

ECONOMIC SUSTAINABILITY DURING TRANSITION: THE CASE OF SCHOLARLY PUBLISHING

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Abstract

In recent years, Open Access has received increased attention by scholars and practitioners as an alternative paradigm to traditional journals for the 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 also added 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 of the possibilities offered by digitization technologies in a faster and cost effective way –, even though TA journals have been quick in keeping up with the innovative services offered by OA journals; on the other hand, many TA journals still enjoy significant first mover advantage and reputation rent which

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 contributions have higher chances of being 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 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 due to 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 of 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 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 of his/her work, in order to reuse it for academic and teaching purposes – and by the business models put in place to cover the 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 and institutional funding. 47% of OA journals require a payment of article processing fees, and in most disciplines the publica-

tion 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 we are mainly interested in this paper in research publications 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 for 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 4th, 2009), in parallel with and in partial reaction to a huge increase in the 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 4th 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 in the publishing scenery has represented «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 have 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 the 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 Open Access publishers for profit – 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 means 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 dis-

tribution 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 also offer good indexing and high visibility 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 self archiving – 11% pre-print prerefereeing, 21% post-print, 30% pre and post-print. It is also to be noted that 107 publishers allow self archiving also for the .pdf print version of the article (70 with no restrictions, 23 with a variable period of embargo, 11 with explicit permission, 3 with a fee, as of April 4th 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 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, and 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 also openly lists the rejected articles on its site;
- 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 is common to all journals published by the same publisher. Therefore, we looked for TA journals published by different commercial publishers, in order to take into consideration competitive dynamics within the area of traditional scientific publishing.
- variety of disciplines. Scientific communities follow different practices of communication for the outcomes of their research; moreover, editorial formats differ significantly, as communication of results requires various media in order to be effectively communicated.

For each of the titles chosen, we conducted a desk analysis aimed at describing the offering of 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 start-up 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 large sized 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 the double market of authors and the creation of readers. 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 self archiving policy, when allowed by the publisher. Where not specified, for some OA journals, data are bracketed; meaning that self archiving 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 and to share them in social bookmarking environments. On this pathway, PLoS ONE's most innovative platform could not be considered because it is 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, 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, divided into subject areas.

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 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

	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
Visibility for the author	free text	x	x	\$3.000 + VAT	
	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			
Benefits for researchers	articles in press			x	x
	statistics per article			x	x
	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				
	OA	OA converted	hybrid	TA	
Type of publication	BMC Cancer	Environmental Health Perspectives	Cancer Gene Therapy	Cutaneous and Ocular Toxicology	
Title	BioMed Central	NIEHS	Nature	Taylor&Francis	
Publisher	2001	(1972) 2004	(1999/2005 free) 2006- for fee	1982	
First year online	2,709 (rank 61/132)	5,636 (rank 1/160)	3,889 (rank 16/81)	0,383 (rank43/45)	
Accessibility and reliability for readers	Impact Factor ISI				
	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.

	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.

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 OA seems to be related to the need to earn visibility via accessibility to a broader audience as a way to compensate for 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 cost, 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 is to say:

- data from SciMAGO (calculated on a 3 year basis; 15,922 titles)
- data from ISI-Thomson Reuters Journal Citation Reports (calculated on a 2 year 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 added pricing data as retrieved in «Journal Prices»: we chose the price per article and the price per citation as most significant, 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 informa

		ScMAGO data										ISI data			Journal prices data		
		% Int. Collab.	Tot docs (3 y)	Tot cites (3 y)	Cit/doc (3 y)	Cited %	Unchited %	%	Tot cites (2 y)	IF	rank	price cit	price per art	relative price			
Science	PLoS Biology	18,28	904	5.416	7.70	603	67%	301	33%	4.907	348	14,101	1,65				
	Fixed Point Theory and Application	12,00	56	30	0.54	20	36%	36	64%								
Science	PNAS - Proceedings of the National Academy of Science	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	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	23,83	301	739	2.47	224	74%	77	26%	618	262	2,359	67,127				
	Environmental Health Perspectives	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	
Medicine	Cancer gene therapy	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	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	19,28	22.6	285	1.53	112	50%	114	50%	139	115	1,209	15,53				
	EURE Revista Latinoamericana de estudio urbano regionales	15,00	58	12	0.21	11	19%	47	81%	2	35	0,057	30,30	19,51	4,44	1,18	
Social sciences	European Sociological Review	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	37,84	132	50	0.39	30	23%	102	77%	6	71	0,085	77,79	1,831.36	354,22	87,53	
Humanities	Bollettino telematico di filosofia politica																
	Hispania																
Humanities	Linguistics and philosophy	23,53	21	14	0.67	7	33%	14	67%								
	Journal of urban history	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.

tion asymmetries makes it possible for publishers to develop their pricing strategies independently from visibility of their journals.

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 quick 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 of 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. However, scientific publishing is heavily subject to externalities, scale, scope and learning economies, as open models are still in a development phase. While traditional journals are consolidated and mature, pure cost structure comparison seems more an academic exercise than a convincing argument of the superiority of one business model over the other, as bargaining power of actors involved in change over time and thus the appeal of a different model. It therefore seemed to us to be more appropriate to evaluate business models sustainability on their ability to rapidly build two sided markets for a comparable level of quality of scientific outcome.

On the reader side, our results support the idea that the 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 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]; 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 of property rights together with resilience of some academic institutions in their incentive systems make it more difficult for 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, which support innovation, while at the same time aligning incentive and a reward system [34]. Yet, on the author side, important distinctions exist in the two models as far as the author is concerned.

In the 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 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 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 searches and make them 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's real contribution to the progress of science and on the other side, helps to foster the journal's reputation, reducing the pre-reputation period (as was the case for PLoS Biology) [37]. Thus, 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 building 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 of the possibilities offered by digitization technologies more rapidly and more cost effectively.

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 contributions have higher chances of being 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 more satisfaction of the needs associated with scholarly work and availability of research outputs.

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 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, lack of a barrier price increases the number of people who will be put in the position to, and who 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 the 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 way 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 the 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 offer-

ing 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 of different publishers.

We therefore see three directions of work ahead of us: a more systematic mapping of offering configuration within and across disciplines, in order 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 in order to verify their search patterns, as well as their preferences as far as offering configuration is concerned.

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