloading (e.g. Adobe's Portable Document Format). Real innovations in online publishing demand new standards. New standards have to be developed regarding the way an electronic scientific paper should look (see section 6.2) and the way it should be refereed. Standards are needed for attaching key words to papers to make them searchable, and for linking articles to related articles published in different 'journals' (whatever 'journal' means in the new setting) by different publishers.

There are both incentives and disincentives to develop new standards swiftly. On the one hand, the market offers incentives to set standards as quickly as possible. The publisher

¹⁸ See Dell'Araccia et al. (1999) for a similar reasoning on the banking industry.

who succeeds to capture a critical mass with a proprietary standard (e.g. software to establish reference-links between papers) obtains a competitive advantage since he controls access to his consumer base.

On the other hand, there are disincentives to develop standards rapidly. Publishers may want to wait until the winning standard has emerged, to avoid investments in an unsuccessful standard. This will be the case if property rights on standards are difficult to establish (e.g. standards on the design of an electronically published paper) and if the value of the technological lead derived from development of the winning standard is relatively small. Moreover, incumbent publishers may hesitate to invest in standards for new markets that cannibalize on their market power in old markets.

Schaffner, cited in Odlyzko (1995), argues that penetration of electronic publishing is hindered by the lack of standards for presenting scholarly information online. Journals that really use the available features for electronic presentation of research are not yet available. On the other hand, publishers are quite active in developing standards for access to a portfolio of journals, including reference links and advanced search facilities. As mentioned above, a large group of established profit and non-profit publishers have announced to adopt a common standard for reference-linking pioneered by two of them. This standard is said to be open to other publishers, suggesting that more mass needs to be created. Up to now, reference links were made available only within the portfolio of a given publisher.

Conclusion: the relevance of switching costs

Since mass is important when selling scientific journals, it is as important to keep serving the installed consumer base. Switching costs - the costs and inconvenience imposed on consumers who switch to a competing journal- establish barriers to entry. Indeed, an entrant has to incur the switching costs of the whole set of consumers he plans to attract (Shapiro and Varian, 1999). If these total switching costs are large, so are the barriers to entry.¹⁹

Many strategies that have been discussed above can be interpreted as strategies that raise switching costs and therefore barriers to entry. We organize those strategies in five items:

¹⁹ Observe that the switching costs per user are strategically unimportant (these costs may even be surmountable). What matters is the total switching costs of the consumer base the entrant needs to attract in order to operate a commercially viable journal.

- *Informational advantage.* The informational advantage incumbent publishers enjoy through analysis of downloads from electronic journals raises the costs of new entry, since the entrant has to pay in some way in order to match the incumbent's targeted product-price portfolio.
- *Contractual lock-in.* Libraries that have subscribed to on-line package deals will find it hard to switch back to the old set of paper-based journals in case future license conditions become unfavourable, because users get accustomed to the enhanced service of access to all journals in the publisher's portfolio. Obviously, a library that has entered into a long-term portfolio contract with a publisher, faces huge switching costs (compensatory damages) when it considers cancellation of some of the titles. A similar reasoning applies to consortium agreements. Such a contractual lock-in also offers the publisher the opportunity to adjust non-contracted aspects of the service to his advantage, e.g. quality and quantity of the journals, quality of the database software, speed of downloading, price (up to the contracted price increase guarantee), and innovation in the nature of the journal and the nature of distribution.
- *Habituation.* Readers invest in learning how to handle the database software the publisher supplies, and they also get familiar with the standards of presentation of the publisher's journals. Switching to another platform is costly, since new commands, routines and practices must be learned.
- *Specific investments.* Substantial durable investments in software, computers and networks have to be made in order to deliver electronic journals to students and researchers. The larger the share of these costs passed on to the library, the harder a switch back to traditional journals, which require a different infrastructure. Also, the more specific the library's investments with respect to a publisher or a platform of publishers, the harder a switch to a competitor or a coalition of competitors.
- *The archive locks in.* Publishers who offer preferential access to the archive to subscribers to the current volume raise the costs of switching to entrants that, as yet, have a nearly empty archive.

Since the ratio of fixed costs to marginal costs is larger for electronic journals than for traditional journals, or more importantly, since the ratio of fixed costs to marginal costs is larger for a portfolio of electronic journals than for a portfolio of traditional journals, a large consumer base is necessary to recover costs. Consequently, higher switching costs have great worth in protecting incumbent publishers' installed consumer base.

7.3 Entrants' new business strategies

New publishers in the market for electronic journals typically employ some business strategies that are different from those played by entrants in traditional journal publishing.

(i) *Debundling of services*

Many new electronic journals deliver a subset of the services provided by traditional (electronic) journals. In particular, new online-only journals tend to focus on dissemination of knowledge and production of claims on priority of discovery, while they do not provide widely trusted quality signals (see section 6.3). In a sense, this type of online journals performs the current tasks of Working Papers, though in a far more efficient way. Obviously, the non-performance regarding refereeing makes this type of online journals imperfect substitutes to refereed journals.

Nevertheless, these type of online journals can steal away part of the business of traditional journals, i.e. those consumers that rely on other mechanisms of quality control, e.g. reputation of the authors, self-assessment of quality, or informal quality signals by trusted colleagues, and soft quality-indicators based on e.g. number of downloads (see section 6.2). Interestingly, since many new online journals do not claim copyrights on published papers, scholars can resubmit their work to traditional journals to obtain a traditional signal of quality.

Searchable E-print archives like Ginsparg's successful archive in high-energy physics and WoPEc's archive of working papers in economics (<http://netec.wustl.edu/WoPEc.html>) are clear examples of this business strategy of debundling. The working paper journals of the Economics Research Network published by Social Science Research Network (<http://www.ssrn.com/ern/index.html>) target at differentiated fields in economics, and therefore closely mimic traditional journals.

The scope for de-bundling may differ between fields. The *European Molecular Biology Organization* (EMBO), for example, argues that biology journals always need some assessment of scientific soundness, since the interpretation of biological research is relatively subjective and controversial (Nature, 08-07-1999).

(ii) *Creating mass*

Publishers of new online-journals need to create mass just as incumbent publishers. Several new strategies can be observed. A few online journals charge the author rather than the reader for publication, e.g. the *MRS Internet Journal of Nitride Semiconductor*

Research, <http://nsr.mij.mrs.org>. With subscription prices equal to zero, the maximum mass of readers can be attracted. Other journals have received government grants to pay for set-up costs or have heavily relied upon facilities provided for free by universities including initiators' labour costs. For example, thanks to an NSF grant, the *Journal of Statistics Education* (<http://www.amstat.org/publications/jse/>) was distributed for free for some time, whereupon subscribers had to pay. During the period of free subscription, the journal was able to create an installed base of authors and readers and to build up a reputation.

Also, new journals may take a free ride on the reputation of a top-ranked traditional journal by adding the prefix 'electronic' or 'Internet' to the title of the traditional journal. Furthermore, new journals could target at young scholars, e.g. graduate students and assistant professors. There are several reasons to do so: (1) junior researchers read more than the average scholar with a permanent position; (2) they do not have cold feet to the Internet; (3) they lack a reputation, hence they have limited access to established journals without a double-blind review process; (4) for the same reason, incentives for submission of high quality papers can cheaply be provided for by establishing prizes for 'best paper in the field' (Varian, 1998); (5) an installed base of young authors and readers pays off for a longer period than an installed base of old scholars.

Finally, new online journals that are not-for-profit could try to recruit leading scholars for the editorial board and for the first couple of issues, in particular those scholars with a strong aversion to the traditional practice of for-profit publishing.

7.4 Conclusions

Incumbent publishers are pursuing strategies to preserve and expand their market power. They aim to increase consumers' switching costs, hence raise barriers to entry (e.g. tying journals, using informational advantages relative to entrants). Other strategies are aimed at expanding the publisher's surplus, at the expense of the consumers' surplus but also the deadweight loss (e.g. price discrimination). However, new technology also offers new strategies to entrants to fight incumbent publishers (e.g. competition on subsets of the bundle of services delivered by traditional journals, and creation of mass through alternative pricing schemes and through targeted marketing).

Part III Market performance and policy options

The market for scientific journals does not perform well. This is a logical result of the current setup, which provides incentives to raise barriers to entry and to restrict dissemination of scientific papers. The key observation is that the market for content (input) and the market for scientific journals (output) are connected, and that publishers can transfer market power in the market for content to the market for journal with help of the copyright. We discuss policy options that target at one of the markets. These options are aimed at improving market performance without addressing the key issue of copyrights. We also elaborate upon a policy option that fundamentally redesigns the setup of the market. This option addresses the key issue of copyrights.

8. Market performance

8.1 Introduction

In the previous chapters we have analysed strategies of academic publishers within the context of the current setup of the market and the influence of outside factors. Now that we have identified how actors in the market behave, we go on to assess whether the outcomes of their behaviour are desirable.

It is important to note that we do not attribute a possibly weak performance of the market to ‘misbehaviour’ of players. Instead we link possibly undesirable market outcomes to adverse incentives of actors. In other words: if the transactions between market players produce undesirable outcomes, then there is something wrong in the setup of the market.

8.2 Assessment of market outcomes

The most pressing problem in the current system of scientific publishing is the reduced access to scientific knowledge, caused by high prices for journals and limited library budgets. Reduced access is not only undesirable for reasons of unsatisfied needs - like interested readers which are deprived of *Vogue* magazine- but also, and more importantly, for reasons of external effects of dissemination of scientific knowledge. As stated in the rationale of this study in the first chapter, publication in journals is an important instrument in the advance of knowledge, and advance of scientific knowledge is a driving force behind many technological and non-technological innovations.

Another undesirable market outcome are the failings in the process from submission to actual publication. In several fields of science the refereeing and editing process is slow, depriving journals of topicality. Electronic publishing, as yet, is more like a continuation of traditional publishing using a different dissemination technology. Really innovative applications of new technology in scientific publishing, though existing, only spread very slowly.

However, it is fair to say that it is not all sorrow and misery in scientific publishing. The current system of scientific publishing has been granting priority rights, establishing quality signals and distributing the results of scientific research. Reviewers of the quality of someone’s scientific work - whether they be readers, employers or financiers - rely on publication records as a quality signal. Publishers have performed the useful task of organizing the whole process of refereeing of papers, editorial work, marketing, copying and distributing, etc.

Moreover, as reputation is measured by citation rates, authors have a strong desire to publish in journals that are widely read. Thus the incentive to publish is at least partly in line with dissemination of knowledge. As a result, throughout the world, especially the Western world, researchers and students have easy access to journals reporting advances in science. Since libraries pay for journal subscriptions, this access is provided for free from point of view of the library users.

8.3 The cause of the journal crisis

The weak performance of the market cluster is a logical result of its current set-up. The main reason is that publishers have the copyrights on high-quality papers (their most important input) in hands. Accordingly, they are able to charge monopoly prices, since papers are not substitutes like jars of peanut butter. There are other reasons which contribute to a weak performance (like the relation between libraries as direct consumers and their users as actual consumers of scientific information), but the fundamental problem originates through the connection between the market for journals and the market for papers. We explain this by following the three steps for the identification of market power as presented in CPB (2000).

(i) The pivotal market

The pivotal market, i.e. the market on which performance needs to be analysed, is the market for journals in a discipline, say economics or medicine. At this market, publishers and readers conclude contracts on the conditions for subscription. We choose journals in a discipline because the main consumers, libraries, take complete disciplines into account when deciding upon subscription (McCabe, 1999).

(ii) The relevant market cluster

The pivotal market is connected with the market for papers (content). At this market, authors trade the copyright on papers in exchange for an assessment of quality and the establishment of a priority claim. Subsequently, publishers sell the processed inputs on the pivotal market.

The relevant market cluster encloses the pivotal market and this connected markets. For an assessment of the market for scientific journals, we also have to consider behaviour at the connected market.

(iii) Barriers to entry on the pivotal market

Entry in the market for journals is deterred as soon as a publisher seizes market power in the connected market for papers. Market power in the market for papers is based on reputation. A high reputation enables a publisher to capture some part of the fixed supply of high-quality papers. After all authors do not want anything else than to publish their papers in a prestigious journal. To realise a publication, authors are prepared to transfer their copyrights to publishers. Then the reader has no choice but to accept a high price other than to cancel his subscription, since he cannot choose between substitutes. An entering journal is almost by definition left with lower-quality papers, which threatens to lock it into a low reputation path, unless the market accommodates another top journal. Therefore, an entering journal does not represent a real threat to the existing prestigious journal.

Publishers pursue several strategies in the relevant market cluster to raise entry barriers and exploit market power, see chapter 5 and 7. In particular, publishers charge high prices for access to journals.

8.4 Conclusions

The performance of the market of scientific journals is weak. Access to scientific knowledge is reduced, the publishing process often slow, and existing technological opportunities are not used to their full potential. These market outcomes are a logical result of the current set-up of the market. The connection between the market for papers (inputs) and the market for journals (outputs) makes that publishers owning a prestigious journal are safe behind high barriers to entry.

9. Solving the journal crisis

9.1 Introduction

What policies could improve upon the current performance of the market cluster of scientific publishing? Three types of policy options are available. Section 9.2 explains why copyrights make the difference between fundamental solutions of the problem and less fundamental solutions. We want to make clear upfront that policy-makers have to decide how far they want to go. We only indicate their possibilities, given how far they want to go. If they want to leave the market setup as it is, we first discuss frequently mentioned options aimed at the market for journals (section 9.3). Then we discuss options targeting at the market for papers (section 9.4). If policy makers want to go all the way, though, and redesign the market completely, section 9.5 presents a policy option that can enhance performance.

9.2 The key issue is transfer of copyright

The key issue that separates fundamental solutions from non-fundamental solutions is the transfer of copyright from author to publisher. As owner of the copyright, the publisher is (to a large extent) able to monopolize the distribution of the article. The publishers' business strategies (see chapters 5 and 7) are founded on the copyrights. For example, the strategy of reputation building is profitable since the copyright secures that the benefits of reputation accrue to the publisher that invested in the reputation. In sum, publishers are keen on the copyright, since copyright enables them to recover costs.

Still, the transfer of copyrights does not comply with the social purpose of scientific publishing. Governments fund scientific research (through universities and scientific foundations) with the objective to provide a public good. Hence, research should be widely disseminated. A high price for access to article is contradictory to this objective.

This implies that a fundamental solution of the market, and indeed one that redesigns the market completely, reverses that copyright transfer. Since such a reversion takes quite some steps in order to make it work, most attention in the rest of this study is spent on how to do this.

9.3 Policy options for the market for journals

Sections 9.3 and 9.4 zoom in on policy options that leave the current market set-up intact. Section 9.3 discusses frequently mentioned policy options that aim at the market for journals.

(i) Apply competition law

Some strategies that publishers pursue might be anti-competitive and not in terms with competition law. Our analysis indicates that entry barriers are indeed high, but seem to arise from the institutional set-up rather than from misconduct. Nevertheless, we did not actually check on abuse of market power, since that is the competence of the competition authorities. Since the geographical space of the market cluster of scientific publishing is the world, international co-ordination might be required.

(ii) Bundle libraries' bargaining power

The collective bargaining power of libraries could countervail the growing dominance of publishers. Libraries could form consortia and bargain with publishers about a long-term subscription to large portfolios of journals. Indeed, libraries are pursuing this strategy and publishers seem to accommodate this trend with tying strategies. The type of market competition then shifts from monopolistic competition (a few suppliers of differentiated journals and many customers) to a bargaining style of competition (few suppliers, few customers).

Co-operation among libraries can improve upon market performance: better deals with publishers means better value for money. However, if the threat of cancellation is neutralized through long-term portfolio contracts, then publishers' incentives to provide value for money and, in particular, their incentives to innovate are relatively low-powered. In chapter 7 we discussed how the tying strategy could lead to higher barriers to entry.

(iii) Enlarge libraries' resources

Libraries' resources for journal subscriptions could be increased by increasing the efficiency of their operations or enlarging their budgets. Efficiency gains could be realised through a merger of the electronic operations of several libraries.

Additional resources can be spent on scientific journals that could not be subscribed to earlier. In principle, a larger quantity of scientific papers justifies larger library budgets. However, it is possible that publishers cream off a large part of the increased resources of libraries through higher subscription rates. After all, journals are must-haves and entry of other publishers is difficult. Therefore, this policy option may not be effective.

(iv) Improve scientist's choices

The university could transfer the costs of journal subscriptions to the individual researcher. For example, the library could levy a tax-per-use or a pay-per-view. This will encourage researchers to trade off access to a journal against other expenditures like research assistants or travelling.

This option makes the actual consumers of journals more conscious of the costs of subscriptions and may improve upon decisions whether or not to subscribe to a certain journal.

9.4 Policy options for the market for papers

We also identify a number of policy options that focus on the market for scientific papers.

(i) Change the measurement of researchers' output

The 'publish or perish' culture provides strong incentives to maximize the quantity of output. Scholars wish to and do actually publish every single finding, since every publication counts. To shift the culture of publishing towards 'publish quality or perish', universities and funding organization could measure researchers' productivity with the quality of a limited number of papers written in the last few years. There is already a tendency towards this in various countries (e.g. the Netherlands).

This option will decrease the wave of publications. Libraries might save money otherwise spent on low-quality journals.

(ii) Provide alternative publication outlets

An important development is the accessibility of (working) papers on the Web. Scientists who want to follow the latest fashion, are not going to wait three years before it is published somewhere. Therefore refereed working papers, such as NBER, serves a purpose that journals were supposed to serve. Yet, the crucial quality signal is often lacking. Still, the development indicates that the community of scientists is not happy with the quality of service provided by the journals.

As an alternative, it is sometimes forwarded that the government could step in and use public funds to recover the fixed costs of publishing. Journals could be priced at marginal costs. This promotes dissemination of knowledge. However, there are reasons not to believe that the governments (or publicly funded non-profit organisations) are

better publishers than private publishers. For example, the government has relatively weak incentives to economize on production costs, and, moreover, the government tend to have a weak feeling with market developments. Therefore, government failure does not make this option attractive.

(iii) Press authors not to submit to 'too expensive' journals

Frequently, academics are asked not to submit their papers to 'too expensive' journals. This type of policy proposal is likely to be ineffective. It cannot be expected from authors that they choose journals on other criteria than reputation.

Conclusions

In sum, some of the policies aimed at the market for journals and papers may actually improve market performance. Most promising are the increased bargaining power by libraries and the ICT developments making accessibility of papers much better. The options do not aim at the fundamental problems: reduced access to scientific information and high barriers to entry resulting in weak competition and slow innovation. This will be discussed in the next section.

9.5 A policy option for the market cluster of scientific publishing

We now extensively explore a policy option that targets at the market cluster as a whole. Since we have concluded that the journal crisis has to be attributed to high entry barriers to the market cluster (section 8.3), it is interesting to address the incentives to raise entry barriers that high.

Several elements of the policy proposal can also be found in other contributions to the literature on academic publishing, see, e.g., ARL et al. (1998), Bachrach et al. (1998), Chodorow (1998), Rowe (1993), Smith (1999), and Walker (1998). This policy option, however, is an integrated redesign for the market cluster as a whole, firmed on micro-economic theory.

9.5.1 The basic idea of the proposal and its benefits

As discussed in section 9.1, copyright transfers from authors to publishers lie at the heart of the problems. Where do the copyrights come from? It is the researcher who transfers his copyright to the publishers. Authors are prepared to transfer their copyrights for two reasons. First, authors obtain a quality assessment in return, which enables them to communicate their research effort to employers and other funding organizations. Second, authors are unable and unwilling to exploit the copyrights themselves. Their

reward system (positions, reputation, research money) is independent of the market value of the articles. Consequently, authors do not devote scarce resources to have their articles assessed. In other words, the authors' incentives to take the burden put on system of scientific publishing into account are weak.

The basic idea is to have authors pay publishers with money in stead of copyrights. This idea has a number of important benefits:

- *Enhanced dissemination of research.* Since publishers do not obtain the copyrights, they cannot price journals above marginal costs. Hence, subscription rates do not prohibit maximal dissemination anymore. This in compliance with the idea that scientific research is meant to be a public good, i.e. with the very reason of government support for scientific research.
- *Competition and innovation in the market for quality assessments.* Since publishers have to charge authors to recover the fixed costs of producing the original, authors have an incentive to economize on their submission behaviour. There is a natural limit to the burden they put on the assessment process. Moreover, publishers have a strong incentive to compete for authors' orders to assess their articles and to provide editorial advice. This spurs competition and innovation.
- *Competition and innovation in distribution.* Without copyrights, the barriers to entry in the market for journals are relatively low. Firms that provide more value for money when composing journals and bringing them to the readers' desktops will win business at the expense of underperformers. Hence, the incentives to innovate and the incentives to rationalize the distribution process are enhanced.

In the current setting of scientific publishing copyrights are the glue that connects the markets for journals with the market for papers. When authors pay publishers with money in stead of copyrights, this connection dissolves. Hence, in order to assess the performance of the system of scientific publishing, we have to study potential entry barriers to each market separately rather than the entry barriers to the market cluster. The second and third benefit above follow from the observation that the entry barriers to the market for quality assessment and the market for distribution are relatively low. Consequently, these markets have the potential to perform relatively well.

When the market for papers and the market for journals are disconnected, it is not productive to keep using the notion '*publisher*' to identify firms delivering services to authors and readers. In the sequel, we label firms that organize the referee process and provide editorial advice '*assessment firms*', and we call firms that select and distribute papers to readers' desktops '*virtual libraries*'. Both types of firms can be for-profit or not-for-profit.

9.5.2 Implementing the basic idea

Some intervention is needed. In the current setting authors are prepared to transfer their copyrights and publishers are prepared to accept them in exchange for the quality assessment and the editorial services they provide. At this point, authors' and publishers' behaviour will not change spontaneously, simply because they do not face the corresponding incentives. The proposal therefore requires a policy measure that puts the copyrights on (publicly financed) scientific research from the authors in the hands of an independent body, in particular independent from government, universities, science foundations and private firms. This organization is committed just to hold the copyright. In particular, the organization has no influence whatsoever on the content of the articles, and it has no right to exploit the copyright in whatever way.

Since authors have to pay with money in stead of copyrights, they need funding. Therefore, the funding agencies (governments, universities, scientific foundations) have to provide not only money for research, but also money to pay assessment firms for the quality assessment and editorial advice.

Readers, on the other hand, do not have to pay for access to content anymore. Refereed research articles are available for free. Still, readers might be willing to pay for additional services. For example, virtual library firms could compose a selection of refereed articles that match the reader's specific research interests, and bring this selection to the reader's desktop.

9.5.3 Accounting for the opportunities and threats of new information technology

Journals distribute article not only to current readers but also to future readers. In other words, journals also perform the function of an archive. Once published, articles are saved for future generations. For paper-based journals this argument does hold, since copies have been stored in many libraries around the world. One may doubt, however, whether the same holds true for electronic journals. Indeed, a single copy of an article posted on the Web could serve the whole world. But a small moment of negligence or simply bad luck could destroy the file.

Our proposal accounts for this issue of archiving electronic papers in the following way. We propose to set up a number of freely accessible electronic archive around the world. These archives act as portals of the ocean of scientific papers, i.e. they coordinate the interaction between supply of information (authors) and demand (readers). The mirror sites ensure the safety of the archive. Since future generation cannot express their willingness to pay for the service of archiving scientific papers, a different way to fund

the archives has to be found. An option is to have them procured by governments, by national science foundations, by learned societies or by supranational (research) institutions. The archive administration is an independent body that has no right whatsoever to limit reader's access to the archive, to change or delete stored articles, or to refuse storage of articles. Archive administration receive funding from the government.

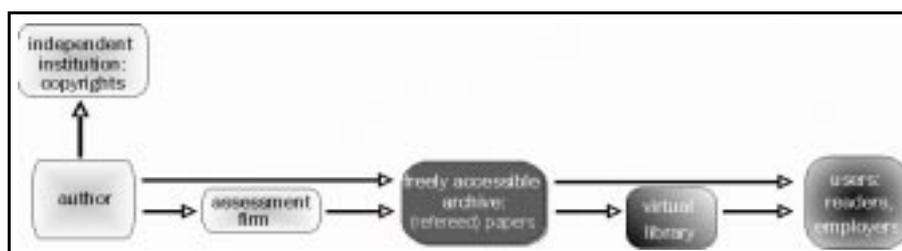
An additional and important benefit of a central archive of refereed articles is that it facilitates an efficient process of dissemination. Authors know where to post their papers (including the result of the quality assessment) in order to attract as many eyes as possible. Readers know where to search for the papers they are looking for. Firms that assist readers with the selection of relevant articles know where to deploy their search engines.

Furthermore, such an archive could automatically attach a publicly trusted electronic data stamp to every article that has been posted. This takes care of the task of production of claims of priority of discovery.

9.5.4 The details of the redesign

We elaborate on our proposal and fill in the details. Let us follow the production, assessment, archiving and dissemination of scientific papers in the proposed setting (see figure 9.1).

Figure 9.1 A redesign of the system of scientific publishing



- *Production of content.* The government directly or indirectly endows researchers with funds for scientific research, for the production of quality assessments of the research, and for editorial advice. Research contracts have the provision that the copyrights on the scientific works produced under the contract will be transferred to the independent body that governs scientific copyrights. In the same way, it is contracted that the copyrights on the quality assessment produced under the contract will be handed over to the copyright entity.

- *Purchase of quality assessments.* Authors can buy quality assessments from assessment firms. A quality assessment is an assessment of the quality of the work as such, and can be produced as soon as a report has been produced. The assessment may include editorial advice how to improve the quality of the paper, both in terms of content and expression. Authors pay for these services. Authors may rework their paper and resubmit it for a further assessment.
- *Production of quality assessments.* Assessment firms hire editors and peer researchers to produce a quality signal, to give editorial advice, and so on. The firms may compensate referees and editors for their efforts financially. The referee process could be single blind, double blind, or completely open.
- *Storage of content and quality assessments.* Author upload their article to the archive with the quality assessment attached. The quality assessment includes the name of the firm that organized the assessment. Hence, this firm attaches its reputation to the assessment report.
- *Production of claims of priority of discovery.* The electronic archive automatically attaches an electronic date stamp to every stored work.
- *Production and distribution of copies.* Readers may simply download copies of work (and the associated quality signals) of their interest from the archive. If they wish, they may buy customized additional services from virtual library firms. Such a firm could select from the archive those works that match the reader's demand with respect to subject of the research, quality, time of production, name of the author, author's affiliation, and so on. Researchers working on public funds can use part of these funds to purchase these additional services.
- *Rewarding researchers.* The government directly or indirectly through universities and science foundations rewards researchers for high-quality high-impact research. It could allocate new research funds, larger funds, tenure, promotion, and so on, to those researcher that have shown a good performance. The government may want to rely not only on the quality assessments of the author's research, but also on its impact. This could be measured through citations. The government or its subsidiaries could rely on specialized firms for the production of citation rates.

9.5.5 Problems of transition

In the transition from the traditional system to the new market cluster, some issues deserve attention.

- *Publishing standards.* There is a need for a standard for electronic publishing of scientific research. Accessibility requires a common electronic format to enable search and selection.
- *Standards of quality measures.* There is need for standard measures of quality. In order to facilitate search and selection, these standards have to be codified. One may opt for a one-dimensional standard of grades, e.g. A-B-C-D. Alternatively, one may look for a multi-dimensional standard, providing qualifications on multiple aspects of quality, possibly differentiated along sub-specialties of the field. For example, an applied research paper may be assessed as very important for readers active in the field of application, and simultaneously as a paper of intermediate quality for scholars who work on the theory that has been applied. Also, a paper could simultaneously be qualified as excellent in terms of ideas and mediocre with respect to the way the ideas are expressed.
- *Assessment firms may be 'bribed'.* Assessment firms may be 'bribed' by authors to deliver high-quality signals to low-quality research. The market does not punish this behaviour immediately. Instead, it has to learn that the quality signal produced by assessment firm X cannot be relied upon anymore. Over time, the assessment firm will lose its reputation, and consequently lose its business.
- *Fake quality assessments.* Authors may attach fake assessments to their articles. This problem will immediately be solved by the assessment firms, that, in fear of losing their reputation, will continuously check whether authors take a free ride on their reputation. In case of fraud, the assessment firm can notify the scientific community, including the archive administrator.
- *Coordination between governments.* There might be a problem of co-ordination between governments. If a small country requires its researchers not to transfer copyrights to publishers, the traditional system will probably not be overthrown. Indeed, for most readers this situation will be equivalent with just again another place to look for relevant work. It seems therefore necessary that a country or a set of countries that produce large amount of high quality research (e.g. the US and the EU) adopt the new system. Other countries will join.
- *Government failure.* This standard objection against intervention to cure market failure does not apply to the intervention required in this proposal. The incorporation of a copyright provision in research contracts is a straightforward action not open for muddling. The electronic archive is a relatively standard product of information technology; its procurement is therefore transparent. The archive administration may apply yardstick competition to provide incentives to her archive contractor (see Tirole, 1988).

In sum, there are important issues that have to be settled in order to make the proposed redesign successful. Still, these potential problems do not fundamentally trouble its performance.

9.5.6 New roles for incumbent players

Who will be the assessors and distributors in the redesigned market? Here, there are new roles to be played by incumbents.

Learned societies and commercial and non-commercial publishers have valuable experience and reputation with respect to refereeing and editing. They are likely to perform the role of assessment firm. They could specialize in the assessment of papers on a narrowly defined subject with a limited quality range. In this case, the assessment firm closely mimics the current function of a journal title. Alternatively, they could decide to serve many disciplines and many levels of quality. The reputation of the incumbent publishers, societies and journals facilitates a flying start of the redesigned market for quality assessments.

Libraries and publishers are experienced in the provision of structure in the ocean of scientific works and in the selection of works relevant for a specific group of consumers. They are likely to transform themselves into virtual libraries. For technical assistance, they may link up with established Internet search firms. Clearly, a lot of outsourcing, consolidation and restructuring needs to be done to make these incumbents fit for this new role.

9.5.7 Summing up

When authors pay publishers with money in stead of copyrights, the market cluster of scientific publishing separates in disconnected markets: a market for quality assessments paid for by authors, and a market for additional distribution services paid for by readers. Both markets have relatively low barriers to entry and may therefore be expected to perform relatively well. Another major advantage of the redesigned market is that articles are available to anyone for free. Hence, dissemination is as widely as possible. Finally, the proposal ensures that future generations will have access to the complete current stock of knowledge, also when this stock is published and archived electronically.

9.6 Conclusions

We identified a number of policy options that could address the journal crisis. The first set of options was aimed at the market for journals, the second set at the market for

papers. Though some of these options improve upon the current performance, they do not address the fundamental problems in the market: limited dissemination of scientific research as a result of high barriers to entry. This was not to be expected either, since these policy options aimed at submarkets in the cluster of scientific publishing, rather than the whole market cluster which is the *relevant* market cluster (section 8.2).

Therefore, we explored an option to redesign the whole market cluster of scientific publishing. This option addresses the heart of the problem: the transfer of copyright from the author to the publisher. The option requires that copyrights are transferred to an independent body that is committed not to exploit them. Consequently, authors will have to pay with money in stead of copyrights for service they enjoy. A system of scientific publishing evolves with relatively low barriers to entry and wide dissemination of scientific papers.

10. Summary and conclusions

10.1 Setting the stage

Scientific journals play an important role in the functioning of the system of scientific research. Journals disseminate research results combined with a quality signal to the benefit of readers, and they establish a claim of priority of discovery combined with the same quality signal to the benefit of researchers and their employers. (*chapter 2*)

Journals are information goods, hence the fixed costs of production of the original are large while the marginal costs of production and distribution of copies are small. Since the assessment of quality is a major function of journals, to the benefit of readers and authors alike, reputation is the most important asset of a journal. The reputation of a journal signals the quality of the papers it publishes to the readers. It enables them to judge the value of papers. Moreover, it helps the authors to show that they have offered value for research money. (*chapter 2*)

Scientific publishers co-ordinate the production of scientific journals. In exchange for the copyright, the publisher attaches a quality signal (the reputation of the journal) to the author's work. The quality assessment is produced by editors and referees, who also share in the reputation of the journal. Finally, the publisher disseminates the journal among libraries and individual readers in exchange for a subscription fee. Since the publisher controls the access to the journal through the copyrights, subscription fees can be set above marginal costs, which is necessary to recover fixed costs. (*chapter 3*)

The setting of scientific publishing has changed in the past decades. The growth and specialisation of academia and the 'publish or perish' culture has led to an increased demand for journal titles and journal space, by authors and readers alike. The library budgets for scientific journals, however, have not followed this trend. (*chapter 4*)

More recently, new information and communication technologies have changed the scene. The fixed costs of production of originals have increased relative to the marginal costs of production and distribution of copies, the traditional bundling of tasks has been challenged by new electronic publication outlets, and the idea that a subscription implies perpetual ownership of the journal volume has faced competition from the concept of a subscription as a temporary right of access. (*chapter 6*)

Within this setting, publishers devise business strategies in order to appropriate a share of the economic surplus of academic publishing. When defining a journal's position, publishers bypass the entry barriers to the markets of well-established incumbent journals by targeting their journal at a (preferably new and growing) sub-specialty

previously served by general-purpose journals. They increase circulation through sampling, linking up with learned societies, and charging favourable prices for the first volumes of the journal. They foster reputation by appointing a highly respected editorial board and including high-quality papers written by well-known scholars in the first issues. Also, they increase profits by charging different subscription prices for libraries and individuals, and manipulating prices of their portfolio of journals. (*chapter 5*)

New information and communication technologies enlarge the set of business strategies available to publishers. Incumbent publishers can raise barriers to entry by tying their journals into portfolios, by setting standards for electronic publishing, and by using superior information about readers' individual demand. Furthermore, they can use this latter information for extensive price discrimination. Entrants can apply, also in addition to their traditional strategies, digital technologies to compete on a subset of the tasks traditionally performed by journals. (*chapter 7*)

10.2 Solving the journal crisis

The journal crisis can be attributed to the high barriers to entry to the market cluster that constitutes the system of academic publishing. Barriers to entry are necessary and desirable in the current setting, since publishers have to recover fixed costs. But high entry barriers invite publishers to raise subscription fees at the expense of libraries' and readers' consumer surplus. Consumers with a willingness-to-pay below the subscription fee but above the marginal costs of production and distribution of a copy are excluded from access to the journal. Moreover, the high entry barriers reduce the incentives to innovate in distribution and publishing technology and to improve upon the performance of the referee process. (*chapter 8*)

Also, authors are exposed to perverse incentives: the 'publish or perish' culture invites them to submit many papers, still they do not internalize the burden on the working load of referees and editors and on the libraries' funds. On the other side of the market, the library system blurs the true revelation of readers' demand. (*chapter 8*)

How to tackle the crisis? Several policy options are open for discussion. Policy-makers have to decide how far they want to go. We only indicated their possibilities given how far they want to go. If they want to leave the market set-up as it is, we discussed frequently mentioned options aimed at the market for journals (section 9.3). Then we discussed options targeting at the market for papers (section 9.4). Improvements are possible mainly by increasing the bargaining power of the libraries and using ICT possibilities to increase speed of accessibility of papers.

If policy makers want to go all the way, though, and redesign the market completely, section 9.5 presented a policy option that can enhance performance. We make a

distinction between the market for journals where publishers conclude contracts with subscribers and the market for papers where authors trade papers with publishers.

Some of these policy options improve upon market performance. Nevertheless, they do not target at the fundamental problem of the market: high entry barriers to the market cluster and, as a consequence, reduced dissemination of scientific research due to high prices. (*section 9.2 and 9.3*)

A third type of policy option does focus on the barriers to entry. This option redesigns the market cluster such that the opportunities to raise entry barriers are reduced. It targets at the connection between the market for papers and the market for journals. In the current set-up of the market, publishers that have the power to attract the best papers (e.g. because of the reputation of their journals) can charge high prices in the market for journals, since their product is a must-have for readers. The copyright transfer from author to publisher facilitates this process. (*section 9.1*)

Therefore, the basic idea of the policy option is to have authors pay publishers with money in stead of copyrights. This disconnects the market for papers from the market for journals and reduces the opportunities to raise entry barriers. Copyright are made ineffective by placing them in the hands of an independent body that is committed to guard and only guard the copyrights. Without copyright and effective competition, publishers are unable to charge prices above marginal costs. This benefits maximal diffusion.

Publishers charge authors in stead of readers to recover the fixed costs of production. Authors use part of their research budget to pay for quality assessments and editorial advice. Hence, authors have incentives to economize on submission behaviour. Publishers have to compete for authors' orders to assess their papers. This spurs efficiency and innovation in the market for quality assessments.

Since copyrights do not limit entry to the market for journals anymore, virtual libraries that provide more value for money will win business. This fosters competition and innovation in the market for selection and distribution of papers. (*section 9.5.1 and 2*)

There is an important role to be played by incumbent publishers and libraries in this new setting. Their know-how and reputation will benefit the performance of the redesigned market. In the transition phase, some potential problems need close attention. Still, this policy option does address the most pressing problem in the market for scientific journal: reduced dissemination because of high barriers to entry. (*section 9.5.5 and 9.5.6*)

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Appendix. Overview of some empirical studies on the market for scientific journals

Year	Title	Principal/Author(s)	Years covered	Field of study	Type of study
1977	Empirical study of scale economies and production complementarity: the case of journal publication	W.J. Baumol and Y.M. Braunstein	1969, 1971, 1973	Variety of disciplines, 56 titles	Estimation of cost functions
1978	Information through the printed word: Journals	F. Machlup and K. Leeson		171 titles	
1978	On the Optimal Provision of Journals Qua Sometimes Shared Goods	J.A. Ordover and R.D. Willig	1975	Economics, 5 titles	Effects of price discrimination
1979	Publishing Economics	G. Rosenbluth	1935-1978	Economics: Canadian Journal of Economics	Development in prices and costs
1986	The development of subscription fees of scientific journals (in Dutch)	Library Tilburg University/ J.N. Sinner	1979-1984	Variety of disciplines, 500 titles	Correlation between changes in serial prices and changes in exchange rates
1989	Report on the ARL Serial Prices Project - A Study of Trends in Average Prices and Costs of Certain Serials Over Time	Association of Research Libraries/Economic Consulting Services	1973-1987		Determinants of serials prices
1990	Communications in Support of Science and Engineering- Library Resources and Research Productivity in Science and Engineering	Council on Library Resources/ N. Van House			Correlation between library resources and scholarly productivity
1990	Price discrimination in 'top' scientific journals	P. Joyce	1964, 1974, 1984	Variety of disciplines	Correlation between price discrimination ratios and impact factors

1991	Longitudinal Study of Scientific Journal Prices in a Research Library	K.E. Marks, S.P. Nielsen, H. C. Petersen, P.E. Wagner	1967-1987	Variety of disciplines, 370 titles	Exploring trends in journal prices, corrected for page volume, exchange rates
1992	University Libraries and Scholarly Communication ('Mellon Report')	Mellon Foundation	1987-1988		Estimation of supply and demand equations
1992	Journal Reputation as a Self-reinforcing Mechanism	L. Cabral	1968-1987	Economics, 40 titles	Correlation between journal reputation and degree of specialisation of journals
1992	The Sources of Scientific Journal Price Increase	Lieberman, R. Noll, W.E. Steinmueller		Economics?, 225 titles	Estimation of supply and demand eq.
1992	An Economic Analysis of Scientific Journal Prices: Preliminary Results	R. Noll, W.E. Steinmueller		Variety of disciplines, 242 titles	Correlation between journal prices and circulation, controlling for quality
1992	The economics of economics journals: A statistical analysis of pricing practices by publishers	H.C. Petersen	1990	Economics	Explaining variations in library prices controlling for quality
1994	The Determinants of Library Subscription Prices of the Top-Ranked Economic Journals: An Econometric Analysis	G.A. Chressanthis, J.D. Chressanthis	1985	Economics, 99 titles	Cross-sectional reduced form hedonic model to study determinants of journal pricing
1998	Journal Price Study	Cornell University (New York)	1988, 1994	Core Agricultural and Biological journals	Analysis of price data

1999	What authors really want	Association of Learned and Professional Society Publishers (UK)/A. Swan, Key Perspectives Ltd.	1999	Variety of disciplines	Analysis of authors' incentives based on questionnaire
1999	Academic Journal Pricing and Market Power: A Portfolio Approach (preliminary)	M.J. McCabe	1988-1998	Biomedical journals	Effect of concentration of ownership on pricing

Abstract

There is a crisis in scientific publishing. The most pressing problem is the reduced access to scientific knowledge, caused by ever-rising prices for journals and limited library budgets. The journal crisis is a logical result of the current set-up of the market. Publishers who obtain copyrights on high-quality papers (their most important input) are able to charge monopoly prices, since papers are not interchangeable like jars of peanut butter. Recent changes in ICT enable a reform of this market setup. If the government wants to fundamentally tackle the journal crisis it could target policy at the limitation of access: publishers' copyrights on scientific papers. When copyrights are made ineffective by placing them in the hands of an independent institute, and authors pay publishers with money instead of copyrights, a competitive system of scientific publishing and free access to scientific papers can result.