

# ECONOMIC SUSTAINABILITY DURING TRANSITION: THE CASE OF SCHOLARLY PUBLISHING

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Paper to be presented at the ELPUB conference – Milano, June 2009  
April 6,2009

## **Abstract**

In recent years, Open Access has received increased attention by scholars and practitioners as an alternative paradigm to traditional journals for publication and diffusion of scholarly publishing. The steady increase in the number of successful Open Access journals shows that the model is a viable alternative in terms both of reputation and visibility; recent studies have also demonstrated its cost-effectiveness. However, the analysis of the sustainability of different models for scholarly publishing needs to take into consideration the existence of network externalities and information asymmetries, that generate two sided markets; the introduction of innovative business models needs to overcome the problem of reaching critical mass both on the readers' and on the authors' market.

In this exploratory paper, we seek to understand to what extent offering configuration contributes to double market development; we compared twelve peer reviewed scientific journals, selected from different academic disciplines. Within each group we selected a pure Open Access (OA) journal, a journal that converted from Toll Access (TA) to Open Access, a hybrid journal, and a pure traditional TA journal. We mapped the offering characteristics and we classified them in terms of accessibility for the reader, visibility for the author and benefits for researchers; we added also information on the pricing scheme of the journal.

Results show a pre-eminence of OA titles in each of the three markets – as they took advantage in a faster and cost effective way of the possibilities offered by digitization technologies -, even though TA journal have been

quick in keeping up with the innovative services offered by OA journals; on the other side many TA journals still enjoy significant first mover advantage and reputational rents, that they can leverage to strengthen their offering. In the asymmetry of the scholarly communication market, competition on the author side is therefore likely to be very strong.

The presence in the market of a variety of business models has benefited the research community, as services have increased, the refereeing process is becoming more transparent, high quality contribution have higher chances to be accessed by wider market segments.

We did not find a significant correlation between business models and offering configuration, neither between price and offering configuration, nor IF and offering configuration, although a wider access has determined an acceleration in the ability of OA journals to reach visibility. As the two business models are likely to be increasingly in direct competition for scarce financial and reputational resources, we expect that publishers (both OA and TA) will look for specific offering configurations for the different research communities they are targeting. In this transition phase, universities are going to play a key role in orienting the development of offerings by different publishers.

**Keywords:** Open Access; Toll Access; e-journals; sustainability of business models; two sided markets

## **1. Introduction**

In recent years, Open Access has received increased attention by scholars and practitioners as an alternative paradigm to traditional journals for publication and diffusion of scholarly publishing [1]. The willingness to contrast the high bargaining power of commercial publishers on the one hand, together with the opportunities offered by digital technologies to redefine products, services and processes on the other were the drivers of a structural change in the competitive configuration of scholarly publishing.

In this paper we compare different types of peer reviewed scientific journals, ranging from Toll Access (TA) traditional publications to Open Access (OA) ones. As Suber explains, the two models differ by copyright policy – in OA the author retains the copyright on his/her work, in order to reuse it for academic and teaching purposes – and by the business models put

in place to cover for article processing charges [2]. While in traditional journals readers pay, via subscription or pay per view, Open Access journals are financed via membership, author contribution of article processing fees, institutional funding. 47% of OA journal require a payment of article processing fees, and in most disciplines the publication costs are covered by the research grant [3].

In parallel with the evolution of different forms of intellectual property protection in addition to copyright, diffusion of scholarly publications has been favored also by the diffusion of open archives (the so called “green road” to research dissemination [4]); as in this paper we are mainly interested in research publication as part of a broader process of research dissemination, archives will be only marginally taken into consideration.

In order to prove the validity of the alternative model in reducing abnormal economic returns deriving to commercial publishers from artificial scarcity [5], contributors in favor of open forms of publication and diffusion of scholarly research outcomes stress optimal utilization of public funding [6], fewer chances of distortion of results and access also to negative results [7], non discrimination in the access of content by researchers from poorer countries or institutions [8], faster circulation of ideas and research results on a broader number of research communities [9], higher visibility of authors [10]. Broadly speaking, OA journals seem more ready to take advantage of the possibilities offered by digital technologies to redefine and make more efficient teaching and research processes [11]. More skeptical publishers and researchers stress the lower quality of open publications versus more established forms of diffusions, information redundancy, higher risk of plagiarism as drawbacks of open models, suggesting that public funding would be better spent in improving the efficiency of the existing system rather than proposing an alternative one [12].

In the last few years, the number of OA journals has increased steadily from 602 titles present in DOAJ, the Directory of Open Access Journals, in December 2003, to 4,010 (on April 4<sup>th</sup>, 2009), in parallel with and in partial reaction to a huge increase in price of traditional journals: according to the American Research Libraries (ARL) Association Statistics 2006-2007, the median serial expenditures has increased by 340% from 1996 to 2007 [13]. As of April 4<sup>th</sup> 2009, OA journals represent almost 16% of the total 25,504 academic refereed active journals listed in the Ulrich’s Periodicals Directory on the same day.

By introducing innovations in how research outcomes are published and distributed and relative costs are covered, OA has represented in the publishing scenery «one of the most exciting and radical events in recent

years» [14]: it is not surprising that in the past few years many OA journals have opened, some experiments have aborted, while a handful of titles succeeded in directly competing with their traditional best in class competitors in terms of impact and visibility. As a recently submitted study by Giglia and Migliore [15] shows, 4,91% of the titles indexed in Journal of Citation Reports 2007 Science edition is Open Access, with a rapid growth from the 2003 1,47%. Moreover, 36,49 % of these titles rank in the first 5 percentiles by Impact Factor (citations of the former two years), and 38,15% by Immediacy Index (citations of the current year in JCR, i.e. 2007).

The steady increase in the number of successful Open Access journals shows that the model is a viable alternative to traditional journals in terms both of reputation and visibility [16]. OA appears also to be more cost-effective for scholarly communication: in an in-depth study based on Bjork's model of scholarly communication [17] and tailored on the British academic system, Houghton and his team pointed out not only the cost savings, but also the increase in return on investment offered by green and gold OA for the institutions involved, with a level of financial requirements compatible with resources currently allocated [18]. The fact that Springer purchased BMC – one of the most successful for profit Open Access publishers – in October 2008 and that several publishers are integrating their offering with forms of “open choice” is a sign that these models are not a temporary fad, but at the same time shifts the debate from a legitimacy issue to that of sustainability of increasingly hybrid models – in which free access is compensated by the payment of a variety of services or by various forms of institutional support -, while at the same time opening the issue of future industry configuration for different scientific disciplines.

According to management and economic literature, sustainability has to do with the following characteristics: effectiveness (meeting the stated goals), efficiency (minimizing the resources utilized to reach the stated goal), durability (the possibility to operate over time), which often implies the introduction of innovative solutions to cope with a changing context. The analysis of the sustainability of different models for scholarly publishing needs to take into consideration the existence of network externalities and information asymmetries, that generate two sided markets [19]. Markets with network externalities are characterized by the presence of two distinct sides, whose ultimate benefit stems from interacting through a common platform. In order to reach critical mass, platforms often treat one side as a profit center and the other as a loss leader, or, at best, as financially neutral. Reputation and brand equity [20] are the outcomes of the effectiveness of double markets functioning, leading to a self reinforcing mechanism. Academic publishing is

characterized by the presence of hyperspecialised clanic communities; the control of reference publications determines strong resilience effects and first mover advantages. The introduction of innovative business models needs to overcome the problem of reaching critical mass both on the reader and on the author market.

Digitization has changed the rules of management of externalities, by making content “liquid” [21]: a physical mean like paper is no longer necessary to diffuse content. For the purposes of our paper, this has several consequences: protection of artificial scarcity has become more difficult, as the physical constraint of the number of pages available for publication has weakened; control of physical distribution channels is no longer a barrier to diffusion; boundaries between scholarly “publication” and “communication” are less clear, as researchers have the possibility to diffuse their work in progress [22]. Open archives (in the form of institutional or subject repositories) often rely on collaborative non-profit model such as Wikipedia and allow the deposit of pre/postprints and generally offer good indexing and high visibility also on generalist search engines. They are therefore a competitive and cost effective way to grant early visibility and access to research outcomes. Out of the 579 publishers listed in RoMEO, 62% allow some form of selfarchiving – 11% pre-print prerefereeing, 21% post.-print, 30% pre and postprint. It is also to be noted that 107 publishers allow selfarchiving also for the .pdf print version of the article (70 with no restrictions, 23 with a variable period of embargo, 11 with an explicit permission, 3 with a fee, as of April 4<sup>th</sup> 2009) [23].

In this exploratory paper, we seek to understand to what extent offering configuration (i.e. what the journal offers to both readers and authors) contributes to double market development. In this paper, we use the term «offering» [24] to define all the attributes qualifying what a company has to offer to its customers or stakeholders. As far as customers are concerned, the offering consists of five elements:

- core technical characteristics of the product or service provided (for example access to content in PDF format);
- price (membership, subscription, pay per view, free access);
- conditions limiting or fostering access or possession (as in the case of some TA papers that are made freely available after a given time from publication);
- immaterial and service elements (indexing on search engines; tagging; comments; exportability to reference manager software...)

- elements affecting the relationship with the customer before, during, after publication (journal and editorial board reputation).

Given the huge information asymmetries characterizing research publication, it is not clear, nor has it been explored, whether richness of offering is conducive to a faster and higher development of a two sided market.

In the following paragraphs, we briefly describe offering configuration in scholarly publishing. Based on the analysis of twelve successful examples in different disciplines, we seek to answer to the following questions:

- is richness of offering an antecedent to success?
- which elements of the offering are viewed as more conducive to success?
- are there significant differences in offerings across scientific disciplines?

## **2. Methodology**

In order to compare different models in their ability to create a two sided market, we selected a sample of journals from different academic disciplines, grouped in the following macro areas: sciences, medicine, social sciences, humanities. Within each group we selected a pure Open Access (OA) journal, a journal that converted from Toll Access (TA) to Open Access, a hybrid journal, that is a TA journal that offers OA based on a fee and a pure traditional TA journal. The criteria of inclusion in the sample were the following:

- scientific quality; we looked for peer-reviewed journals. Only one, «*Bollettino telematico di filosofia politica*», is not peer reviewed but ensures scientific integrity by a quality filter performed by the editorial board, and openly lists on its site also the rejected articles;
- visibility of the journal; where possible, we chose titles with Impact Factor, which is a worldwide comparable indicator, notwithstanding its limitations. This was not possible for all the titles in the Humanities category, as they are not tracked by the ISI Journal Citation Reports;
- innovativeness of platform used as far as OA journals are concerned;
- relevance of publisher as far as TA titles are concerned. As scholarly publishing is a very concentrated industry, offering characteristics of a given journal are common to all journals

published by the same publisher; we therefore looked for TA journals published by different commercial publishers, so as to take into consideration competitive dynamics within the traditional scientific publishing.

- variety of disciplines. Scientific communities follow different practices of communication of the outcomes of their research; moreover, editorial formats differ significantly, as communication of results require various media to be effectively communicated.

For each of the titles chosen, we conducted a desk analysis aimed at describing offering configuration and – in the case of converted journals – the reasons behind the change of the model; we identified the IF when present, the date of startup of the journal (for journals that converted from TA to OA we indicated the date of availability in OA form), whether the title was available in paper and digital format. We mapped the offering characteristics and we classified them in terms of accessibility for the reader, visibility for the author and benefits for researchers. We then gathered information on the pricing scheme of the journal, considering the print + online fee in US dollars for big-size institution based in Europe (all prices are expressed in USD at the exchange rate of April 1st 2009). In looking at services offered, we took three perspectives: the reader, the author, the researcher. Although in scientific publishing the three roles often coincide, each of them has specific needs that can be addressed separately. We did not map services available to a fourth crucial category, i.e. reviewers, as in this paper we are focusing on the process of double market of authors and readers creation. Accessibility for readers was operationalised by looking at the extent to which content was available in digital format and free of charge; reliability was addressed via peer-review. Services to authors had to do with the visibility obtained through the publication and dissemination of their results; we therefore looked not only for ease of retrieving via search engines but also for early access to results via in-print services on the publisher's platform and the selfarchiving policy, when allowed by the publisher. Where not specified, for some OA journals, data are bracketed meaning that selfarchiving is implicit in the journal policy. We also considered the presence of a format other than .pdf, which enables new technologies such as text and data mining, and the development of an increasing number of overlay services [25]. Benefits for researchers referred to the ease of using the published material as a starting point for a further referencing process and the presence of features adding value to search, share and update: editorial platforms are increasingly shaped by Web 2.0 tools like RSS feeds, the possibility to post comments, to tag articles, to share them in social bookmarking environments. On this pathway, PLoS ONE's most

innovative platform could not be considered because not yet tracked by ISI: but its possibility to add notes within the text stands unique in the existing publishing scenario, in the very spirit of “dialogue” of the first academic journals. Elsevier’s platform Science Direct has recently added an appealing “2collab” link for comments, tags, and rating. This last option is unique in our sample. Springer offers the “Author’s mapper” feature (a unique feature as well).

Virtually all of the examined platforms offered a rich variety of predefined searches by selected keyword-title-author both in specialized search engines like Google Scholar and in specific subject sources, like Teaching files or Dissertations or subject hubs. SciELO, the Brazilian OA platform, profiles users in a very sophisticated way, making it possible to users to save collections and searches and to set alerts on favourite topics.

Results are presented in tables 1 to 4, splitted by subject areas.



Area	Humanities				
	OA	OA converted	hybrid	TA	
Type of publication					
Title	Bollettino Telematico di Filosofia Politica	Hispania	Linguistics and Philosophy	Journal of Urban History	
Publisher	Dip. scienze della politica, Fac. Sc. Pol. Univ. Pisa	Consejo Superior de investigaciones científicas	Springer	Sage	
First year online	2000	(1940) 2006	2004	1974	
Accessibility and reliability for readers	Impact Factor ISI	no	no	no	0,180 (rank 27/30)
	peer review	quality evaluation	x	x	x
	visible process of peer review				
	digital format	x	x	x	x
	free abstract	x	x	x	x
	free text	x	x	\$3.000 + VAT	
Visibility for the author	indexing in subject databases		x	x	x
	selfarchiving allowed	(pre/post)	(pre/post)	pre/post	pre
	visibility on search engines	x	x	x	x
	formats other than pdf	x			
	articles in press			x	x
	statistics per article			x	x
Benefits for researchers	multimedia				
	online references of cited articles	x	x	x	x
	cited by	x	x	x	x
	related articles		x	x	x
	predefined keyword/author research in other databases		x	x	x
	comments	blog			
	social bookmarking	x		x	x
	rating and/or tagging				
	author's mail	x	x	x	x
	citation export to endnote etc.			x	x
	alert for news via mail			x	x
	alert when cited				x
	profiling (My...)	x	x	x	x
RSS feed	x		x	x	
Price	pay per view			\$34	\$20
	subscription		online free print \$97,68	\$ 1.012	print+online \$917
	OA article processing charge	free	free	\$ 3.000 + VAT	
	institutional membership				

Table 1: offering characteristics for Humanities journals

Area	Medicine				
	Type of publication	OA	OA converted	hybrid	TA
Title	BMC Cancer	Environmental Health Perspectives	Cancer Gene Therapy	Cutaneous and Ocular Toxicology	
Publisher	BioMed Central	NIEHS	Nature	Taylor&Francis	
First year online	2001	(1972) 2004	(1999/2005 free) 2006- for fee	1982	
Accessibility and reliability for readers	Impact Factor ISI	2,709 (rank 61/132)	5,636 (rank 1/160)	3,889 (rank 16/81)	0,383 (rank43/45)
	peer review	x	x	x	x
	visible process of peer review	x			
	digital format	x	x	x	x
	free abstract	x	x	x	x
free text	x	x	\$3,000 fee		
Visibility for the author	indexing in subject databases	x	x	x	x
	selfarchiving allowed	pre/post/PDF	(public domain)	pre	pre
	visibility on search engines	x	x	x	
	formats other than pdf	x	x	x	
	articles in press	x	x	x	x
statistics per article	x				
Benefits for researchers	multimedia	x		x	
	online references of cited articles	x	x	x	x
	cited by	x			
	related articles	x	x	x	x
	predefined keyword/author research in other databases	x		x	
	comments	x			
	social bookmarking	x			x
	rating and/or tagging				
	author's mail	x	x	x	x
	citation export to endnote etc.	x		x	x
	alert for news via mail	x	x	x	x
	alert when cited				
profiling (My...)	x		x	x	
RSS feed	x	x	x	x	
Price	pay per view			\$32	\$45
	subscription	online free no print edition	online free print \$363	print only \$1867	\$1.880
	OA article processing charge	\$1.465 (free if member)	\$30 per page	\$3,000	

Table 2: offering characteristics for Medicine journals

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Area	Social sciences				
	OA	OA converted	hybrid	TA	
Type of publication					
Title	Journal of the Medical Library Association	EURE Revista Latinoamericana de Estudio Urbano	European Sociological Review	International Journal of Manpower	
Publisher	Medical Library Association	SCiELO	Oxford Univ. Press	Emerald	
First year online	(1898) 2002	1997	1985	1980	
Accessibility and reliability for readers	Impact Factor ISI	1,392 (rank 14/56)	0,167 (rank 29/30)	0,855 (rank 32/96)	0,188 (rank 80/81)
	peer review	x	x	x	x
	visible process of peer review				
	digital format	x	x	x	x
	free abstract	x	x	x	x
free text	x	x	\$1.800/3.000		
Visibility for the author	indexing in subject databases	x	x	x	x
	selfarchiving allowed	(pre/post)	(pre/post)	pre - NO PDF	pre/post
	visibility on search engines	x	x	x	x
	formats other than pdf	x	x	x	x
	articles in press	x		x	
statistics per article	x	x			
Benefits for researchers	multimedia				
	online references of cited articles	x	x	x	x
	cited by		x	x	
	related articles	x	x	x	x
	predefined keyword/author research in other databases	x	x	x	
	comments	blog			
	social bookmarking			x	
	rating and/or tagging				
	author's mail	x	x	x	x
	citation export to endnote etc.		x	x	x
	alert for news via mail	x	x	x	x
	alert when cited		x	x	
profiling (My...)		x	x	x	
RSS feed	x	x	x	x	
Price	pay per view				\$18,75
	subscription	online free \$210 print	online free \$120 print	print +online \$618	print+online? \$13.369
	OA article processing charge	free	free	\$1.800 if subscr \$3.000 if not	
	institutional membership	x			

Table 3: offering characteristics for Social Sciences journals

Area	Sciences				
	OA	OA converted	hybrid	TA	
Type of publication					
Title	PLoS Biology	Fixed Point Theory and Application	PNAS Proceedings of the National Science	Computer Languages Systems and	
Publisher	Public Library of Science	Hindawi	National Acad. Science	Elsevier	
First year online	2003	(2004) 2006	1997	2002	
Accessibility and reliability for readers	Impact Factor ISI	13,5 (rank 1/70)	0,562 (rank 93/207)	9,598 (rank 3/50)	0,429 (rank 69/84)
	peer review	x	x	x	x
	visible process of peer review				
	digital format	x	x	x	x
	free abstract	x	x	x	x
free text	x	x	\$1.200 fee (\$850)		
Visibility for the author	indexing in subject databases	x	x	x	x
	selfarchiving allowed	pre/post	pre/post/PDF	pre/post	post - NO PDF
	visibility on search engines	x	x	x	x
	formats other than pdf	x	x	x	x
	articles in press		x		x
statistics per article	x				
Benefits for researchers	multimedia	x			
	online references of cited articles	x	x	x	x
	cited by	x		x	x
	related articles	x		x	x
	predefined keyword/author research in other databases	x		x	
	comments	x			
	social bookmarking	x		x	x
	rating and/or tagging				x
	author's mail	x	x	x	x
	citation export to endnote etc.	x		x	x
	alert for news via mail	x			x
	alert when cited			x	x
profiling (My...)	x		x	x	
RSS feed	x	x		x	
Price	pay per view			\$10/25	\$31,50
	subscription	online free print \$415	online free print \$195	print + online \$8.865	\$1.234
	OA article processing charge	\$2.850 (waived if	\$550 (free if member)	\$1.200 (\$850 instit.)	
	institutional membership	x	x	x	

Table 4: offering characteristics for Science journals

Generally speaking, there is a mild correlation between IF and variety of services offered; IF seems to be more related to the age of the title. OA journals outperform the other categories as far as accessibility for readers is concerned. Moreover, the richest platforms in terms of services offered are OA; all four types of journals considered in all disciplines, though, offer a good mix of services. Except for Humanities, benefits for researchers tend to be higher in OA models.

In all disciplines, there is a strong competition between types of journals in the services offered to the author; in scientific and medical disciplines competition seems tougher, as the services offered to authors are more sophisticated than in other types of disciplines. In general, OA converted journals are less rich in services offered both to authors and to researchers; the decision to switch to a OA seem to be related to the need to earn visibility via accessibility to a broader audience as a way to compensate for a lower competitiveness of the offering.

In many industries, price is either correlated to quality or product availability; in other cases, price is determined on the basis of costs, to which a markup is added. As part of the debate between supporters of different models deals with pricing schemes and cost structures, we sought to correlate different business models to quality and visibility issues, working on a partially different sample, in order to maximise variety of publishers considered. We acknowledge that citations are a partial proxy for quality assessment, but we chose them as an indicator for their convenience.

In table 5, we collected the only quantitative available data on journal utilization and cost-effectiveness, that's to say:

- data from SciMAGO (calculated on 3 years basis; 15,922 titles)
- data from ISI-Thomson Reuters Journal Citation Reports (2 years basis; 8,292 titles)
- data from Bergstrom-McAfee's «Journal Prices – Journal cost-effectiveness 2006-2008 beta».

“Journal Prices” calculates its ratings with ISI 2006 citations and 2008 prices; so we had to refer to 2006 citation data both for SciMAGO and ISI JCR.

We looked at the number of total documents published by the journal in the last three years and the incidence of international collaborations among published articles, based on data from SciMAGO; utilization was measured in terms of total number of citations for the journal, average number of citations per article, incidence of cited articles on total articles and Impact Factor, based on data from SciMAGO and on ISI Journal Citation Report as of 2006; finally we add pricing data as retrieved in «Journal Prices»: we choose as more significant the price per article and the price per citation, adding also the

Relative Price Index as calculated by «Journal Prices». As cost per citation for OA is zero, OA titles show no data in this section of the table [26].

A direct comparison could not be inferred, due to the limited size of the sample considered. The table therefore has only to be taken as a mere indication of trend.

The utilization of journals differs significantly across disciplines; hybrid and OA journals systematically outperform the other types of journals by numbers of citations per document and by percentage of documents cited among documents published, thus suggesting that higher circulation encourages citations.

Price does not seem to be correlated to IF, nor to journal utilization; price volatility is high across disciplines and within disciplines, particularly if we consider price per citation or per article and relative price. The presence of huge information asymmetries makes it possible to publishers to develop their pricing strategies independently from visibility of their journals.

			SciMAGO data									ISI data				Journal prices data		
			% Int. Collab.	Tot docs (3 y)	Tot cites (3 y)	Cit/doc (3 y)	Cited	%	Uncited	%	Tot cites	Tot docs (2 y)	IF	rank	price per cit	price per art	relative price	
Science	PLoS Biology	OA	18,28	904	5.416	7,70	603	67%	301	33%	4.907	348	14,101	1/65				
	Fixed Point Theory and Application	OA C	12,00	56	30	0,54	20	36%	36	64%								
	PNAS - Proceedings of the National Academy of Science	HYBR	33,82	9.712	95.338	10,52	9.032	93%	680	7%	60.594	6.284	9,643	3/50	0,12	0,98	0,07	
	Computer Languages Systems and Structures	TA	27,27	28	23	0,88	11	39%	17	61%	13	22	0,591	57/82	252,04	105,61	18,21	
Medicine	BMC Cancer	OA	23,83	301	739	2,47	224	74%	77	26%	618	262	2,359	67/127				
	Environmental Health Perspectives	OA C	17,38	1.908	5.745	6,42	912	48%	996	52%	3.294	562	5,861	1/144	0,30	1,15	0,11	
	Cancer gene therapy	HYBR	31,62	297	1.160	4,01	251	85%	46	15%	783	187	4,187	17/140	4,35	12,50	2,01	
	Cutaneous and ocular toxicology	TA	28,00	24	15	0,68	8	33%	16	67%	6	22	0,273	43/45	1.046,42	58,60	92,74	
Social sciences	Journal of the Medical Library Association	OA	19,28	226	285	1,53	112	50%	114	50%	139	115	1,209	15/53				
	EURE Revista Latinoamericana de estudio urbano regionales	OA C	15,00	58	12	0,21	11	19%	47	81%	2	35	0,057	30/30	19,51	4,44	1,18	
	European Sociological Review	HYBR	18,92	93	98	1,07	46	49%	47	51%	37	61	0,607	39/93	6,16	3,53	0,59	
	International journal of manpower	TA	37,84	132	50	0,39	30	23%	102	77%	6	71	0,085	77/79	1.831,36	334,22	87,53	
Humanities	Bollettino telematico di filosofia politica	OA																
	Hispania	OA C																
	Linguistics and philosophy	HYBR	23,53	21	14	0,67	7	33%	14	67%								
	Journal of urban history	TA	3,45	89	13	0,15	10	11%	79	89%	15	93	0,161	28/30	127,33	17,16	3,89	

Table 5. Journal utilization and costs.

### **3. Building a two sided market**

OA journals introduced several innovations in the scholarly publishing industry; yet, as our results show, the biggest traditional publishers were fast in adapting their offering to the changing competitive environment. As investments in platforms are high and competition for visibility very strong, we can expect that smaller traditional publishers will find it increasingly difficult to compete in the scientific journal business. While the fundamental distinction between TA and OA journals is still clear, both types of publications are increasingly relying on a variety of services to cover operating costs; the presence of hybrid forms and the introduction of OA journals by traditional publishers make the distinction between models blurred.

Academic institutions and funding agencies are now offered an alternative to traditional publishers for research publication and communication: as their interest ought to be to ensure the access to the best findings, regardless to the business model adopted, they are now required to play a more active role than in the past to orient researchers behaviour [27]. As offering configuration becomes more articulated and competition between OA and TA models more stringent as they compete for institutional funding, the issue of efficiency becomes more visible to all actors involved and increasingly important in orienting decisions. By comparing cost structures of traditional and Open Access journals, some authors [28] have succeeded in identifying the key activities involved with the publication and diffusion processes [29], the cost categories associated with different publication strategies, the impact of some of the externalities related to the process [30]; on the revenue side, TA models are more effective, as the same content can be sold for different uses, while OA seem to be more efficient on the cost side, as fixed costs are spread over a higher number of readers. Yet, as scientific publishing is heavily subject to externalities, to scale, scope, learning economies, as open models are still in a development phase, while traditional journals are consolidated and mature, as bargaining power of actors involved change over time and thus the appeal of different model, pure cost structure comparison seems more an academic exercise than a convincing argument of the superiority of one business model over the others. It therefore seemed to us to be more appropriate to evaluate business models sustainability on their ability to rapidly build two sided markets for comparable level of quality of scientific outcome.

On the reader side, our results support the idea that OA model creates a broader audience and visibility for content otherwise circulated among small clans of peers. Such a result is not surprising: one of the pillars of OA is the

reduction of barriers to access and we can therefore expect that – if quality is comparable – citations will be maximized in the OA model versus the traditional publishing. As far as readers for academic purposes are concerned, although our results indicate that the number of citations of OA articles is still quite small and previous research suggests that loyalty to traditional models is high [31], more recent studies show that most of the electronic resources used by faculty in every discipline adopt an OA business model [32] and that 72% of the interviewed researchers in UK have already published in an OA journal [33].

Our results indicate that leading TA journals have been quick in keeping up with the innovative services offered by OA journals and competition on services to researchers (indexing, referencing and so on); in this case, growing competition has created better services to the reader community. In the logic of Web 2.0, services are constantly being added, and quickly become industry norms in those disciplines (science and medicine related) in which competition among platforms is tougher.

As far as the author side is concerned, artificial scarcity in traditional scholarly publishing created through high rejection rate, exclusivity on property rights together with resilience of some academic institutions in their incentive systems make it more difficult to OA journals to compete with their TA counterparts: as Houghton recognizes, in overcoming the barriers towards a more cost-effective scholarly communication via OA new metrics are requested, that support innovation, while at the same time aligning incentive and reward system [34]. Yet, on the author side, important distinctions exist in the two models as far as the author is concerned.

In scholarly publishing sector, quality and prestige are the two typical elements necessary to build reputation and the two should be mutually enforcing [35]. Excellent authors, editors and referees determine quality, whereas age of journal, impact, circulation, recognition by academic committees are as important as quality in affecting prestige. OA journals can compete with TA journals on all these parameters, with the exception of age; for younger publications, “quality” – the outcome of a serious peer-review and editorial process - is a prerequisite for “reputation of quality”, that in turn is fundamental for the generation of a virtuous circle linking quality, visibility and reputation. While most of the OA journals are still in the quality creation phase, some of the established TA journals leverage on prestige and impact obtained in the past as surrogates for quality; this is one explanation of the fact that most of TA journals were slow in enriching their offering.

Digital technologies make it possible to transfer the reputation factor from the status of the journal to the value of the article itself. Readers are the most



active actors in the selection process of works, and technology development has brought important changes even in this activity. Search engines and their related services facilitate search by article and not by journal, and therefore lower shift the branding effect from publisher to author, thus making the distance between quality and reputation of quality shorter. The fruition of science, thanks to digitization, has become more focused, and diverse channels are used to refine search and make it more specific to the researcher's needs. As a consequence, an article written by a still unknown researcher has more chances to be found read and cited on the web than on paper. This was almost impossible with traditional models of publication, through which only eminent scientists got credit; the vicious circle of giving credit only to already famous researchers seems to be broken, or at least leveled, reducing the Matthew effect [36].

Moreover, a digital content openly available and easily retrievable by search engines, like Google or Google Scholar, reaches a wider readership, making the article more likely to be not only cited and used, but also evaluated. New tools supplied by the most important OA platforms allow readers (as well as peer reviewers) to rate, comment, tag the article, and, each time the content is associated with a Creative Commons licence, link and reuse the content itself. This highlights the single article real contribution to the progress of science and, on the other side, helps to foster the journal reputation, reducing the pre-reputation period (as it has been the case for PLoS Biology) [37]. So, visibility, quality and reputation might go together and keep pace.

#### **4. Conclusions**

Scientific publishing is an imperfect market; technological evolution – together with market behavior - has determined an irreversible change in the structure of scientific publishing and has increased the importance of quickly build a two sided market as a driver for sustainability of different business models; OA journals have proven to be an efficient and innovative alternative to TA journals for research publication and communication, as they take advantage in a faster and cost effective way of the possibilities offered by digitization technologies.

The presence in the market of a variety of business models has benefited the research community, as services have increased, the refereeing process is

becoming more transparent, high quality contribution have higher chances to be accessed by wider market segments.

We therefore expect that in the near future the number of OA journals with high IF will increase at a fast rate, while more sophisticated metrics of reputation and quality based on individual author contribution will be developed [38]. Offerings by journals from different business models will converge, as journals will increasingly develop services [39], while significant differences will increase between more important players (both OA and TA) and smaller ones. From the end user point of view, increased competition means a better satisfaction of the needs associated with scholarly work and research outputs availability.

This is not to say, though, that OA will necessarily replace TA journals. Due to the asymmetry of the publishing market – in which publishers need scholars as authors, editors and referees; authors need publishers for an organized peer-review and for the distribution; but publishers need authors more than the reverse – journals in the same field compete for authors [40].

While OA models are superior as far as reach maximisation is concerned, as lack of a barrier price increases the number of people who will be put in the position to and will access scientific results, many TA journals still enjoy significant first mover advantage and reputational rents, that they can leverage to strengthen their offering; competition on the author side is therefore likely to be very strong.

Resilience by universities in adapting their incentive systems to the changed publishing environment is another factor that will make substitution unlikely, particularly in disciplines characterised by the dominance of local scientific communities; in these cases, composition and characteristics of editorial board rather than offering sophistication are likely to be a driver of success on the submission side. Moreover, the pace of introduction and diffusion of increasingly sophisticated offerings will be different across disciplines, on the basis of the specificity of publishing and communication processes of scientific results. In disciplines where books are preferred to article journals as a typical mean to communicate research results, OA models are slower to be introduced.

There are several limitations to our study, that need to be addressed in further and more extensive research. In our search for the characteristics of the offering of different journals we were able to identify some trajectories of development of new services, but were still unable to determine which services are more conducive to rapid double market creation; moreover, we sought to maximize variety in our sample creation, but in this way we were unable to select competing journals within the same disciplines. Cases in our

sample often represent top in class journals with an international audience; the relationship with local communities of practice is still largely unexplored. From a methodological point of view, while it was relatively easy to identify different services, metrics for effectiveness and economic efficiency of different offering configuration still need to be fine tuned.

We did not find a significant correlation between business models and offering configuration, neither between price and offering configuration, nor IF and offering configuration, although a wider access has determined an acceleration in the ability of OA journals to reach visibility. As the two business models are likely to be increasingly in direct competition for scarce financial and reputational resources, we expect that publishers (both of OA and TA journals) will look for specific offering configurations for the different research communities they are targeting. In this transition phase, universities are going to play a key role in orienting the development of offerings by different publishers.

We therefore see three directions of work ahead of us: a more systematic mapping of offering configuration within and across disciplines, so as to follow the fast redefinition of how research is published, commented, certified and made available; an analysis of incentive systems by universities as far as publication is concerned; a survey on authors from different disciplines and institutions so as to verify their search patterns, as well as their preferences as far as offering configuration is concerned.

## **Acknowledgments**

The authors wish to acknowledge the help of Maria Rita Micheli.

## **Notes and References**

All sites last accessed on April 4<sup>th</sup> 2009.

- [1] BOAI, Budapest Open Archives Initiative. Read the initiative, 2002. Available at <http://www.soros.org/openaccess/read.shtml>; WEITZMAN, JB – LESSIG, L. Open Access and creative common sense. Open Access now, 14 May 2004, Available at <http://www.biomedcentral.com/openaccess/archive/?page=features&issue=16>; WARLICK, SE, VAUGHAN, KTL., Factors influencing publication

- choice: why faculty choose Open Access. *Biomedical Digital Libraries*, 4 (1), 2007; GUÉDON, JC. Mixing and matching the green and the gold road – Take two. *Serials review*, 34 (1), Mar. 2008, p. 41-51. Available at [doi:10.1016/j.serrev.2007.12.008](https://doi.org/10.1016/j.serrev.2007.12.008); ARMBRUSTER, C. A European model for the digital publishing of scientific information? *Social Science Research Network Working paper*, 2008. Available at [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1106162&rec=1&srcabs=1088453](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1106162&rec=1&srcabs=1088453).
- [2] SUBER P. Open Access overview, 2007. Available at <http://www.earlham.edu/~peters/fos/overview.htm>.
- [3] OAD, Open Access Directory, TA journals that converted to OA, 2009. Available at [http://oad.simmons.edu/oadwiki/OA\\_journal\\_business\\_models](http://oad.simmons.edu/oadwiki/OA_journal_business_models); KAUFMANN-WILLS RESEARCH GROUP. The facts about Open Access. Report ALPSP, October 2005. Available at [http://www.alpssp.org/ngen\\_public/article.asp?id=200&did=47&aid=270&st=&oid=-1](http://www.alpssp.org/ngen_public/article.asp?id=200&did=47&aid=270&st=&oid=-1).
- [4] BOAI, Budapest Open Archives Initiative. Read the initiative, 2002. Available at <http://www.soros.org/openaccess/read.shtml>
- [5] HESMONDHALGH, D. *Cultural Industries*, London: Sage, 2007.
- [6] HOUGHTON, J, SHEENHAN, P. The economic impact of enhanced access to research findings, University of Melbourne Centre for Strategic economic Studies Working paper n. 23, July 2006. Available at <http://www.cfses.com/documents/wp23.pdf>; TERRY, R, KILEY, R. Open Access to the research literature: a funder's perspective, in JACOBS, N ed. *Open Access: Key strategic, technical and economic aspects*, Oxford : Chandos 2006, p.101-109. Available at <http://eprints.rclis.org/archive/00006224/>
- [7] YOUNG NS; et al. Why Current Publication Practices May Distort Science. *PLoS Medicine* 5 (10), 2008, e201. Available at <http://www.plosmedicine.org/article/info%3Adoi%2F10.1371%2Fjournal.pmed.0050201>.
- [8] GUÉDON, JC. Mixing and matching the green and the gold road – Take two. *Serials review*, 34 (1), Mar. 2008, p. 41-51 Available at

- [doi:10.1016/j.serrev.2007.12.008](https://doi.org/10.1016/j.serrev.2007.12.008); KIRSOP, B. Before and After: OA in Developing Countries. Paper presented at *Berlin 5 Open Access : From Practice to Impact : Consequences of Knowledge Dissemination*, Sept. 2007, Padova, Italy. Available at <http://www.aepic.it/conf/viewabstract.php?id=267&cf=10>.
- [9] LAWRENCE, S. Online or invisible? Free online availability substantially increases a paper's impact. *Nature*, 411 (6837), 2001, p. 521. Available at <http://citeseer.ist.psu.edu/online-nature01/>; HARNAD, S, BRODY, T. Comparing the Impact of Open Access (OA) vs. Non-OA Articles in the Same Journals. *D-Lib Magazine*, 10(6), Jun. 2004. Available at <http://www.dlib.org/dlib/june04/harnad/06harnad.html#Brody>.
- [10] EYSENBACH G. Citation Advantage of Open Access Articles. *PLoS Biology*, 4 (5), 2006, e157. Available at [doi:10.1371/journal.pbio.0040157](https://doi.org/10.1371/journal.pbio.0040157)
- [11] ROOSENDAAL, HE; et.al. Changes in the value chain of scientific information: economic consequences for academic institutions. *Online Information Review*, 27 (2), 2003, p. 120-128; ROOSENDAAL, HE, GEURTS P. Forces and functions in scientific communication: an analysis of their interplay. Paper in *CRISP '97, Cooperative Research Information Systems in Physics*. Available at <http://www.physik.uni-oldenburg.de/conferences/crisp97/roosendaal.html>.
- [12] KING CJ; et al. Scholarly communication: academic values and sustainable models, Berkeley CSHE Papers 1606, 2006. Available at <http://repositories.cdlib.org/cgi/viewcontent.cgi?article=1080&context=csh>; PRISM, Partnership for Research Integrity in Science and Medicine, 2007. Available at <http://www.prismcoalition.org/>. In the SPARC Open Access Newsletter of April 2<sup>nd</sup>, 2009, Peter Suber addresses these objections and meet them: SUBER, P. A field guide to misunderstandings about open access, Apr. 2009. Available at <http://www.earlham.edu/~peters/fos/newsletter/04-02-09.htm>.
- [13] ARL – Association of Research Libraries. *ARL Statistics 2006-2007*, Washington : ARL, 2008, p. 11. Available at <http://www.arl.org/bm~doc/arlstat07.pdf>.
- [14] McVEIGH M. Open Access Journals in the ISI citation database. Analysis of Impact Factors and citation patterns. A citation study from Thomson

Scientific, October 2004. Available at <http://scientific.thomsonreuters.com/media/presentrep/essayspdf/openaccesscitations2.pdf>.

- [15] GIGLIA, E, MIGLIORE S. Open Access journals and Impact Factors. Data and trends, 2009 [submitted].
- [16] SUBER, P. Thinking about prestige, quality and Open Access. SPARC Open Access Newsletter, Sept. 2008. Available at <http://www.earlham.edu/~peters/fos/newsletter/09-02-08.htm>;  
ANTELMAN, K. Do Open Access articles have greater research impact? College and Research libraries, 65 (5), 2004, p. 372-382. Available at [http://eprints.rclis.org/archive/00002309/01/do\\_open\\_access\\_CRL.pdf](http://eprints.rclis.org/archive/00002309/01/do_open_access_CRL.pdf);
- [17] BJORK, BC. A model of scientific communication as a global distributed information system. Information research, 12 (2) Feb. 2007. Available at <http://informationr.net/ir/12-2/paper307.html>.
- [18] HOUGHTON J; et al. Economic implications of alternative scholarly publishing models: Exploring the costs and benefits, JISC Report, Jan. 2009. Available at <http://www.jisc.ac.uk/publications/publications/economicpublishingmodelsfinalreport.aspx>.
- [19] CAILLAUD, B, JULLIEN, B. Software and the Internet: competing cybermediaries. European Economic Review, 45, 2001, p. 797-808, available at <http://idei.fr/doc/by/jullien/cjeer00.pdf>; ARMSTRONG, M. Competition in two-sided markets. The RAND Journal of Economics, 37 (3), 2006, p. 668-691 Available at <http://www.jstor.org/stable/25046266>; ROCHET, JC, TIROLE J. Two-Sided Markets: A Progress Report. The RAND Journal of Economics, 37 (3), 2006, p. 645-667. Available at [http://www.tse-fr.eu/images/doc/by/rochet/rochet\\_tirole.pdf](http://www.tse-fr.eu/images/doc/by/rochet/rochet_tirole.pdf).
- [20] KELLER L. *Strategic brand management: Building, measuring and managing brand equity*, New Jersey : Prentice Hall, 1998
- [21] BAUMAN, Z. *Liquid modernity*, Cambridge : Polity, 2000.
- [22] MARON, NL, KIRBY SMITH, K. Current models of scholarly communications, Washington : ARL, 2008. Available at

<http://www.arl.org/bm~doc/current-models-report.pdf>; KING CJ.; et al. Scholarly communication: academic values and sustainable models, Berkeley CSHE Papers 1606, 2006. Available at <http://repositories.cdlib.org/cgi/viewcontent.cgi?article=1080&context=cshe>

[23] RoMEO, Rights METadata for Open archiving. Available at <http://www.sherpa.ac.uk/romeo/>; RoMEO, Publishers allowing the deposition of their published version/PDF in Institutional Repositories. Available at <http://www.sherpa.ac.uk/romeo/PDFandIR.html>.

[24] CODA, V. La valutazione della formula imprenditoriale. Sviluppo e organizzazione, 82, 1984 p. 7-22.

[25] SWAN, A. Open Access and the progress of science. American scientist 95, May-Jun. 2007, p. 198-200; LYNCH, C. Open Computation: Beyond Human-Reader-Centric Views of Scholarly Literatures, in JACOBS, N ed. *Open Access: Key strategic, technical and economic aspects*, Oxford : Chandos 2006, p. 185-193. Available at <http://www.cni.org/staff/cliffpubs/OpenComputation.htm>

[26] Journal prices - Journal cost effectiveness 2006-2008 beta. Available at <http://www.journalprices.com/>; explanations of the calculation methods are available at <http://www.mcafee.cc/Journal/explanation.html>. Two composite indicators are calculated: A) The Composite Price Index (CPI) is the geometric mean of the Price Per Article and the Price Per Citation. B) The relative price index (RPI) is the CPI divided by the average CPI of non-profit journals in the same subject category. Journals that have multiple subject listings are factored into the average CPI for each field it belongs to, and its RPI is its CPI divided by the average of the average CPIs for each field.

On cost per citation in OA: COCKERILL, M. Maximum access at minimum cost. BioMedCentral Blog, 20 Feb 2007. Available at <http://blogs.openaccesscentral.com/blogs/bmcblog/entry/200702201>;

HOUGHTON J; et al. Economic implications of alternative scholarly publishing models: Exploring the costs and benefits, JISC Report, Jan. 2009. Available at <http://www.jisc.ac.uk/publications/publications/economicpublishingmodelsfinalreport.aspx>.

- [27] HOUGHTON J; et al. Economic implications of alternative scholarly publishing models: Exploring the costs and benefits, JISC Report, Jan. 2009. Available at <http://www.jisc.ac.uk/publications/publications/economicpublishingmodel/sfinalreport.aspx>.
- [28] CLARKE, R. The cost profiles of alternative approaches to journal publishing. *First Monday*, 12 (12), 3 Dec. 2007. Available at <http://www.uic.edu/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/2048/1906>; KING, DW. The cost of journal publishing: a literature review and commentary, *Learned Publishing*, 20, Apr. 2007, p. 85-106.
- [29] COCKERILL, M. Business models in Open Access publishing, in JACOBS, N ed. *Open Access: Key strategic, technical and economic aspects*, Oxford : Chandos 2006, p. 111-119. Available at <http://demo.openrepository.com/demo/bitstream/2384/2367/4/businessmodelsino.pdf>.
- [30] RIN – UK Research Information Network. Activities, costs and funding flows in the scholarly communication system in the UK, Report, May 2008. Available at <http://www.rin.ac.uk/costs-funding-flows>.
- [31] KLING, R, McKIM G. Scholarly Communication and the Continuum of Electronic Publishing. *Journal of the American Society for Information Science and Technology*, 50 (10), 1999, p. 890–906. Available at <http://xxx.lanl.gov/ftp/cs/papers/9903/9903015.pdf>.
- [32] MARON, NL, KIRBY SMITH, K. Current models of scholarly communications, Washington : ARL, 2008. Available at <http://www.arl.org/bm~doc/current-models-report.pdf>.
- [33] JISC, JISC Open Access publication charges survey. Report, Oct. 2008. Available at <http://www.jisc.ac.uk/media/documents/aboutus/workinggroups/jiscoapubcharge.doc>.
- [34] HOUGHTON J; et al. Economic implications of alternative scholarly publishing models: Exploring the costs and benefits, JISC Report, Jan. 2009. Available at



<http://www.jisc.ac.uk/publications/publications/economicpublishingmodel/sfinalreport.aspx>.

- [35] SUBER, P. Thinking about prestige, quality and Open Access. SPARC Open Access Newsletter, Sept. 2008. Available at <http://www.earlham.edu/~peters/fos/newsletter/09-02-08.htm>
- [36] WILLINSKY, J. Open Access and academic reputation. Slaw.Ca, 16 Jan 2009. Blog post. Available at <http://www.slw.ca/2009/01/16/open-access-and-academic-reputation/>. In the sociology of science, "Matthew effect" was a term coined by Robert K. Merton to describe how, among other things, eminent scientists will often get more credit than a comparatively unknown researcher, even if their work is similar; it also means that credit will usually be given to researchers who are already famous. MERTON, RK. The Matthew Effect in Science, II: Cumulative advantage and the symbolism of intellectual property. *ISIS*, 79, 1988, p. 606-623. Available at <http://garfield.library.upenn.edu/merton/matthewii.pdf>.
- [37] WILLINSKY, J. Open Access and academic reputation. Slaw.Ca, 16 Jan 2009. Blog post. Available at <http://www.slw.ca/2009/01/16/open-access-and-academic-reputation/>.
- [38] BOLLEN J; et al. Clickstream data yields high-resolution maps of science. *PLoS ONE*, 4 (3), 2009, e4803. Available at <http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0004803>; see also the homepage of MESUR. METrics from Scholarly Usage of Resources. Available at <http://www.mesur.org/MESUR.html>.
- [39] PETERS, P. Redefining scholarly publishing as a service industry. *Journal of electronic publishing*, 10 (3) Fall 2007. Available at <http://quod.lib.umich.edu/cgi/t/text/text-idx?c=jep;cc=jep;rgn=main;idno=3336451.0010.309;view=text>; ARMBRUSTER, C. A European model for the digital publishing of scientific information?, Social Science Research Network Working paper, 2008. Available at [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1106162&rec=1&srcabs=1088453](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1106162&rec=1&srcabs=1088453).

- [40] SUBER, P. Thinking about prestige, quality and Open Access. SPARC Open Access Newsletter, Sept. 2008. Available at <http://www.earlham.edu/~peters/fos/newsletter/09-02-08.htm>