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ABSTRACT

Academic Journals as Two-Sided Platforms: Empirical Evidence from Data on French Libraries*

This paper analyzes the demand and cost structure of the French market of academic journals, taking into account its intermediary role between researchers, who are both producers and consumers of knowledge. This two sidedness feature will echoes similar problems already observed in electronic markets - payment card systems, video game consoles, etc. - such as the chicken and egg problem, where readers won't buy a journal if they do not expect its articles to be academically relevant and researchers, that live under the mantra 'Publish or Perish', will not submit to a journal with either limited public reach or weak reputation. After the merging of several databases, we estimate the aggregated nested logit demand system combined simultaneously with a cost function. We identify the structural parameters of this market and find that price elasticities of demand are quite large and margins relatively low, indicating that this industry experiences competitive constraints.

JEL Classification: L11 and L82
Keywords: differentiated products models, media industry and two-sided platforms

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Introduction

This paper analyzes the demand and cost structure of the French market of academic journals, taking into account its intermediary role between researchers, who are both producers and consumers of knowledge. This two sidedness feature will echoes similar problems already observed in electronic markets – payment card systems, video game console etc - such as the chicken and egg problem, where readers won't buy a journal if they do not expect its articles to be academically relevant and researchers, who live under the mantra "Publish or Perish", will not submit to a journal with either limited public reach or weak reputation. Therefore, while on the consumer side, journals compete for subscriptions, on the producer side, journals compete for papers that would maximize the expected number of citations. In this context, journals will have their price settled according to their ability to attract academically relevant articles.

Taking academic journals as differentiated products, we rely on the recent developments of the empirical Industrial Organization literature to estimate the aggregated logit demand system combined simultaneously with a pricing function under the assumption of Bertrand competition. We assume that the current business model among publishers is the readers-pay model and that the subscription pricing policies are determined oligopolistically. Furthermore, by recognizing that the impact factor - our measure of journal's number of citations – is determined by the public reach and the reputation of the journal, we introduce an additional equation that is able to capture the two-sidedness feature of the industry.

Based on the merging of two important price databases, EBSCO and SWETS, together with the journal's quality indicators provided by the Journal of Citations Report edited by ISI, we collected data covering the yearly subscription of journals by French universities from several domains of sciences and social sciences and their characteristics for the period 1994 to 2004. We can show that French universities' subscriptions are substantially elastic to the price of journal, with publishers seizing a relatively low mark-up. Also, publishers that share non for profit (NFP) objectives price lower than for profit (FP) ones.

The data also strongly supports the two-sidedness feature of academic journals. Besides having a significantly positive effect on the demand, the impact factor has a negative impact on the costs of journals, indicating that journals with good reputation (a high citation record) experience lower costs. Interestingly, we find that the impact factor among NFP journals is significantly higher than FP ones. Another important result is that journals that have experienced a change of publishers in the last 10 years have a significantly higher impact factor than the others.

The results obtained in this paper are striking and original. They have implications not only on the way the competition analysis of the industry should be carried out but also on the way that publishers affect the scientific output as a certification vector and as a dissemination one.

The rest of this paper is organized as follows. Section 2 characterizes the market of academic journals as a two sided market. Section 3 presents the related literature, followed by section 4, which describes the database. Section 5 presents the methodology applied and the results are presented in Section 6. We conclude in Section 7.

Academic Journals as Two Sided Platforms

The last 20 years witnessed a huge innovation wave in the communications technology, specifically in digital communications. Data storing and data transfer became accessible as never before and the 'data intermediation' industry grew rapidly. As the number of transactions grew exponentially in developed countries, the interest for the actual functioning of this industry among players and researchers grew proportionally.

Developed in the late nineties, the two-sided market theory proposed an interpretation of how this renewed industry functions. The standard two-sided market models share a common feature: It stresses the fact that platforms that link two types of traders by some means are valued by the potential sizes of these two groups of users. As such, the platforms' pricing policy take network effects into account, adjusting its price structure according to the willingness-to-pay of each side of the market. An increase in prices on one side directly reduces its users' participation, which, in turn, reduces the expected gain from the other side of the platform. Thus, in some circumstances, one side of the market could be subsidized by the other side.

The insights provided by the theory carry out to different industries from payment systems to operating systems, shopping malls, video game consoles and media.[1] One of our goals here is to assess the extent to which this paradigm applies to the market for academic journals.

Academic researchers are both producers and consumers of knowledge. Academic journals play an intermediary role of certification that unveils the dynamics of the profession: A researcher has to publish his studies to be evaluated and to be recognized as a professional. So academic journals are the vector through which certified scientific information flows. While the impact of the 'Publish or Perish' mantra on the research activity itself has consequences of its own on the scientific development of a society – and a normative analysis of the current status quo is of interest, but out of the scope of this study -, the role of publications on the ranking and funding of universities as well as criterion for promotion and tenure awarding of a researcher only sharpens the impact of the mantra on the research agenda.

[1] See Rochet and Tirole (2003 and 2005) for a presentation of this new paradigm and latest developments. See Jullien (2004) for a review of the theoretical results applied to electronic markets. Armstrong (2005) has focused on media and the role of advertisement and content.

So, as a platform, an academic journal not only plays the traditional role of information flow management (i.e.; research output dissemination), but it also certifies the articles they publish, and therefore the authors. Usually, a journal aims at publishing the articles that will be the most influential in the field for the years to come, that is, the articles that maximize the expected number of citations. The larger the number of citations a journal obtains, the stronger their attractiveness among readers. For that reason, journals compete for the best articles through referee committees, which select and screen the submitted articles.

Now, the academic research community has strongly benefited from the decreasing costs of information processing and telecommunications. Researchers face a completely different scenario from what was available some years ago. They are able to run fairly complex programs in shorter time and to use internet as a medium to exchange ideas/papers and find relevant references.

Thus, research output has increased sharply, which has raised tensions on the functioning of the traditional printed journals. Cheap talks and anecdotic evidence indicated that, while the average time for a researcher to receive a first evaluation of its scientific paper has increased considerably, the variance of time taken to actually publish an accepted paper has increased even more, particularly for the most popular journals. These features counteracted the increasing need for a faster access to scientific literature, itself fuelled by the increasing availability of easy-to-use communication systems.

In this context, observers remark a lasting movement towards a reorganization of the academic journals. The publishers reacted in twofold ways: On the researchers' market side, established publishers have launched new academic journals, which are more specialized and have faster refereeing procedures; on the readers and librarians' side, the publishers proposed several value-added services and special journal packages that have become known as the Big Deal. We briefly comment them in what follows.

Concerning the researchers' side, the reply to the increasing research output, driven by the sharp decrease of research costs, has been the creation of new journals in order to adjust to the differentiation of new research fields and the increased variance of the research quality. In the meantime, this flow of creation has certainly been boosted by the design of more efficient software (sometime freely available) to manage and edit journals. The already feeble technological barrier in such industry decreased even further. Notable, the for-profit publishers took the lead in the creation of new journals and, at present, they hold most of the recently created new journals. As a consequence, libraries concentrate much of their subscriptions on these publishers. (See Case, 2004, p.2 and Dewatripont *et alii*, 2005, p.44.)

As regard the readers' side, a typical contract between a library and a publisher would entail simple print and/or electronic versions, with added value services to libraries such as precise statistics on the number of electronic consultations and desktop electronic access. One of the most notorious publishers' initiatives in the last ten years has been what became known as the Big Deal. This special contract differs from publisher to publisher but, its basic format consists of a multi-year contract that bundles the journal's printed version to its electronic one and has a limiting policy regarding cancellation of subscriptions. Generally, this contract would be tied to the library, but also, publishers frequently would propose clauses based on the library's previous subscriptions record. Notably restrictive, the Big Deal has been sometimes considered as a strategic barrier to entry to competing new journals.[2]

In summary, the two-sidedness nature of academic journals, that is to say, dissemination on one side towards researchers/consumers and certification on the other side to researchers/producers have been responsible for the impact of the electronic revolution on the dynamics of the market of academic journals, i.e., creation of new journals and the design of new contracts.

The related literature

To our knowledge, the first theoretical model that recognizes the two-sidedness feature of the academic journals market was developed by McCabe and Snyder (2005). Their article focuses on the academic journal as a certification device, a role which allows readers to decrease their cost of reading papers. The talent of the journal's referee committee determines its ability to minimize the number of low quality articles that are accepted for publication. Authors do not observe the quality of their paper *ex-ante* and the submission pricing policy is designed so as to attract as many submissions as possible. Under this framework, and provided that the private benefit of researchers from having a paper published is higher than the publication and refereeing costs, the subscription price is increasing with the quality (or talent) of the journal. In other words, a journal that improves its refereeing process directly hurts the authors, whose perceived probability of having a paper accepted decreases, but directly benefits readers, that face a lower cost of reading the journal.

Jeon and Rochet (2006) also characterize the market for not-for-profit academic journals as a two-sided market to study their pricing and quality policies. Differently from McCabe and Snyder, the authors model academic journals as perfect certification devices, where quality is given endogenously with the pricing policy. In such case, the referee procedure has the unique role of assigning which articles should be published and which should not. In a world where the readers benefit from the quality of the published articles, but incur a fixed cost of reading them, and researchers benefit from the publication per se and from the quality of its paper, the first best pricing policy will be subsidizing readers. Here, readers are creating externalities to researchers, who benefit from each one that reads his paper. Under a budget balance constraint, the journal issue subscription prices equal to zero which corresponds to open access to readers. Because there are not as many readers without subsidization, binding papers in terms of quality are not submitted and the average quality of the journal increases.

[2] See Edlin and Rubinfeld (2004) for a discussion on the Big Deal as a strategic barrier to entry.

Not-for-profit journals, whose objective function favours readers, would tend to decrease journal's quality below optimal under open access while the effect would be reversed under the subscriber-pays model.

Our empirical study is more related to McCabe and Snyder's theoretical model with respect to the journal's technology. We recognize that journals differ across their ability (or talent) to detect the quality of a submitted article and, typically, a journal's talent is a function of the journal's perceived quality. In fact, a high quality journal should have lower cost to hire a good referee committee, a willing full editorial board and, by that way maintains or even increases its reputation. Because most of the referees are not paid (or paid symbolically) and reviewing is costly, the recruitment of referees is frequently based on the researchers' expectation of having their own work published or on their motivation to build their reputation. The same is true for hiring editorial boards, mainly with respect to reputation. Since the reputation of a journal plays an important role on its current talent to screen the submitted articles, it seems only natural to assume that the latter is determined through an endogenous process, rather than deterministic, as in McCabe and Snyder. In our analysis, we investigate the impact of talent on costs, using a proxy variable for the quality of a journal.

Our approach to the publisher's behaviour is different from Rochet and Jeon (2006). While they study the behaviour of not-for-profit publishers, we assume publishers compete in prices *a la* Bertrand to maximize their profit. In our estimations, we control for the existence of not-for-profit publishers.[3]. Finally, we are assuming that the publishers adopt the subscriber-pays model.

A recent hedonic price study performed by Dewatripont *et alii* (2005) used one of the price databases adopted in our analysis. Among their conclusions, they found that there are large price differences across fields, controlling for total number of journals' citations, not-for-profit journals price lower than for-profit ones and older journals price lower. The total number of citations had a positive impact on prices. Our results corroborate some of their findings and contribute with further insights on the functioning of the market.

The Data

Our database combines several sources. The annual levels of subscription per journal are obtained from the information network of all French university libraries, ABES (Agence Bibliographique de l'Enseignement Supérieur). Besides holding the integral of all their collections from 1994 to 2004, the subscription characteristics included the format and language of the journal and the nationality of the publisher.

[3] Not For Profit journals are defined as all journals that belong to a University Press or Society type of publisher.

Other journals' characteristics are obtained from the merger of two annual publications of the Journal of Citation Reports (JCR herein), (1) the Sciences Edition from 1994 to 2003 and (2) the Social Sciences Editions from 1994 to 1997, 1999 and 2003. Journals' characteristics for which we have data include the total number of citations, impact factor and cited half indexes, number of issues and articles, publisher and up to five (sub)fields covered. The journals are selected according to their fields' importance in the database. The covered fields are Business, Chemistry, Computer Science, Economics, Engineering, Mathematics, Medicine Probability and Statistics, Physics and Psychology.

The price variable is the combination of listed subscription prices given by the two main firms distributing journals in France, EBSCO and Swets Information Services. They are among the worldwide leaders in providing information access and management solutions through print and electronic journal subscription services, research database development and production, online access to more than hundred databases and thousands of e-journals, and e-commerce book procurement. The use of two different sources for obtaining the price variable is due to an important fall in the number of journals listed by EBSCO from 1998 onwards.[4] This EBSCO price list is complemented by the Swets data, which covered the period from 2001 onwards. Notably, some journals presented quite different price magnitudes and we have implemented a corrective program that would fix for such differences biased towards the magnitudes of the Swets' prices, which core generally lower than EBSCO's.[5] The consequent lack of price information during the period 1998-2000 impacts its market share and price statistics. We aim at controlling its effects during the estimation procedures. Notably, the available price schedules are restricted to the basic per journal subscription, which abstracts from any of the quantity discounts publishers usually offer libraries. The bundling of journals proposed by these contracts - the Big Deal is an example - are not explicitly covered by our database. However, we have gathered data on the year the main publishers started offering electronic subscriptions to readers in the US which is an important feature of this type of contract, and we use it as a proxy to the French case.[6] (See Case, 2004.)

Additional data are obtained from other sources. For instance, to understand the impact of the perceived concentration of publishers in the academic journals market led us to gather data on the merger activity of the industry among the main publishers. We have combined this information with our data on publishers per journal.

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[4] One explanation for this fall in the number of journals with listed prices might be the rising of more complex subscription price menus, which led EBSCO to register them differently.

[5] Both EBSCO and Swets database presented prices that are wrongly coded in cents or in tens of cents, for which we apply a corrective algorithm. Because Swets' identified corrections accounted only for 0.13% of the data and EBSCO's for 4.7%, we assume that Swets is more correct than EBSCO and take its price magnitudes as the correct ones.

[6] Another problem on our data on prices is that the price listing is irrespective of the journal's format. We assume the price is for the printed version only, though we know that libraries have subscribed some printed journals with the optional electronic version. Once the printed version is subscribed, libraries sometimes are faced with its free either, free under constraints or paid electronic version. We assume the libraries take the printed version, but we try to account in the estimated the fact that libraries are offered electronic formats.

An important drawback of this work is the lack of data on the costs of publishers. We did not have access to this crucial data, which made especially more complicated the estimation of the model. As an alternative, we construct some proxy cost variables based on the journals and publishers' information. These variables include field and editor dummies, number of subscribed journals proposed by the publisher, the nationality of the publisher, number of issues per year, and some interactions between these variables. We also include a dummy for not-for-profit publishers.

The following tables provide summary descriptive statistics of variables that are used in the specifications we discuss below. These variables include prices (in real dollars 2000), market shares, number of articles, total number of citations, impact factor and cited half index.

The market share of a journal *j* at time *t* is defined as the number of universities that have at least one of its libraries subscribing to *j* at time *t* divided by the total number of journals available at time *t*. The impact factor is a measure of the importance of citations of a journal which is the ratio of total cites in a current year of articles published in a given journal the previous two years over the total number of articles published the previous two years. The cited half life index represents the minimum number of years back from the current year that allow to account for half of the total number of citations of the journal. This last index measures in some sense the length of the citations' lifecycle of a journal and will differ depending on the field of the journal. As a preliminary remark, one should notice that the sample is quite asymmetric with respect to the selected characteristics, one exception being the cited half index.

Table I gives the mean and median market shares and prices of the journals. Although our definition of market share and our price adjustment algorithm have inflated the statistics for the period 1998-2000, some trends are noticeable.[7] The median market share of a journal has been decreasing steadily in the last ten years and prices increased likewise.

Table II provides statistics on some basic characteristics of the journals. Besides the sharp increase in the number of articles between 1998 and 2002, its median and mean have basically converged to the same number as 1994. Nevertheless, the mean and median number of citations and the impact factor of a journal have increased considerably, which may be due to the higher number of articles together with lagged character of these quality measures. The cited half index indicates a mild increase in the life cycle of the articles published by a typical journal. Notably, the few journals that are covered by EBSCO during the period 1998-2000 do not differ in terms of citations and impact factor, but contribute to an increase in the mean and median number of articles.

Table III provides the mean and median ratio between price and journal's citation and between price and unit impact factor. The median market share of a journal has been decreasing steadily in the last ten years and prices have not changed significantly.

[7] As mentioned, Swets prices are lower than EBSCO prices. The corrective algorithm adjusted prices downwards.

Table I :Descriptive statistics of prices and market shares per year

Year	Market Shares (a)		Price (a), (b)		Number of journals
	Mean	Median	Mean	Median	
1994	0.0007188	0.0006072	1076.34	325.12	772
1995	0.0006380	0.0004660	1262.13	365.30	818
1996	0.0006314	0.0004817	1119.60	386.43	872
1997	0.0006385	0.0004970	1243.25	410.40	889
1998	0.0016411	0.0013736	1648.16	712.87	303
1999	0.0017464	0.0015060	1489.85	773.40	307
2000	0.0024651	0.0021142	1517.94	772.13	253
2001	0.0004951	0.0003318	891.16	463.87	1038
2002	0.0005142	0.0004031	964.08	513.98	1037
2003	0.0004658	0.0003176	1013.02	542.69	1232
2004	0.0004421	0.0002961	1105.39	589.33	1254

Note: (a) There is a fall in the number of observations between years 1998 and 2000, which, given our definition of market share, led to an artificial increase of the mean individual journal's market share. Also, the observed different price magnitudes were adjusted through a corrective algorithm which adjusted the bias towards Swets prices' magnitudes. Since many of the sampled journals during the years 1998-2000 are not present in the Swets database, the algorithm has not reached them, and price means are consequently higher.
(b) Simple annual means.

Table II: Descriptive statistics of journals' characteristics per year

Year	Number of Issues	Number of articles		Total Number of Citations [a]		Impact Factor [a]		Cited Half [a]
	Median	Mean	Median	Mean	Median	Mean	Median	Median
1994	6	160.5	97.0	3161	1161	1.5349	0.9029	6.6
1995	6	168.5	101.5	3648	1257	1.6201	0.9109	6.8
1996	6	173.6	102.0	3962	1358	1.6763	0.9955	6.8
1997	8	170.3	100.5	4035	1373	1.5933	0.9534	6.9
1998	12	229.6	133.0	5120	1802	1.7469	1.0365	6.7
1999	10	218.1	117.0	5459	1504	1.6830	0.9325	6.9
2000	12	229.6	143.0	5084	1981	1.6574	1.0400	6.8
2001	11	199.9	126.0	5923	2270	2.0555	1.3518	6.9
2002	12	192.8	119.0	5908	2338	2.0844	1.4158	7.1
2003	8	175.2	98.0	5490	2000	2.0034	1.3236	7.3
2004	8	166.6	96.6	4414	1498	1.7690	1.1264	6.7

Note: (a) computed averages for 1998 and 2004.

As discussed, the journals listed in JCR are characterized by up to 5 subfields of science. From a total of 219 subfields, we have selected the 10 most frequent domains of science by grouping the subfields into its respective major field. For instance, journals with the subfields 'Psychology, Applied' and/or 'Psychology, Biological' were gathered into the field of Psychology; the journals with subfields 'Anatomy & Morphology' and 'Parasitology' were gathered into Medicine. Such procedure decreased the occurrence of overlapping (sub)fields from 50% to less than 1%.

Table IV provides per field medians over some important journal's characteristics. It indicates that the academic appraisal of a journal and its consequent use in future research and final publication differs across fields. Firstly, Medicine journals cover almost half of the database and have the highest median impact factor of the sample.

Table III: Price per journal's characteristics

Year	Price per citation		Price per impact factor		Number of journals
	Mean	Median	Mean	Median	
1994	2.3573	0.3474	2103.52	456.27	772
1995	2.3877	0.3591	1945.39	504.75	818
1996	1.8538	0.3370	1666.35	467.87	872
1997	2.0781	0.3414	1863.38	488.32	889
1998 [a]	3.0818	0.3929	2874.46	644.59	303
1999	2.9678	0.5068	2753.92	706.50	307
2000	2.4624	0.4053	2890.58	670.25	253
2001	0.9761	0.2582	1037.94	374.49	1038
2002	1.0248	0.2744	999.03	395.42	1037
2003	0.7527	0.3244	997.57	438.87	1232
2004 [a]	1.1782	0.4575	1264.50	556.47	1254

Note: (a) computed averages.

Table IV: Subscribed journals's characteristics per field (medians)

Fields	Impact Factor	Number of Articles	Price in 2000 dollars	Market Share %
Mathematics	0.55294	60	552.61	9
Economics	0.58974	39	321.33	6
Engineering	0.61716	103	569.07	12
Computer Science	0.62000	54	648.07	4
Probability and Statistics	0.65809	49.5	210.49	3
Business	0.68493	38	306.49	3
Psychology	1.25022	41	280.79	4
Physics	1.37632	194	1379.14	5
Chemistry	1.68600	240	1394.37	7
Medicine	1.84971	150.5	443.54	47
Total				

Secondly, we find that some fields have a different citation dynamics than others and that median prices differ considerably across fields. Notably, Physics and Chemistry's are far more expensive than any other field. Given these characteristics, field specificity seems relevant to properly capture the network effect of academic journals. We address it in our estimates.

We finally turn to the publishers characteristics. The Academic Publishing industry is among the one that most seized the mergers and acquisitions wave of the 90's. From a total of 262 publishers, we have chosen the most representative of the sample and controlled for their merger activity; they are: Blackwell Publishing Ltd., Cambridge University Press, Reed Elsevier, Wolters Kluwer, Oxford University Press, Sage Publication Ltd., Springer Science, Taylor & Francis Group PLC and John Wiley and Sons Inc, Lippincott Williams & Wilkings (Monroe, 2005). By far, Elsevier is the publisher with the highest market share, followed by Blackwell and Springer. According to our sample, the major publishers' field profile is quite similar: Most of them have around 45% journals covering Medicine. Among them, Wolters Kluwer is the most diversified one while Lippincott is specialized in Medicine only journals.

Econometric Specification and Estimation

Until recent, the estimation of demand systems of differentiated products was subject to two major drawbacks: (1) the need to fully characterize the substitution pattern between products implied the estimation of the squared number of the existing products, framed as the dimensionality problem, and (2) the introduction of heterogeneity between consumers, which is expected in a differentiated products' market.

The discrete choice literature provides solutions to both problems.[8] The dimensionality problem was solved by casting preferences in terms of the space of the products' characteristics (and not in terms of the much larger space of products). The consumer's heterogeneity is translated through distributional assumptions whose coefficients are estimated. The most popular model in this class is the simple logit model based on the assumption of a i.i.d. extreme value distribution. However, it is well know that this assumption is strong with regard the characterization of the consumers' substitutions patterns. In order to overcome such limitations, more flexible forms have been proposed and among them we find the nested-logit and its generalized form, the random coefficients discrete choice model. With respect to the simple logit, the nested logit adds more structure to the consumer heterogeneity by replacing the i.i.d. extreme value assumption of the random term with a variance components structure. By grouping the products in well defined and mutually exclusive groups, the consumer is allowed to have a common shock across products within the same group. In this nested-logit framework, the probability of a consumer choosing a product belonging to the same group is higher than choosing just any other product.

Among the advantages of the random coefficients discrete choice model is the further generalization of the substitution pattern among products. (See Nevo, 1998). This time, it accounts for a weighted average of the consumers' price sensitivity, where the weight is the individual consumer's probability of purchase. Another advantage of this framework is that it prevents the *a priori*

[8] To cite a few (and be unfair to many): McFadden (1973, 1984), Berry (1994), Berry, Levinsohn and Pakes (1995), Goldberg (1995), Nevo (1997).

segmentation of the market, which can be a problem in markets where such segmentation is not so clear. (See, for the case for personal computers, Bresnahan *et alii,* 1997.)

Although the nested model still holds limitations on the substitution pattern with respect to the random coefficients discrete choice model, we have opted for this framework here because it is simpler to implement and because the grouping of journals is fairly straightforward.[9] We now turn to the econometric estimation of a structural model of competition between publishers of journals on the market for academic journal subscriptions by French university libraries.

The following section describes the model. We have also performed per field analysis for journals in Medicine and Economics, to which cases we have adopted the simple logit demand framework.

The Model

The representative consumer is a university library, which decides for buying one of the available academic journals, based on the researchers it represents, which varies according to the field and to the quality of their research output. The library might also buy an outside alternative or not buy any journal at all.

The nested demand framework assumes products are classified in *G* different groups plus the group corresponding to the outside alternative. In the context of academic journals, journals are classified according to different fields of science. In this framework, journals of the same field are closer substitutes than journals outside the field. The utility of subscribing a journal *j* by consumer *i* is given by:

$$u_{ij} = \delta_j + \varepsilon_{ig} + (1-\sigma)\varepsilon_{ij} . \tag{1}$$

We do not include the time subscript *t* for the sake of simplicity.

The component δ_j in equation (1) represents the average utility of journal *j* and it is common to all consumers. It is decomposed in three parts. More formally, the average utility is:

$$\delta_j = X_j\beta + \rho I_j - \alpha p_j + \xi_j . \tag{2}$$

The first part, $X_j\beta$, includes the journal's characteristics in $X_j\beta$ such as number of articles, number of issues, field, dummies for major publishers, their nationality, year dummies and some interactions

[9] There are 316 out of 3468 journals with overlapping fields, mainly for Computer Science, Engineering and Mathematics. The assignment of a journal to a field followed an arbitrary order. Once we look at the statistics per field, we can see that these fields share very similar characteristics. Furthermore, given its low representation of the data, less than 1%, we are confident that the assignment procedure will not mislead estimates in a relevant way.

between them. The second part, I_j, includes the quality of the journal, that is, the scientific importance of its published papers. The third part is the price of the journal, where the parameter α represents the disutility of price of a journal and should be positive. Finally ξ_j represents the unobserved components of quality.

The second and the third elements in equation (1), namely ε_{ig} and ε_{ij} are random variables that reflect the difference between the consumer's individual appraisal over the journal and the average payoff it delivers, represented by δ_j. Notably, ε_{ig} is common to all journals belonging to the same field g and ε_{ij} is specific to the journal j itself. The multiplicative parameter σ ranges between 0 and 1 and denotes the *degree of intragroup correlation*. It measures the correlation of the consumer's utility from journals that belong to the same field. The closer this parameter is to one, the higher the chance the consumer will switch to another journal within the same field when its price increases. When σ is close to zero, the consumer does not make distinction between fields when subscribing a journal. This case corresponds to the standard logit model in which all journals are symmetric. When σ is close to one, the journals within a field are considered as very close substitutes.

The library i subscribes the journal j that maximizes her utility. In order to compute the probability that a library subscribes a journal j, the nested logit model assumes that both ε_{ig} and ε_{ij} are such that its composite term $\varepsilon_{ig} + (1-\sigma)\varepsilon_{jt}$ follows an extreme value distribution. The average utility of the outside alternative is normalized to zero, that is, $\delta_0 = 0$. Thus, the probability s_j of a library to subscribe journal j is given by:

$$s_j = \frac{\exp\left(\delta_j \big/ (1-\sigma)\right)}{D_g} \frac{D_g^{1-\sigma}}{1+\sum_{g=1}^{G} D_g^{1-\sigma}}, \qquad (3)$$

where $D_g = \sum_{k \in G_g} \exp\left(\delta_k \big/ (1-\sigma)\right)$.

At the aggregate level, the choice probability, s_j, coincides with the market share of the journal j. The total number of subscriptions of journal j, say q_j, is directly given by expression $q_j = s_j N$. Following Berry (1994), we can rewrite equation (3) to yield the demand equation:

$$\ln s_j - \ln s_0 = X_j \beta + \rho I_j - \alpha p_j + \sigma \ln s_{jg} + \xi_j, \qquad (4)$$

where s_{jg} is the market of journal *j* in group *g* and s_0 is the market share of the outside good. Given our definition of market share of a journal, that is, the number of universities that have at least one of its libraries subscribing to journal *j* at time *t* divided by the total number of journals available at time *t*, we include as outside good all the journals that were not subscribed at period *t*, though they were available in the previous years.

We assume that each publisher *f* produces a set of journals F_f. Its net profit is the sum of its operational profits minus a fixed cost *K*. The operational profit of journal *j* is equal to the product of its total subscriptions and the margin, that is, the price p_j minus the marginal cost c_j of journal *j*. Then, still omitting subscript *t*, the total profit of firm *f* is:

$$\pi_f = \sum_{j \in F_f} \left(p_j - c_j\right) q_j - K . \tag{5}$$

Publishers compete in prices *à la* Nash-Bertrand. Given the nested logit specification of the demand, the pricing equation for each journal is given by:

$$p_j = c_j - \frac{1-\sigma}{\alpha(1-\sigma s_{fg} - (1-\sigma) s_f)} , \tag{6}$$

where s_{fg} is the publisher *f*'s market share in field *g*; s_f is the publisher *f*'s overall market share and c_j is the (constant) marginal cost of journal *j*. The marginal cost of a journal *j* is parameterized as:

$$c_j = \exp(w_j \gamma + \omega_j) , \tag{7}$$

where w_j is the vector of the deterministic part of the journal's characteristics, γ is the technological parameters to be estimated and ω_j is an unobserved random part. The deterministic part includes a constant term, number of issues per year, number of journals subscribed per publisher, impact factor, dummies for fields, years, major publishers, nationality of the publisher, for non for profit journals and some interactions between them. Notably, we include the impact factor as cost characteristic. It should be capturing a reduced form of the journal's effort towards having a high quality journal. We would expect that the higher the impact factor of the journal, the lower is the cost for the journal to find good referee committees and a willingfull editorial board. For these reasons, journals with lower impact factor should have higher cost than journals with high impact factor. Therefore, we expect the effect of the impact factor to be negative on costs. This conjecture is related to the model of McCabe and Snyder (2005), since the impact factor would be a measure of the talent a journals has in screening the good articles out of the submitted ones.

Finally, the per field analysis will correspond to the same structural model, applied to the simple logit framework, where σ equals zero. The market shares are redefined as $s_{jg} = s_j$, which is the number of universities that have at least one of its libraries subscribing to the Medicine (or Economics) journal *j* at time *t* divided by the total number of Medicine (or Economics) journals available at time *t*, We include as outside good all the respective field journals that were not subscribed at period *t*, though they were available in the previous years.

Endogenous quality

Journals provide the service of publishing certified articles and, as such, intermediate researchers/producers and readers. These would attribute value to the journal that, respectively, has a large readership base and publishes good quality articles, which generates the chicken&egg problem commonly found in the context of two-sided markets. Here, such value is approximated by the lagged impact factor. Furthermore, according to JCR (2006), many factors "(…) can influence citation rates, such as language, journal history and format, publication schedule and subject specialty." Thus, given the highly endogenous nature of the impact factor, we further specify the simultaneous model by adding the following equation[10]:

$$I_{jt} = \lambda I_{jt-1} + Z_j\theta + u_{jt}\,, \tag{8}$$

where I_{it} the impact factor of journal *j* at time *t*, Z_j is a vector of journals' characteristics. Following JCR's expertise and the recent developments in the two-sided market theory, this matrix includes the number of articles and issues per year, a dummy for non-for-profit journals, some field dummies, a step dummy indicating a change of publisher. Finally, I_{jt-1} is the lagged impact factor of the journal *j*. The parameter λ would be capturing the network effect of the past readership of the journal.

Estimation results on the complete sample

We first provide results for the complete sample. The estimation results of the field analysis are briefly discussed afterwards.

Table A1a and A1b (See Appendix) present the set of empirical results taking into account the endogeneity of prices. We run the nested logit demand (Equation 4) combined simultaneously with the pricing Equation 6. The first column of the regression output tables provide the results when the

[10] Since prices are positively correlated to the quality of a journal, not accounting for this relation would underestimate the effect of the impact factor on the demand for journals.

impact factor is not accounted and then, in a second column, when it is accounted as exogenous, which we call the benchmark. The following columns show the estimation results when the impact factor is endogenous. The last two columns present the results when we include the impact factor Equation 8, which would be capturing the two sided nature of this market.

Given the need to control for journals' prices and quality endogeneity, our choice of instruments was guided by the need to include the variables that are linked to price and quality, but do not affect the unobserved demand shocks. A natural list of instruments, in this case, includes the competitors' characteristics. The full list of instruments is presented on Table A2.

The first regression output without the impact factor as explanatory variable is displayed in the first column of Table A1a and it is called Model 1. The second column (Model 2), the benchmark case, shows that not recognizing the endogenous character of the impact factor yields a zero correlation between impact factor and the demand for journals. This result is counterintuitive since it implies that subscriptions would be unrelated with the impact factor, which is a celebrated measure of the quality of a journal. Once we allow for the impact factor to be endogenous (Models 3 and 4), its effect on demand becomes statistically significant and with the expected positive sign.

The fifth and the sixth columns present the results for the simultaneous model including the third equation, which will capture the network effect through the journal's previous impact factor. Notably, this effect is positive and highly significant. Additionally, the introduction of the impact factor equation does not change the effect of the impact factor on the demand, but it increases the estimated value of σ, our measure of intragroup correlation. The implications of such change on our structural estimates for demand and costs will echo the theory's prediction that the market becomes more competitive when two-sidedness is accounted.

Some side results from the estimates of the third equation are worth mentioning. The number of issues of a journal is weakly and positively correlated with the quality of the journal and the NFP journals usually have higher impact factor. Interestingly, the impact factor is not statistically affected by changes in the ownership structure of journals.[11]. The field dummies indicate the importance of accounting for the specificities of a field citation pattern. In particular, Medicine and Chemistry have a quite distinct citation pattern when compared to other fields.

The estimates for the major publishers' dummies indicate that they have a statistically negative effect on the impact factor when compared to the other publishers and their effect, with exception of Kluwer and Taylor & Francis are quite similar between each other. At last, the electronic dummy, which is a step dummy for the year these major publishers started offering the electronic version of the journal (bundled or not with the printed version) is positively correlated with the impact

[11] One would expect that the merging activity of the last years has been concentrated among the journals with the highest quality/prestige in academics, which would indicate that the publishers' choice towards buying a journal could not be considered deterministic. If we add this dummy in the list of endogenous variables of the model, its effect is positive and highly significant.

factor. This indicates that the publishers were successful in using the electronic format to increase the quality of their own journals.

The cost-side parameters have the expected signs for all the model specifications. The estimated coefficients for number of issues and the constant are positive and significantly different from zero. The coefficient for the impact factor is significantly positive and, once taken as an endogenous variable, it becomes negative and statistically different from zero. In other words, when we fail to recognize the endogenous character of the impact factor on the cost function, we find that the best journals are the ones with higher cost. As discussed before, such result is not intuitive because one would expect that well-established high quality journals have a lower cost to run a journal with the suitable editorial board and refereeing committees than a lower quality journal. This estimate would be capturing the reduced form of the effort a journal makes towards publishing high quality papers. If one take such variable as a measure of the talent of journals – and here we refer to McCabe (2005)'s work -, we verify that journals indeed differ with respect to their talent to select articles.

We find that as we improve the specification of the model, the sign of the estimate of the non-for-profit (NFP) dummy changes from positive when we do not include the impact factor in the estimations to negative, when we include it as exogenous, to finally become positive and at 10% significance level in our preferred specification. The empirical literature on academic journals usually finds that NFP journals price lower than for-profit (FP) ones. Our result implies that such pricing policy would not be due to lower costs - according to our estimates, such journals seize higher costs – but do a deliberate strategy to price lower.

The role of the dummies for nationality of the journal is very relevant for the estimates of both the impact factor and the NFP dummy estimates on the cost function. If we do not control for nationality, the effect of NFP dummy on the cost becomes negative and the effect of the impact factor becomes positive. One interpretation, suggested in Dewatripont *et alii* (2005), is that the change of currency in Europe, together with the appreciation of the Euro against the dollar on 2001 led to a significant increase in the price of the journals and such would be responsible for the bias usually found in the recent literature that the NFP journals, which are more frequent in the US are less expensive than the FP journals, which are more frequent in Europe. However, a close look at our merged database yields average prices that are quite similar across countries for both FP and NFP publishers, except for UK. There, the average price of its FP journals is the double of NFP journals, even though their quality is lower. Therefore, in a context where UK data is responsible for almost half of the observations (2026 FP journals and 65 NFP journals out of 3956 observations), we find relevant to control for such idiosyncrasies with some country dummies.

Finally, we turn to the demand-side parameters. Notably, while α varies very little across the model specifications, the same is not true for the estimated σ. The different specifications yield slightly different estimates, which range from 0.91 to 0.95. The associated first R-squares, which roughly speaking measures the fraction of the variation of prices (with the associated parameter α)

and market shares (with the associated parameter σ) that are explained through the instruments, also changes considerably and for both parameters. Regarding σ, it clearly increases when we improve the specification towards the Full Model. The same is not true for α: Depending on the choice of instruments, the first R-squared either decreases or increases. We have favoured the specification that yields the highest first R-squared for α. Therefore, our preferred structural estimates are based on the estimation results of the last column of Table A1b, the Model 6.

Notably, the lack of more precise information on costs, such as wage paid by publisher, number of pages, surface of the journal, expenses with material are taking its toll. Our estimates on the (short run) costs are not as precise as one would like it to be.

Empirical Analysis

Table V compares the key structural estimates derived from the model where impact factor is exogenous (Model 2) with the results from the model including the impact factor equation (Model 6). We have captured a remarkable feature with the available data: Our estimates reveal that the demand for academic journals is highly elastic, under both scenarios. On the top of that, the estimated elasticity increases once we introduce the impact factor equation, corroborating the results obtained in the two-sidedness theoretical literature. As discussed in a previous section, an increase in prices creates a multiplicative effect since it directly reduces the number of (paying) readers which in turn reduces the expected gain from researchers to publish in the journal.

The estimates for the marginal cost do not vary much from one specification to the other. However the pricing policy and therefore the mark-up changes considerably, decreasing by 43%, when we use the complete model including the impact factor equation. Nevertheless, given that the estimated elasticities are already very high under the benchmark model, the estimated average mark-ups are low, around 9.8%, and reduces to 5.5% under the complete model. The median of the annual marginal cost of a journal is around $668 (2000 USD) and its average is close to $1081 the complete model.

Note that the aggregated elasticity, that is, the percent change of the inside good market share resulting from a one percent increase in their prices, almost does not changed from one model to the other since α does not change significantly. Its estimated value is 0.52.

The following Table VI and Table VII present the key structural statistics per publisher. From a total of 262 publishers, we have chosen the most representative of the sample. Notably, Elsevier, John Wiley & Sons Inc and Springer are the publishers with the highest individual journal elasticities. Because of the high values of elasticities, the economic margins are quite low. For our selected publishers, the median ranged from 2% to 8.6%, while the overall median economic margin is around 4%. In particular, Elsevier, which accounts for almost half of our sample, John Wiley & Sons Inc and Springer has a median marginal cost slightly above the overall median journal

Table V: Estimated demand and cost parameters

	Own Elasticity		Cross Elasticity		Marginal Cost		Mark Up (Percentage)	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Model 1	-29.01	-18.28	0.53	0.11	1058.64	645.1	9.808	6.917
Model 6	-52.27	-32.94	0.99	0.20	1081.26	668.69	5.555	3.851

Table VI: Estimated demand elasticities per publisher

Model 1: Impact Factor Exogenous

	Own Elasticity		Cross Elasticity		Cross Editor Elasticity	
	Mean	Median	Mean	Median	Mean	Median
Blackwell	-12.30	-10.49	0.13172	0.03373	0.00111	0.00044
Cambridge	-13.60	-11.85	0.20007	0.10946	0.00091	0.00039
Elsevier	-35.00	-23.42	0.77442	0.18713	0.00369	0.00113
Ieee	-12.38	-11.57	0.37429	0.11395	0.00120	0.00042
Kluwer	-23.53	-20.55	0.27123	0.17629	0.00086	0.00061
Lippincot	-15.53	-15.31	0.05177	0.02026	0.00128	0.00049
Oxford	-13.86	-12.39	0.11259	0.03347	0.00098	0.00057
Sage	-9.66	-7.85	0.10777	0.07973	0.00034	0.00022
Springer	-39.71	-29.31	0.44324	0.11494	0.00243	0.00110
Taylor	-21.99	-15.73	0.21110	0.07180	0.00091	0.00052
Wiley	-44.93	-34.00	0.58493	0.18916	0.00309	0.00121

Model 6: Impact Factor Endogenous with Equation

	Own Elasticity		Cross Elasticity		Cross Editor Elasticity	
	Mean	Median	Mean	Median	Mean	Median
Blackwell	-22.17	-18.88	0.24651	0.06238	0.00111	0.00044
Cambridge	-24.50	-21.36	0.37510	0.20522	0.00091	0.00039
Elsevier	-63.05	-41.79	1.45188	0.34988	0.00368	0.00113
Ieee	-22.29	-20.85	0.70222	0.21376	0.00119	0.00042
Kluwer	-42.40	-37.05	0.50882	0.33045	0.00086	0.00061
Lippincot	-28.00	-27.60	0.09613	0.03763	0.00127	0.00049
Oxford	-24.98	-22.33	0.21065	0.06189	0.00098	0.00057
Sage	-17.41	-14.14	0.20215	0.14816	0.00034	0.00022
Springer	-71.56	-52.83	0.83068	0.21356	0.00242	0.00110
Taylor	-39.63	-28.35	0.39582	0.13405	0.00091	0.00052
Wiley	-80.96	-61.29	1.09630	0.35472	0.00308	0.00121

Table VII: Estimated marginal costs and mark-ups per publisher

Model 1: Impact Factor Exogenous						
	Marginal Cost		Mark Up (Percentage)		Market Shares	
	Mean	Median	Mean	Median	Mean	Median
Blackwell	423.78	358.92	15.35848	10.44086	0.00099	0.00040
Cambridge	480.06	406.77	12.35638	8.91958	0.00082	0.00040
Elsevier	1282.88	826.00	9.81868	6.71697	0.00112	0.00047
Ieee	427.16	383.34	13.85983	12.38679	0.00106	0.00047
Kluwer	856.21	740.16	5.54937	5.14481	0.00051	0.00033
Lippincot	542.87	531.79	9.24485	7.63821	0.00104	0.00033
Oxford	486.87	431.59	11.35488	8.23335	0.00098	0.00048
Sage	329.33	262.81	14.20512	13.03759	0.00046	0.00047
Springer	1470.29	1064.61	5.13561	3.59331	0.00068	0.00040
Taylor	796.70	561.05	8.24381	6.67901	0.00059	0.00040
Wiley	1672.17	1247.36	4.00966	3.10001	0.00095	0.00040
Model 6: Impact Factor Endogenous with Equation						
	Marginal Cost		Mark Up (Percentage)		Market Shares	
	Mean	Median	Mean	Median	Mean	Median
Blackwell	443.30	376.46	8.61430	5.83140	0.00099	0.00040
Cambridge	497.49	427.27	6.86448	4.95268	0.00082	0.00040
Elsevier	1309.15	855.23	5.63102	3.78966	0.00112	0.00047
Ieee	450.17	408.13	7.83673	7.14305	0.00106	0.00047
Kluwer	873.84	757.40	3.08487	2.86009	0.00051	0.00033
Lippincot	562.19	551.66	5.15120	4.26238	0.00104	0.00033
Oxford	504.26	449.01	6.30695	4.57131	0.00098	0.00048
Sage	346.44	280.32	7.88675	7.24533	0.00046	0.00047
Springer	1488.49	1082.20	2.85683	2.00391	0.00068	0.00040
Taylor	813.97	578.51	4.57709	3.72032	0.00059	0.00040
Wiley	1690.34	1264.77	2.22926	1.72687	0.00095	0.00040

Note: The average market share of the outside option is around 45%.

Summing up, our complete model led us to significant increase in our estimates for the elasticities. This result is due to the multiplicative effect of price increases in the context of the two-sided market as discussed above. Recall that the starting point of our analysis is the assumption that the relevant business model is the reader-pays model, where the publishers concentrate their profit on readers. The implied assumption under this framework is that publishers look at two features of the market: (1) how much surplus they can extract from the each part of the market and (2) how elastic these parts are. In this setup, our estimation yields a quite elastic demand for journals. If our assumptions are correct, the publishers consider that the surplus to be extracted from readers/libraries to be higher than from the one that could be extracted from researchers, as the readers' willingness to have access to a journal is higher than the researcher's willingness to publish an article in a journal.

Results for the field analysis

We have performed field analysis for journals in Medicine and Economics. The main goal of this section is to provide the extent our estimates for own-price elasticities are sensitive to our definition of market-share. We find that elasticities remain high enough under the reduced samples, with editors seizing around 15% median mark-up. We also find that university libraries experience higher aggregate elasticities for both fields when compared to the overall sample. Such higher aggregate elasticity might reflect the effects of the simpler assumptions of the logit model or by the fact that we are able to identify a higher substitution effect among domains that it could be expected.

The Journals in Medicine

Given the importance of Medicine journals in our sample, we have performed the same analysis to this restricted sample. This field is characterized by important price and impact factor disparities across subfields, leading us to, besides controlling for the most fashionable fields, further characterize the demand with nonlinearity on the impact factor and interaction with NFP dummy. We have withdrawn from the data corresponding to years 1998 to 2000.

We find that price elasticities are high and that the two-sidedness holds for the field, that is, price elasticities increase once we account for the endogenity of the impact factor. However, when comparing these results with the complete sample ones, we find that, although our estimates for the alpha have slightly increased, individual price elasticities have reduced considerably, from a median of -33 to -12.6. In the light of our definition of market shares, such result is expected in elasticity formulas of a logit estimation. Besides, not only the individual journal's market share have increased as regard the whole sample market shares, but also prices have decreased since the observations corresponding to years 1998 to 2000 were withdrawn from the sample. Publishers seize consequently higher mark-ups with a median of 13.3% and an average 16.7%. The median marginal costs is around 413 while the average is of 717 real dollars 2000. (See Tables A1M, A2M, A3M and A4M in appendix.)

The mean aggregate elasticity, which corresponds to the effect on the demand for subscribing Medicine journals if all their prices increase by 1% *ceteris paribus*, is around -2.62. Such higher aggregate elasticity reflects the fact that libraries might be reacting to price increases by substituting medicine journals for publications in other fields.

Elsevier, which is among one of the major supplier of journals in our sample, seizes a higher mark-up on Medicine only journals than when compared to all sample.

The Journals in Economics

The analysis for journals in Economics[12] revealed a considerably high elastic demand with publishers seizing a median mark-up of 16.4%. (See Tables A1E, A2E and A3E in appendix.) Nonetheless, although the estimate is higher than on the overall sample, estimated elasticities are lower. Again, such results are led by the sensitivity of own-price elasticities to prices under the (nested) logit framework when the market share is small. The fact that journals in Economics are cheaper than a typical journal leads to lower price elasticities and higher mark-ups, everything being equal.

The estimated aggregate elasticity is slightly higher than Medicine journals, with libraries reducing by 2.68 their demand for an increase of 1% in all Economics journals. For this field, we cannot confirm whether two-sidedness is important in this field. Probably, a further characterization of these journals is in need.

Conclusion

This article has examined the market for academic journals subscriptions by French university libraries during the period 1994 to 2004. By merging two important datasets on prices, EBSCO and Swets, and journal's characteristics, JCR, with data on French university library subscriptions, we are able to characterize the properties of the demand and the extent of which two-sided markets are relevant. We also characterize some aspects of the industry's technology.

Firstly, we find that library subscriptions are substantially elastic to the price of journals. Although the lack of some information on prices of a number of journals and the lack of better information about the editing and publishing costs per journal prevent us to identify more precisely the structural parameters on this market, both own and cross price elasticities of demand are quite large and margins relatively low, indicating that competition is important in this industry.

We are able to identify some important features of the industry. Above all, our data confirms the relevance of the two-sidedness on the industry. We do not find evidence that the impact factor of a journal is correlated with change of publishers. Another side result is that NFP journals, that is, journals published by academic societies or university press are of better quality than others.

On the cost side, we find that journals differ across their ability to select good articles. A high quality journal normally enjoys lower costs of hiring a high level editorial board and motivated

[12] Data corresponding to years 1998 to 2000 have been also withdrawn.

referees. It is expected that these journals require lower effort to publish a good selection of articles. We cannot confirm the common perception that NFP journals have lower costs than FP journals.

The results obtained in this paper are striking and original. They have implications not only on the way the competition analysis of the industry should be carried out but also on the way publishers affect the scientific output.

Appendix

Table A1a: Econometric estimates of the model for journal subscriptions by university libraries

	Model 1			Model 2			Model 3		
	No Impact Factor			Exogenous Impact Factor			Endogenous Impact Factor		
							Without Impact factor equation		
			1st Stage			1st Stage			1st Stage
	Estimate	t Value	R-squared	Estimate	t Value	R-squared	Estimate	t Value	R-squared
Demand Parameters: Deterministic components of the expected utility of the journal									
Constant	-4.08705	-13.97		-4.10884	-14.04		-3.98146	-13.09	
Economics	0.44419	2.79		0.449179	2.82		0.47454	2.97	
Engineering	0.628685	5.2		0.635442	5.25		0.66266	5.43	
Mathematics	0.995996	7.4		1.003438	7.46		1.023288	7.59	
Physics	1.693018	10.7		1.689671	10.77		1.693934	10.94	
Chemistry	1.488064	10.09		1.470139	9.98		1.466018	10.07	
Probability and Statistics	-0.95153	-4.67		-0.9441	-4.64		-0.96976	-4.74	
Medicine	2.451146	7.12		2.437632	7.08		2.511206	7.2	
Issues per year	0.177121	21.8		0.176251	22.49		0.175304	24.69	
Impact Factor				**0.014928**	**1.19**		**0.023007**	**1.76**	**0.939**
ELSEVIER	0.200854	1.55		0.211478	1.62		0.232468	1.78	
ELSEVIER*UK	1.293551	7.35		1.293101	7.41		1.272103	7.42	
BLACKWELL	0.191346	1.47		0.203745	1.56		0.215362	1.65	
SPRINGER	0.763864	2.79		0.763206	2.79		0.763945	2.8	
WILEY	1.824594	10.82		1.831943	11.01		1.828038	11.26	
TAYLOR	0.72413	3.32		0.742627	3.4		0.747369	3.43	
KLUWER	0.959837	3.17		0.958162	3.17		0.962167	3.19	
US	0.158256	0.59		0.145887	0.55		0.145659	0.55	
UK	0.652514	2.4		0.638109	2.34		0.639298	2.35	
FR	0.055973	0.17		0.063682	0.19		0.07956	0.24	
DE	1.852585	4.96		1.846823	4.95		1.847062	4.97	
Med*US	-0.56447	-1.6		-0.57966	-1.65		-0.59589	-1.69	
Med*UK	-0.91177	-2.64		-0.92571	-2.68		-0.93436	-2.71	
Med*DE	-0.91408	-2.24		-0.91489	-2.24		-0.91646	-2.25	
Med*FR	-0.64913	-1.54		-0.6462	-1.53		-0.66056	-1.57	
1996	-0.20412	-1.59		-0.19992	-1.56		-0.20972	-1.62	
1997	-0.14783	-1.17		-0.14606	-1.16		-0.15749	-1.24	
1998	-0.19104	-1.09		-0.18296	-1.05		-0.2241	-1.27	
1999	0.099966	0.6		0.10277	0.61		0.053275	0.31	
2000	0.688958	3.85		0.69518	3.88		0.646045	3.55	
2001	-0.22158	-1.96		-0.21613	-1.92		-0.22018	-1.9	
2002	0.106405	0.87		0.106357	0.87		0.105055	0.85	
2003	0.323207	2.73		0.322196	2.72		0.321342	2.68	
2004	1.641693	11.02		1.63097	10.95		1.666785	10.79	
Cost Parameters: Deterministic components of the journal's expected marginal cost									
Constant	4.921391	34.68		4.881444	33.87		5.134461	29.08	
Economics	-0.21594	-3.13		-0.19896	-2.89		-0.26084	-3.54	
Engineering	0.192847	3.61		0.221148	4.1		0.099675	1.53	
Mathematics	0.38408	6.24		0.41865	6.68		0.259388	3.24	
Physics	0.652857	9.34		0.649329	9.26		0.656389	8.8	
Chemistry	0.612726	9.59		0.579641	9.11		0.671972	9.82	
Probability and Statistics	-0.53322	-5.2		-0.52809	-5.1		-0.50555	-4.74	
Medicine	0.291756	1.94		0.277249	1.85		0.327751	2.08	
Issues per year	0.05497	26.99		0.053416	26.51		0.058789	25.27	
Not for Profit	0.018598	0.48		-0.00338	-0.09		0.092175	1.92	
Impact Factor				**0.052885**	**5.34**		**-0.20623**	**-3.24**	**0.939**
Impact Factor squared				**-0.00148**	**-3.66**		**0.011349**	**3.67**	**0.7668**
Number of journals subcribed	0.002928	7.27		0.002788	6.96		0.003291	7.59	
Number of journals subcribed squared	-0.0000025	-6.93		-0.0000024	-6.68		-0.0000028	-7.24	
ELSEVIER	-0.67291	-5.04		-0.61755	-4.66		-0.73646	-5.14	
ELSEVIER*UK	0.787239	10.71		0.795138	10.81		0.7371	9.11	
BLACKWELL	-0.24535	-3.51		-0.21315	-3.07		-0.25351	-3.43	
SPRINGER	0.352711	2.89		0.371081	3.05		0.278663	2.14	
WILEY	0.859807	12.74		0.876496	12.97		0.871627	12.12	
TAYLOR	0.432182	4.54		0.478398	5		0.339683	3.13	
KLUWER	0.782093	5.75		0.794959	5.85		0.72055	4.95	
US	-0.1422	-1.22		-0.16876	-1.45		-0.06112	-0.48	
UK	0.137204	1.15		0.115541	0.97		0.153665	1.23	
FR	-0.42719	-2.91		-0.39884	-2.73		-0.50972	-3.29	
DE	0.601216	3.71		0.589322	3.64		0.643883	3.79	
Med*US	-0.18837	-1.22		-0.22309	-1.45		-0.1458	-0.89	
Med*UK	-0.22493	-1.5		-0.26253	-1.75		-0.13939	-0.87	
Med*DE	-0.22657	-1.27		-0.23423	-1.32		-0.19856	-1.06	

	Estimate	t Value	1st Stage R-squared	Estimate	t Value	1st Stage R-squared	Estimate	t Value	1st Stage R-squared
Med*FR	-0.40867	-2.22		-0.39988	-2.18		-0.44822	-2.31	
1998	0.071393	0.99		0.066489	0.93		0.092056	1.21	
1999	0.204344	2.82		0.192782	2.66		0.19154	2.48	
2000	0.158106	2.1		0.149734	1.99		0.16992	2.13	
1996	-0.04349	-0.91		-0.04561	-0.95		-0.03483	-0.69	
1997	-0.0617	-1.32		-0.06611	-1.42		-0.06188	-1.26	
2002	0.159431	3.55		0.152351	3.4		0.1834	3.87	
2003	0.253401	5.51		0.246385	5.38		0.284953	5.8	
2004	0.508324	8.34		0.492197	8.1		0.532552	8.37	
Parameters of Interest									
alpha	**0.002301**	**23.73**	**0.3137**	**0.002298**	**25.09**	**0.284**	**0.002289**	**28.69**	**0.197**
sigma	**0.916604**	**48.41**	**0.3855**	**0.913516**	**47.73**	**0.3773**	**0.947747**	**30.61**	**0.4614**
Statistics									
Nb of Observations	3834			3834			3834		
Value of the Objective Function	0.1			0.11			0.1		
Instruments									
Lagged Impact Factor							x		
Lagged Logarithm of Market Share									
Other Instruments	x			x			x		

Table A1b: Econometric Estimates of the model for journal subscription is by university libraries

(Continued)

	Model 4			Model 5			Model 6		
	Endogenous Impact Factor			Endogenous Impact Factor					
	Without Impact factor equation			With Third Equation					
	Estimate	t Value	1st Stage R-squared	Estimate	t Value	1st Stage R-squared	Estimate	t Value	1st Stage R-squared
Demand Parameters: Deterministic components of the expected utility of the journal									
Constant	-3.98601	-13.12		-3.94563	-13.07		-3.94929	-13.09	
Economics	0.474088	2.97		0.471796	2.96		0.471476	2.96	
Engineering	0.662144	5.42		0.657903	5.4		0.657548	5.39	
Mathematics	1.023176	7.59		1.01954	7.56		1.019554	7.56	
Physics	1.694655	10.89		1.689833	10.86		1.690642	10.82	
Chemistry	1.466615	10.03		1.461576	10		1.462248	9.97	
Probability and Statistics	-0.96948	-4.74		-0.97947	-4.79		-0.97938	-4.79	
Medicine	2.509763	7.2		2.505735	7.2		2.504814	7.2	
Issues per year	0.175418	23.98		0.175439	23.98		0.175556	23.36	
Impact Factor	**0.022972**	**1.76**	**0.9391**	**0.023015**	**1.76**	**0.9391**	**0.022985**	**1.76**	**0.9391**
ELSEVIER	0.232138	1.78		0.234539	1.8		0.234311	1.79	
ELSEVIER*UK	1.273516	7.39		1.270755	7.38		1.272087	7.35	
BLACKWELL	0.215272	1.65		0.215204	1.65		0.215155	1.65	
SPRINGER	0.764315	2.8		0.764455	2.8		0.764861	2.8	
WILEY	1.82938	11.19		1.828864	11.19		1.83022	11.12	
TAYLOR	0.747987	3.43		0.745931	3.42		0.746547	3.42	
KLUWER	0.962692	3.19		0.962376	3.19		0.962967	3.19	
US	0.145488	0.55		0.14715	0.55		0.14701	0.55	
UK	0.639405	2.35		0.640794	2.35		0.640968	2.35	
FR	0.078974	0.24		0.078181	0.23		0.077656	0.23	
DE	1.848111	4.97		1.85017	4.98		1.851288	4.97	
Med*US	-0.5959	-1.69		-0.58707	-1.67		-0.58714	-1.67	
Med*UK	-0.93479	-2.71		-0.92609	-2.69		-0.92656	-2.69	
Med*DE	-0.91698	-2.25		-0.90875	-2.23		-0.90931	-2.23	
Med*FR	-0.66033	-1.57		-0.66446	-1.58		-0.66433	-1.58	
1996	-0.208	-1.61		-0.21791	-1.69		-0.2163	-1.68	
1997	-0.15579	-1.23		-0.17309	-1.37		-0.17151	-1.35	
1998	-0.22174	-1.25		-0.24327	-1.38		-0.24124	-1.37	
1999	0.055848	0.33		0.038929	0.23		0.041145	0.24	
2000	0.648726	3.57		0.627802	3.47		0.630118	3.48	
2001	-0.2175	-1.87		-0.23045	-2		-0.22787	-1.98	
2002	0.106736	0.86		0.094722	0.77		0.096363	0.78	
2003	0.323134	2.7		0.315789	2.64		0.317555	2.66	
2004	1.667909	10.8		1.651003	10.75		1.652377	10.76	
Cost Parameters: Deterministic components of the journal's expected marginal cost									
Constant	5.123236	29.15		5.162608	31.05		5.153334	31.09	
Economics	-0.25618	-3.48		-0.26324	-3.65		-0.25914	-3.6	
Engineering	0.107228	1.66		0.090465	1.47		0.096974	1.58	
Mathematics	0.268612	3.37		0.25106	3.35		0.258988	3.46	
Physics	0.654202	8.79		0.638746	8.77		0.636585	8.76	
Chemistry	0.663808	9.73		0.65069	9.74		0.643245	9.64	
Probability and Statistics	-0.50288	-4.72		-0.50221	-4.88		-0.4996	-4.86	
Medicine	0.322517	2.05		0.29355	1.9		0.288577	1.87	
Issues per year	0.058323	25.27		0.058116	25.77		0.057696	25.76	
Not for Profit	0.085614	1.79		0.084657	1.86		0.078836	1.74	
Impact Factor	**-0.18831**	**-3.01**	**0.9391**	**-0.19277**	**-3.49**	**0.9391**	**-0.17692**	**-3.26**	**0.9391**
Impact Factor squared	**0.010462**	**3.44**	**0.7672**	**0.010664**	**3.97**	**0.7675**	**0.009879**	**3.75**	**0.7679**
Number of journals subcribed	0.003244	7.5		0.00322	7.66		0.003177	7.57	
Number of journals subcribed squared	-0.00000282	-7.15		-0.0000028	-7.34		-0.0000027	-7.25	
ELSEVIER	-0.72402	-5.07		-0.7152	-5.13		-0.70388	-5.06	
ELSEVIER*UK	0.739392	9.15		0.732868	9.35		0.734738	9.38	
BLACKWELL	-0.24919	-3.37		-0.24835	-3.44		-0.24444	-3.38	
SPRINGER	0.285175	2.19		0.282724	2.22		0.288484	2.27	
WILEY	0.870773	12.11		0.865838	12.29		0.864956	12.28	
TAYLOR	0.348096	3.22		0.339626	3.25		0.346935	3.32	
KLUWER	0.723224	4.97		0.713251	5.03		0.715403	5.04	
US	-0.0685	-0.54		-0.06368	-0.52		-0.07016	-0.57	
UK	0.150433	1.2		0.150073	1.22		0.147191	1.2	
FR	-0.50048	-3.23		-0.50199	-3.31		-0.49371	-3.25	
DE	0.638166	3.76		0.635518	3.82		0.630323	3.79	
Med*US	-0.15056	-0.92		-0.13252	-0.83		-0.13655	-0.86	
Med*UK	-0.14766	-0.92		-0.13052	-0.83		-0.1377	-0.88	

	Estimate	t Value	1st Stage R-squared	Estimate	t Value	1st Stage R-squared	Estimate	t Value	1st Stage R-squared
Med*DE	-0.20047	-1.07		-0.18561	-1.01		-0.18715	-1.02	
Med*FR	-0.44367	-2.29		-0.44336	-2.34		-0.43925	-2.31	
1998	0.090563	1.19		0.080794	1.09		0.079404	1.07	
1999	0.191711	2.48		0.188895	2.5		0.189047	2.51	
2000	0.168679	2.11		0.161417	2.07		0.160274	2.05	
1996	-0.03538	-0.7		-0.03622	-0.73		-0.03671	-0.74	
1997	-0.06188	-1.26		-0.07347	-1.53		-0.07355	-1.53	
2002	0.180726	3.81		0.173055	3.73		0.170593	3.68	
2003	0.281929	5.74		0.281109	5.86		0.278403	5.8	
2004	0.527998	8.3		0.498748	8.01		0.494366	7.95	
Two sided Parameters: Deterministic components of the journal's impact factor									
Physics				0.053049	1.12		0.053016	1.12	
Chemistry				0.191103	4.34		0.191064	4.34	
Medicine				0.219368	10.13		0.219341	10.13	
Engineering				0.07649	2.28		0.07643	2.28	
Lagged Impact Factor				**0.928097**	**225.92**		**0.928097**	**225.92**	
Dummy for Change of Editor				-0.00331	-0.17		-0.00318	-0.16	
Issues per year				0.005872	4.45		0.005871	4.45	
Not for Profit				0.170104	4.79		0.170025	4.79	
ELSEVIER				-0.12339	-3.3		-0.12329	-3.3	
BLACKWELL				-0.10333	-2.26		-0.10328	-2.26	
SPRINGER				-0.14328	-2.46		-0.14324	-2.46	
WILEY				-0.10494	-1.99		-0.10492	-1.99	
TAYLOR				-0.07993	-1.12		-0.07993	-1.12	
KLUWER				-0.08072	-1.06		-0.08068	-1.06	
ELETRONIC				0.111848	3.35		0.111702	3.34	
Parameters of Interest									
alpha	**0.002291**	**27.49**	**0.215**	**0.002291**	**27.5**	**0.2166**	**0.002293**	**26.48**	**0.234**
sigma	**0.947053**	**30.91**	**0.4616**	**0.952596**	**32.6**	**0.4695**	**0.952129**	**32.85**	**0.4702**
Statistics									
Nb of Observations	3834			3834			3834		
Value of the Objective Function	0,10			0,13			0,13		
Instruments									
Lagged Impact Factor	x								
Lagged Logarithm of Market Share	x						x		
Other Instruments	x			x			x		

Table A2: List of instruments

Lagged Cited Half Index
Competitors' Price per field
Competitors' nb of articles per field
Number of articles published
Number of competitors (publishers)
Number of competitors per field
Competitors' number of journals subscribed
Competitors' number of titles
Total R&D expenditures of the native country
R&D expenditures of the native country from higher level education institutions
R&D expenditures of the native country from government
Total R&D expenditures of the native country squared
R&D expenditures of the native country from higher level education institutions squared
R&D expenditures of the native country from government squared
Total R&D expenditures of the native country percentage GDP
R&D expenditures of the native country from higher level education institutions percentage GDP
R&D expenditures of the native country from government percentage GDP

Table A1m: Estimates of the model for Medicine journal subscription

	Model 1M			Model 2M			Model 3M		
	Exogenous Impact Factor			Endogenous Impact Factor			Endogenous Impact Factor With Impact factor equation		
	Estimate	t Value	1st Stage R-squared	Estimate	t Value	1st Stage R-squared	Estimate	t Value	1st Stage R-squared
Demand Parameters: Deterministic components of the expected utility of the journal									
Constant	-4.57007	-2.78		-6.70136	-3.47		-6.82595	-3.54	
Issues per year	0.639385	9.2		0.628021	8.51		0.623019	8.45	
Articles published in the year before	0.007948	3.36		0.005595	1.81		0.005606	1.82	
Not for Profit	-1.93393	-0.95		-1.34689	-0.19		-1.33368	-0.19	
Not for Profit * Impact Factor	-0.91127	-2.2		-1.47533	-0.76	0.7246	-1.49992	-0.77	0.7246
Impact Factor	0.700177	2.67		2.782862	3.69	0.9479	2.896628	3.84	0.9479
Impact Factor squared	-0.01855	-1.44		-0.13272	-3.27	0.7846	-0.139	-3.43	0.7846
Diagnostic Specialties	-1.41079	-1.63		-1.34084	-1.36		-1.3647	-1.39	
Clinical Disciplines	-0.55931	-0.83		-0.56525	-0.77		-0.57183	-0.78	
Oncology	-4.04844	-2.72		-4.22766	-2.69		-4.2124	-2.69	
Genetics and Heredity	1.747609	1.46		1.742232	1.36		1.752948	1.37	
Cardiac and Cardiovascular Diseases	3.462419	2.03		3.544719	1.96		3.522015	1.95	
Number of fields covered	0.994024	2.06		1.052569	1.89		1.018634	1.83	
Germany	3.536417	2.89		3.88992	2.99		3.920149	3.02	
Total years of subscription	-0.06132	-1.72		-0.07378	-1.91		-0.07507	-1.94	
ELSEVIER	3.520068	4.51		3.565964	4.31		3.576722	4.33	
SPRINGER	16.13124	9.84		16.80078	9.3		16.74268	9.28	
WILEY	12.1514	7.78		11.37696	6.81		11.28586	6.77	
KLUWER	4.889949	1.46		5.827208	1.65		5.71231	1.62	
NATURE	2.718472	1.22		2.849745	1.2		2.695974	1.14	
1996	-1.86538	-1.43		-2.17858	-1.57		-2.07076	-1.5	
1997	-2.5896	-1.98		-3.12519	-2.24		-3.2069	-2.31	
2001	-3.48077	-2.73		-3.91458	-2.81		-3.74397	-2.69	
2002	-3.27316	-2.66		-4.21309	-3.04		-4.16661	-3.01	
2003	-1.27748	-1.01		-2.40397	-1.74		-2.40908	-1.74	
Cost Parameters: Deterministic components of the journal's expected marginal cost									
Constant	4.706799	35.34		4.551639	30.71		4.523452	30.64	
Issues per year	0.031928	6.31		0.030903	5.85		0.030366	5.75	
Articles published in current year	0.002156	6.34		0.001781	4.47		0.001804	4.54	
Articles published in current year sqrd	0.0000015	-5.22		-0.00000139	-4.31		-0.00000143	-4.45	
Total years of subscription	-0.01237	-4.29		-0.013	-4.33		-0.01327	-4.44	
Not For Profit	-0.49956	-4.35		-0.60582	-4.86		-0.62289	-5	
Impact Factor	0.111177	5.29		0.276537	4.56	0.9479	0.298175	4.94	0.9479
Impact Factor squared	-0.00341	-3.27		-0.01256	-3.78	0.7846	-0.01376	-4.16	0.7846
Oncology	-0.16634	-1.4		-0.18202	-1.47		-0.1808	-1.46	
Genetics and Heredity	0.107917	0.79		0.105239	0.74		0.103315	0.72	
Number of fields covered	0.13831	3.57		0.145438	3.61		0.140984	3.51	
Germany	0.12793	1.3		0.151521	1.48		0.159023	1.56	
ELSEVIER	0.326247	5.19		0.320698	4.9		0.323471	4.97	
BLACKWELL	0.284636	4.31		0.274558	3.95		0.268335	3.88	
NATURE	0.186084	1.03		0.207488	1.1		0.18317	0.98	
SPRINGER	1.253069	11.05		1.27983	10.8		1.274677	10.81	
WILEY	1.184148	10.27		1.10078	8.96		1.088131	8.9	
KLUWER	1.041047	3.84		1.106724	3.91		1.087539	3.86	
1996	-0.00267	-0.03		-0.02564	-0.23		-0.00734	-0.07	
1997	-0.0326	-0.31		-0.07067	-0.64		-0.08677	-0.79	
2001	0.108371	1.06		0.080394	0.75		0.11001	1.03	
2002	0.153793	1.56		0.085269	0.81		0.092239	0.88	
2003	0.353733	3.44		0.260609	2.34		0.258543	2.34	
Two sided Parameters: Deterministic components of the journal's impact factor									
Constant							0.142438	3.55	
Lagged Impact Factor							0.960018	126.96	
Oncology							0.026609	0.3	
Genetics and Heredity							-0.10456	-1.19	
Cardiac and Cardiovascular Diseases							0.083156	0.8	
Not for Profit							0.158303	1.88	
Issues per year							0.006508	1.72	
Articles published in the year before							-0.00002	-0.16	
Parameter of Interest									
alpha	**0.016291**	**18.07**	**0.3613**	**0.016557**	**15.94**	**0.3593**	**0.016522**	**15.96**	**0.3596**
Statistics									
Nb of Observations	1030			1030			1030		
Value of the Objective Function	0.18			0.21			0.25		
Instruments									
Lagged Impact Factor	x			x					
Other Instruments	x			x			x		

Note: the years 1998 to 2000 were not included in the analysis.

Table A2m : Summary of Structural Estimates for Journals in Medicine

	Own Elasticity		Cross Elasticity		Marginal Cost		Mark Up (Percentage)	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Model 1M	-11.85	-7.278	0.027	0.008	661.62	381.91	17.89	14.35
Model 3M	-12.65	-7.749	0.02	0.007	712.97	413.36	16.49	13.29

Table A3m: Structural Estimates for Journals in Medicine

Model 1M: Impact Factor Exogenous												
	Own Elasticity		Cross Elasticity		Cross Editor Elasticity		Marginal Cost		Mark Up (Percentage)		Market Shares	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Blackwell	-11.383	-7.262	0.034	0.009	0.032	0.009	632.667	394.246	17.758	14.087	0.003	0.001
Cambridge	-16.244	-5.794	0.017	0.007	0.016	0.006	932.138	293.947	17.942	17.302	0.001	0.001
Elsevier	-11.439	-7.11	0.026	0.009	0.024	0.007	635.12	371.477	18.697	14.934	0.002	0.001
Kluwer	-9.011	-5.895	0.029	0.008	0.026	0.007	488.868	288.091	25.613	19.841	0.005	0.001
Lippincot	-12.425	-7.767	0.028	0.007	0.027	0.006	698.676	414.381	15.436	13.184	0.002	0.001
Oxford	-10.655	-7.761	0.022	0.009	0.02	0.008	588.305	413.788	17.878	13.114	0.002	0.001
Sage	-10.865	-8.526	0.009	0.006	0.008	0.006	600.038	461.242	16.434	11.76	0.001	0.001
Springer	-13.441	-6.874	0.026	0.007	0.024	0.006	760.452	358.558	17.677	14.965	0.002	0.001
Taylor	-14.084	-8.865	0.021	0.01	0.019	0.007	799.483	479.234	16.143	12.068	0.002	0.001
Wiley	-12.111	-7.349	0.025	0.008	0.023	0.007	678.725	388.431	17.611	14.263	0.002	0.001
Model 3M: Impact Factor Endogenous with Equation												
	Own Elasticity		Cross Elasticity		Cross Editor Elasticity		Marginal Cost		Mark Up (Percentage)		Market Shares	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Blackwell	-12.2	-8.161	0.015	0.008	0.013	0.007	685.009	436.709	15.993	12.711	0.001	0.001
Cambridge	-17.826	-5.783	0.019	0.006	0.017	0.005	1031.24	293.83	19.252	17.335	0.001	0.001
Elsevier	-11.564	-7.644	0.017	0.007	0.016	0.006	645.885	405.11	17.259	13.74	0.002	0.001
Kluwer	-10.696	-5.526	0.03	0.008	0.028	0.007	592.965	271.237	20.198	20.119	0.006	0.001
Lippincot	-13.053	-8.064	0.024	0.006	0.023	0.006	738.613	433.825	15.153	12.717	0.002	0.001
Oxford	-12.305	-8.257	0.014	0.008	0.014	0.007	691.49	442.114	16.183	12.453	0.001	0.001
Sage	-11.288	-9.196	0.009	0.007	0.009	0.007	627.326	502.609	16.389	11.065	0.001	0.001
Springer	-14.932	-7.143	0.027	0.006	0.025	0.006	853.681	377.146	16.655	14.134	0.002	0.001
Taylor	-16.162	-10.488	0.024	0.011	0.021	0.007	928.281	583.125	14.519	9.535	0.002	0.001
Wiley	-13.721	-8.958	0.025	0.007	0.024	0.007	778.9	487.303	15.985	11.58	0.002	0.001

Note: The average market share of the outside option is around 72%.

Table A4m: List of instruments for Journals in Medicine

List of Instruments
Lagged Logarithm of Market Share
Lagged Cited Half Index and its squared value
Competitors' average and median Prices
Competitors' average and median nb of articles
Number of competitors (publishers)
Competitors' number of subcribed journals and its squared value
Editor's number of subscribed journals
Year step dummy for main editors offering electronic version of printed journals
Total R&D expenditures of the native country and percentage GDP
R&D expenditures of the native country from higher level education institutions and percentage GDP
R&D expenditures of the native country from government and percentage GDP

Table A4e: Estimates of the model for subscriptions on Journals in Economics

	Model 1E			Model 2E			Model 3E		
	Exogenous Impact Factor			Endogenous Impact Factor			Endogenous Impact Factor With Impact factor equation		
	Estimate	t Value	1st Stage R-squared	Estimate	t Value	1st Stage R-squared	Estimate	t Value	1st Stage R-squared
Demand Parameters: Deterministic components of the expected utility of the journal									
Constant	-12.7336	-8.02		-13.2083	-7.99		-13.2757	-8.05	
Issues per year	1.693541	5.62		1.643856	5.42		1.63594	5.4	
Articles published in the year before	0.056969	3.38		0.060321	3.45		0.060334	3.45	
Not for Profit	-3.83472	-1.87		-4.62641	-2.16		-4.53969	-2.13	
Impact Factor	1.266319	1.42		2.292711	2.1	0.744	2.44985	2.25	0.744
ELSEVIER	10.4301	7.17		10.28937	6.95		10.33945	7.03	
SPRINGER	5.982034	1.25		6.074491	1.27		5.951031	1.25	
WILEY	13.4808	3.35		13.19214	3.26		13.42739	3.33	
KLUWER	5.624446	3.39		5.784766	3.44		5.641204	3.37	
OXFORD	3.214535	1.25		3.978025	1.51		3.695827	1.41	
Trend	0.71436	5.3		0.70732	5.18		0.707429	5.21	
Cost Parameters: Deterministic components of the journal's expected marginal cost									
Constant	3.470096	13.9		3.420213	13.29		3.420796	13.32	
Issues per year	0.168158	5.77		0.167013	5.7		0.165243	5.65	
Not For Profit	-0.51592	-1.89		-0.58638	-2.08		-0.56565	-2.01	
Impact Factor	0.201848	1.77		0.308196	2.23	0.744	0.326578	2.36	0.744
Step dummy for change of publisher	-0.11438	-0.91		-0.11582	-0.92		-0.1125	-0.9	
Nb of journals subscribed per publisher	0.002163	1.66		0.002149	1.64		0.002206	1.69	
Nb of journals subsc per publisher sqrd	0.0000034	-2.58		-0.00000352	-2.6		-0.00000334	-2.48	
ELSEVIER	1.429095	3.22		1.432182	3.21		1.358366	3.05	
SPRINGER	0.766432	1.25		0.780757	1.27		0.76314	1.25	
WILEY	1.757871	3.46		1.723998	3.38		1.76326	3.48	
TAYLOR	0.744847	2.15		0.731751	2.1		0.74339	2.14	
KLUWER	1.228688	5.55		1.238761	5.55		1.220229	5.5	
OXFORD	0.728563	2.16		0.794318	2.29		0.750001	2.18	
Trend	0.075578	3.75		0.074986	3.69		0.072422	3.59	
Two sided Parameters: Deterministic components of the journal's impact factor									
Constant							0.086368	1.49	
Lagged Impact Factor							0.791324	20.52	
Articles published in the year before							-0.00127	-1.71	
Issues per year							0.021556	1.8	
Not for Profit							0.101171	1.56	
Parameter of Interest									
alpha	**0.022334**	**12.95**	**0.5787**	**0.022355**	**12.28**	**0.5824**	**0.022352**	**12.34**	**0.5812**
Statistics									
Nb of Observations	228			228			228		
Value of the Objective Function	0.35			0.34			0.54		
Instruments									
Lagged Impact Factor	x			x					
Other Instruments	x			x			x		

Note: the years 1998 to 2000 were not included in the analysis.

Table A2e: Structural Estimates for Journals in Economics

Model 3E: Impact Factor Endogenous with Equation

	Own Elasticity		Cross Elasticity		Cross Editor Elasticity		Marginal Cost		Mark Up (Percentage)		Market Shares	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
American Economic Association	-3.481	-3.591	0.202	0.025	0.179	0	117.038	116.664	28.963	27.85	0.054	0.007
Blackwell	-5.269	-4.041	0.047	0.021	0.045	0.02	185.709	128.59	32.582	31.862	0.01	0.005
Cambridge	-3.933	-2.506	0.039	0.021	0.029	0.009	131.394	67.417	35.933	40.01	0.012	0.006
Elsevier	-20.136	-18.437	0.227	0.092	0.221	0.088	855.855	772.806	8.817	6.717	0.01	0.006
International Monetary Fund	-1.21	-1.257	0.053	0.009	0.045	0	9.645	11.584	83.017	79.534	0.043	0.007
Kluwer	-13.547	-12.381	0.082	0.051	0.07	0.043	563.367	509.658	9.68	8.221	0.006	0.005
M I T Press Journals	-5.24	-5.305	0.179	0.03	0.153	0	196.311	193.512	19.28	18.893	0.028	0.006
Oxford	-4.608	-4.671	0.031	0.025	0.024	0.017	161.536	163.702	27.902	22.093	0.007	0.005
Sage	-9.647	-4.407	0.058	0.02	0,000	0	389.199	153.172	21.253	22.692	0.005	0.005
Springer	-13.951	-13.288	0.054	0.043	0.008	0	581.566	552.481	20.076	19.556	0.005	0.005
Taylor	-10.19	-8.753	0.156	0.045	0.118	0.006	417.155	349.082	11.131	11.5	0.012	0.006
The Rand Journal Of Economics	-3.763	-3.763	0.182	0.182	0.156	0.156	129.496	129.496	26.638	26.638	0.046	0.046
University Of Chicago F	-3.607	-4.459	0.026	0.017	0.023	0.013	113.639	151.371	39.415	24.38	0.012	0.005
Wiley	-16.826	-17.493	0.183	0.07	0.116	0.014	715.759	751.22	6.746	6.05	0.01	0.006
All Journals in Economics	-11.197	-6.943	0.121	0.042	0.11	0.033	456.043	265.266	21.675	16.399	0.012	0.006

Note: The average market share of the outside option is around 52%.

Table A3e: List of instruments for Journals in Economics

Lagged Logarithm of Market Share
Lagged Cited Half Index
Competitors' average and median Prices
Competitors' median impact factor
Number of competitors (publishers)
Competitors' number of journals and subcribed journals
Dummy for journals that have an open access policy (REPEC) and its interaction with time the policy started
Year step dummy for main editors offering electronic version of printed journals
Total R&D expenditures of the native country and percentage GDP
R&D expenditures of the native country from higher level education institutions and percentage GDP
R&D expenditures of the native country from government and percentage GDP

References

Armstrong, Mark (2005): "Competition in Two-Sided Markets," *Mimeo*.

Berry, S. (1994): "Estimating Discrete Choice Models of Product Differentiation," *RAND Journals of Economics*, 25(2), 242-262.

Berry, S., J. Levinsohn and A. Pakes (1995): "Automobile prices in equilibrium," *Econometrica*, 63(4), 841-890.

Bresnahan, T., S. Stern and Trajtenberg (1997): "Market Segmentation and the sources of rent from innovation: personnal computers in the late 1980s," *RAND Journal of Economics*, 28(0), S17-S44.

Case, Mary M. (2004): "A Snapshot in Time: ARL Libraries and Electronic Journal Resources," *Association of Research Libraries,* Bimonthly Report 235.

Dewatripont, M., V. Ginsburg, P. Legros, A. Walckiers, J-P. Devroey, M. Dujardin, F. Vandooren, P. Dubois, M. Ivaldi, J. Foncel, M-D. Heusse (2005): "Study on the economic and technical evolution of the scientific publication markets in Europe," Final Report, December 2005.

Edlin, Aaron and Daniel Rubinfeld (2004): "Exclusion or efficient pricing? The "Big Deal" bundling of academic journals," *ABA: Antitrust LJ*, 72(1), 128-159.

Jeon, Doh-Shin and Jean-Charles Rochet (2006): "The Pricing of Academic Journals: A Two-Sided Markets Perspective," *Mimeo*.

Journal of Citation Report (2006): "Using JCR wisely," sourced on 18/05/2006 at http://jcrweb.com/www/help/ hjcr_a2.htm.

Jullien, Bruno (2004): "Two-Sided Markets and Electronic Intermediation," *IDEI Working Papers*, 295.

McFadden, D. (1973): "Conditional logit analysis of qualitative choice behaviour," in *Frontier of Econometrics,* ed. by P. Zarembka. New York: Academic Press.

McFadden, D. (1984): "Econometrics analysis of qualitative response models," in *Handbook of Econometrics, Volume III*, ed. by S. Griliches and M. Intilligator. Amsterdam: North-Holland.

McCabe, Mark J.(2004), "Law Serials Pricing and Mergers: A Portfolio Approach," *Contributions to Economic Analysis and Policy*, 3(1), 1221-1221.

McCabe, Mark J. and Christopher M. Snyder (2005): "Open Access and Academic Journal Quality," AER, 95(2), 452-458.

Monroe, Mary H. (2005): "The Academic Publishing Industry: A Story of Merger and Acquisition," *Information Access Alliance and Association of Research Libraries*, sourced 06/07/2005 at http://www.niulib.niu.edu/publishers/index.htm .

Nevo, Aviv (1997): "Demand for the ready-to-eat cereal and its implications for price competition, merger analysis and valuation of new goods," PhD Dissertation, Harvard University.

Rochet, Jean-Charles and Jean Tirole (2003): "Platform Competition in Two-sided Markets," *Journal of the European Economic Association*, 1(4), 990-1029.

Rochet, Jean-Charles and Jean Tirole (2005), "Two-Sided Markets: A Progress Report", *IDEI Working Papers*, 275.