Authors publication strategies in scholarly publishing

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Abstract

In this exploratory study, we analyze publishing patterns of authors from different disciplines, as part of a broader analysis of the transformation of the scholarly publishing industry. Although a growing body of literature analyses the author's role within the process of research production, validation, certification and dissemination, there is little systematic empirical research on publishing patterns; little therefore can be said on relevant issues within the current debate on the future of scholarly publishing such as authors' responses to (or even awareness of) the growing array of publication possibilities or the speed of adaptation to the increasing series of incentives by funding agencies or academic institutions. On the basis of the analysis of three years of publications gathered in the institutional repository of Università degli Studi di Milano, we highlight trends of publication strategies and different responses to incentive systems. Preliminary results indicate that publication outcomes and intensity differ across disciplines, while similarities occur mainly in terms of choice of preferred outcomes by seniority. Open access is still uncommon among the authors in our sample and it is more utilized by relatively senior authors and active authors.

Keywords: scholarly publishing; publishing strategies; industry changes;

1. Introduction

The process of knowledge creation in the academic field follows a quite rigidly codified pattern. Academic and scholarly knowledge is in fact systematic, premeditated, reflective and continuously submitted to the scrutiny of a community of experts.[1] Creation is therefore a long, time consuming process for academic authors, and several steps have to be overcome, to reach the final moment of knowledge delivery to the audience [1].[2] Publications as well as academic affiliation contribute to strengthen authors' reputation, which is a critical element for economic and social professional growth in the academia. Over time, as scholars build their reputation and become visible within their community, publication occurs on increasingly more prestigious journals. As personal prestige increases, authors are likely to orient research trajectory development and to influence publication patterns of younger colleagues.

The tangible starting point of academic knowledge creation is identified in the existing body of scholarly literature, which constitutes the background of all academic scientific works [2],[3]. The central stage is the moment of design, in which the social process of knowledge becomes tangibly represented. After the designing stage, concepts are integrated into a particular body of knowledge, whose choice is influenced by several factors, with a special weight of the discipline of interest.

The choice of the body of knowledge to refer to in a particular research design coincides with the choice of the viable publication outcome, which is widely considered a determinant step for the evaluation of the scholarly work and the resulting academic assessment within academic institutions [4], [5].

Research patterns are influenced by the necessity to conform to reward mechanisms of institutions to obtain career advancements; authors may therefore choose where to publish on the basis of specific incentive structures, deriving from national, institutional or community indications and explicit or implicit incentives. In recent times academic institutions are progressively increasing control mechanisms on faculty members in order to enhance a greater visibility and major prestige at the international level. As competition for research funding becomes more intense, and institutions and

1 It is also necessary to underline that knowledge production activities in different areas entail different epistemic cultures (Knorr Cetina, 1999), and consequently different patterns of results delivery.

2 This conceptualization of science as a knowledge production system (Latour and Woolgar 1986) is functional for understanding the possibilities for the inclusion of new publication channels in the editorial chain of scholarly publishing.

funding agencies are increasingly interested in the visibility of the outcomes of the research process by authors associated with these institutions, attention on what and where publication occurs becomes higher and possibly influences authors' behaviour.

Publication outcomes by academic authors is therefore a good dependent variable of strategies put in place by authors to ensure maximum visibility, reputation and personal achievement. In spite of a growing body of literature analysing the author's role within the process of research production, validation, certification and dissemination, there is little systematic empirical research on publishing patterns; little therefore can be said on relevant issues within the current debate on the future of scholarly publishing such as authors' responses to (or even awareness of) the growing array of publication possibilities or the speed of adaptation to the increasing series of incentives by funding agencies or academic institutions.

In this exploratory paper, we are interested in analysing publishing patterns by academic authors as part of a broader research project on the evolution of scholarly publishing. In recent years, digitization and technological advancements have indeed contributed to a structural redefinition of the scholarly publishing industry and contributed to an increase in publishing and diffusion of scholarly output. While traditional publishers have developed a digital strategy and upgraded their offering, a variety of digital only publishers and repositories have emerged with a multiplicity of innovative business models, covering all phases of the scholarly publishing process (from idea discussion to publishing to research dissemination and communication), different revenues streams and intellectual property protection régimes. While publication tools are constantly evolving, authors' strategies remain sometimes unaffected [6], [7], reflecting the established norms of the traditional academic environment.

Based on the systematic analysis of three years of publications by authors from different disciplines but from the same institution, we wish to highlight to what extent recent publication patterns mirror the changes occurring within the scholarly publishing industry and whether similarities and differences occur in publishing strategies across different disciplines. Although descriptive in nature, we think that our study contributes with fact based hints to the current debate on the assessment of the quality of research activity and on the future of scholarly publishing, while giving evidence to all parties involved on how academic authors from different disciplines build their reputation and visibility, while strengthening that of their institution.

2. Literature review

There is a growing body of literature describing why academic authors publish and how they choose where to publish. Broadly speaking, literature addresses individual drivers to publication, the incentive system put in place at the institutional level, the patterns of research diffusion and certification across different disciplines.

The willingness to contribute to science's advancements is undoubtedly a leading motivation both to undertake the academic career and to publish [8], [9]; moreover, authors publish to be promoted and advance in their institutions. [10], [11], [12], [13], [14] show a correlation between journal rankings and tenure and promotion decisions. Last but not least, authors publish as part of their legitimization process: consensual evaluations of publication channels have the potential to impact on research quality assessment and individuals' promotion prospects and publishing strategies [15]. Recognition of personal contribution to journals' articles can be used as a *currency* to obtain reputation and being accredited by the scientific community. In recent years international collaborative research projects have increased [16], as a consequence of the rising competition to publish in top quality journals. Collaborative research represents a way to improve data availability, and collaboration with foreign researchers is very attractive for those who face difficulties in data collection when trying to conduct studies across countries [16]. Researchers are often invited by institutions to collaborate, in order to include more features to the final paper and to increase the probability of publication in high ranked journals. Although authors tend to publish in the same channels their senior peers and their scientific community deem appropriate, young researchers may benefit from a less conformist behaviour and the choice of more radical journals [17].

As competition for research funding increases, authors are pressured on the one hand to accelerate publication of results and increase visibility and to publish on key refereed journals for purposes of promotion and tenures on the other, respecting constraints and strict rules [6].

The choice of where to publish at the individual level parallels the effort academic institutions are making to build their reputation at the international level and their degree of acceptance of new forms of publication. Attitudes of disciplines toward scholarly communication in general is affected by the institutional setting of departments [18], [19], [20]; the use of new electronic media is influenced by the academic field [21 [22], [23], [24], [25]. Moreover, the reward in terms of reputation that authors from different disciplines achieve from the publication on specific channels varies and influences authors' decision for results delivery [26], [27], [28].

Web 2.0 tools are already considered as essential means for creating users community networks for commercial businesses [3]; they are also increasingly used to accelerate knowledge production and diffusion in the scientific fields[29], [30], [31], [32]. Scientists consider wikis and collaborative tools in general as a convenient place to post ideas and comments but not to publish freely, because of the possibility of being scooped and lose credit [29]. The advocates of Science 2.0 affirm that Web technologies have to be sustained in order to move researchers toward the kind of openness and community that were supposed to be the hallmark of science in the first place and these new interactive technological forms are conceived to support traditional research, with the aim of facilitating scientific communication.

In the meantime, economic constraints have made research funding very competitive, stimulating research and funding institutions to put pressure on the research community to be effective in the dissemination of research results; therefore, several research institutions have put in place incentive systems on research publication outcomes, whereas funding agencies have been increasingly committed to maximise visibility and public access of research outcomes financed with public resources [33], [34], [35], [36], [37], [38], [39].

Publication strategies are influenced by the specific research field [40]. Communication strategies and mechanisms for the creation of trust among authors vary across disciplines [41], [42], [20], [43], [44], [45]. In 1999, Kling and McKim called for the need of systematic studies across disciplines, because past literature tended to homogenize publication strategies across different disciplines, thus inevitably promoting quantitative studies and methodologies associated with the most prolific disciplines in terms of publication, typically medicine and life sciences. In spite of a growing number of studies comparing publications from different research fields, the topic is still underexplored, particularly on the coexistence of traditional and alternative publishing tools. Many studies have looked at researchers in different fields, but without disaggregating results in a systematic way [46], [47], [48].

Of particular interest for the current debate of the future of scholarly publishing is the attitude towards digital tools. Kling [23], analysed how authors were facing the transition from paper to digital tools. Allen [49] focused on the differences among authors from humanistic disciplines in terms of engagement in depositing in institutional repositories. Antelmann

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3 E.g. *see* Vickery G., Wunsch-Vincent S, *Participative web and user-created content: Web 2.0, wikis and social networking*, 2007, OECD Publisher, available at http://www.oecd.org/document/40/0,3343,en_2649_34223_39428648_1_1_1_1,00.html (April 2010)

[50], [51] focused instead on how authors from different disciplines approached technological tools; other studies addressed the degree of acceptance of digital publications and new forms of publication and research diffusion, from open access journals to repositories [52], [53], [54]. Yet, publication strategies across disciplines as a response to institutional pressures and differences in behaviour among more productive and less productive researchers are issues still largely unexplored.

3. Methodology

In this paper, we wish to describe publication strategies of authors with different seniority and from different research fields; more specifically, we are interested in their choices of publication outcomes, their attitude towards new forms of publication and diffusion of scientific results (such as open access journals and repositories), their response to institutional incentives to publication. We claim that most studies on scholarly publishing take a "one size fits all" approach, in that they do not adequately consider differences among publications and differences among authors in terms of reputation and attitude to research. In any given academic institution, only a limited portion of faculty is devoted to research and only a limited portion of such faculty is highly productive, visible and targeting to top tier journals. Moreover, it is likely that publication patterns change with seniority, as authors reach a higher level of reputation and status on the one hand and are on the other less pressured to publish. Moreover, it is still unclear how different disciplines approach the coexistence of traditional and digital channels for publishing their works and if differences are due to the presence of specific norms of the field of belonging or to the different scientific framework in which authors work.

In the next paragraphs we wish to answer to the following questions:

- are there differences among authors in different disciplines as of where to publish and how much to publish?
- are these differences driven by discipline or by academic seniority?
- to what extent open access journals are being exploited as a viable publication channel? What drives their utilisation?

We feel that answers to these questions, although still preliminary, contribute to the current debate on the future of scholarly publishing as they start systematically comparing outcomes from different academic disciplines. More specifically, they help understand the current acceptance of open access journals as viable alternatives to traditional journals and under which conditions they are most appreciated.

Our empirical base consists of the institutional repository of Università degli Studi di Milano, for the years 2006-2009. The repository has been active since 2005 and currently holds a stock of 43,264 publications by 7,646 authors from 14 research areas.

The choice of this repository as the empirical base of our research is driven not only by convenience and accessibility, but also by the fact that it is the most complete institutional database in Italy, as the University made it mandatory to its faculty to archive scientific outputs since 2008 and the mandate has been effectively enforced[4], thus making the institutional repository a good reference to understand publication patterns across disciplines for scholars of different seniority. Table 1 shows the percentage of faculty members complying with the repository; as part of the faculty is not involved in publishing activities (particularly at a very young age, as it is the case with research assistants and first year PhD students), we feel that the repository is a good representation of the situation in this particular university.

Table 1: Percentage of faculty in institutional repository.

	Tenured professors	Full researchers	PhD and temporary researchers
In repository	1,037	703	337
Not in repository	339 (24.6%)	272 (27.9%)	332 (49.6%)
Total faculty	1,376	975	669

Moreover, Italy is characterised by huge differences in reputation and scientific productivity of universities, and the debate on the evaluation of scientific outcomes is very strong, as universities have to comply with national standards in the evaluation of scholars for career advancements.[5] Yet, the assessment of research outcomes[6] does not take into consideration authors' performances.[7] Milan University is a good starting point to address opportunities and difficulties in evaluating authors' performance, as it is characterised by big variety in terms of disciplines[8], level of authors'

[4] The IR has been defined primary source for every internal and external research assessment

[5] For further details see Reale, E. (2007), La valutazione della ricerca pubblica. Un'analisi della valutazione triennale della ricerca, Milano, Franco Angeli.

6 E.g. see http://www.crui.it/valutazione/HomePage.aspx?ref=1176.

[7] Research assessments involve only institutions and departments.

[8] All disciplines except engineering are represented.

productivity, international reputation of authors. More specifically, Medicine departments enjoy a long standing reputation at the national and international level for the quality of the research and education.

The repository archives publications authored by at least one faculty member; faculty was classified according to the following categories:

- tenured faculty (associate and full professors);
- permanent researchers
- temporary researchers (PhD students, research assistants…)

Publications were classified in the following categories

- books
- chapters of books
- journal articles
- conference proceedings.

The analysis was conducted in two steps. First an analysis of the overall database was performed, in order to assess:

- the percentage of faculty involved in research activity;
- the number of published outcomes;
- the number and type of published outcomes by seniority;
- the relative importance of different publication outcomes;
- the impact of career opportunities on research productivity;
- the language used to publish.

A subsequent analysis for a limited number of disciplines allows an analysis by author, carried on to highlight specific publication strategies for more active authors in terms of attention to more recent forms of publications (namely open access), language used, types of publication outcomes. As we were particularly interested in the penetration of open access, we chose to focus on the following disciplines: computer science, medicine, humanities, chemistry and physics. Medicine was chosen as being traditionally important and prestigious department within the university; the others were chosen as literature on open access stresses the importance of new forms of publications in these disciplines. Data were analysed using SPSS.

4. Analysis of results

Table 2 shows the distribution of publications by faculty and by year; for each faculty, announcements of permanent positions available within the university are highlighted.

Table 2: Publications and announcements of tenured positions per year.

		2006	2007	2008	2009
Agriculture	Publications	937	1225	1175	653
	Announcements	1	3	14	0
Pharmacy	Publications	930	981	924	400
	Announcements	0	3	6	0
Law	Publications	321	333	306	192
	Announcements	4	5	5	0
Letters	Publications	597	694	645	450
	Announcements	0	8	19	0
Medicine	Publications	3980	4433	4549	3719
	Announcements	11	15	15	0
Veterinary	Publications	1333	1443	1405	635
	Announcements	4	3	6	0
Mathematics, Natural Sciences, Physics	Publications	2311	2612	2425	1368
	Announcements	6	11	35	0
Sport Sciences	Publications	162	140	124	81
	Announcements	0	1	7	0
Political Sciences	Publications	431	534	488	328
	Announcements	1	6	7	0

Table 2a shows the breakdown of the announcements by role.

Table 2a: Announcements for positions available at Università degli Studi di Milano.

	2006	2007	2008
Full professor	3	0	15
Associate	0	0	55
Researchers	24	55	49

In 2006, 27 new academic positions were announced; this is a small number if compared with the 55 positions announced in 2007. We see a generalized increase of publication records deposited for all the faculties, except for the Faculty of Sport Science, for which no positions were announced. In 2008, there has been an increase of positions announced, in particular for the faculties of Physics, Mathematics and Natural Sciences and the Faculty of Medicine for the role of researchers and associate professors. If we look at publication patterns of the different roles, we see that there is an increase of publication for researchers, even though, in general, there is a decrease in the total publication stock for 2008. In 2009, no positions have been announced and we see a consistent decrease of publications for all the roles.

As it can be expected, there is an increase in the number of publications deposited over time, as the awareness about the repository increases and enforcement policies for its use are more effective. Moreover, both in 2007 and 2008, the university opened several tenure track positions, which are not surprisingly correlated with an increase in publication outcomes for those years. Although it is not necessarily true that positions will be occupied by the university faculty members (as these positions are opened at the national level), it is reasonable to expect that authors will try to put themselves in the position of becoming eligible candidates. For the Italian system, this is the highest incentive to publication; as positions are announced by law, potential candidates normally get ready one year in advance by increasing the number of their publications, so as to have higher chances to be admitted to the evaluation procedures; this explains why there is a strong drop in the publication rate between 2008 and 2009.

Table 3 shows the outcome of a cross tabulation analysis performed on the number of publications per faculty per year; the "expected count" row for each year shows the number of publications that one could expect in the hypothesis that there were no relationship between year and discipline. Broadly speaking, the table shows that Pharmacy, Law, Veterinary, Mathematics and Sport Sciences show a high publication activity in 2006; except Medicine, Law and Sport sciences all disciplines respond actively to incentives in 2007 in view of 2008 positions; Agriculture and Veterinary show active publication rates in 2008. Medicine is the only discipline with higher than expected publications in 2009. Apart from the opening of positions, all disciplines show a cyclical publication pattern.

Table 3: Publication pattern per discipline per year

			AGRICULTURE	FARMACY	LAW	LETTERS	MEDICINE	VETERINARY	MATHEMATICS, PHYSICS, NATURAL SCIENCES	SPORT SCIENCES	POLITICAL SCIENCES	Total
Year	2006	Count	937	930	321	597	3980	1333	2311	162	431	11002
		Expected count	1014,7	822,7	293,0	606,8	4242,0	1224,7	2216,5	128,9	452,9	11002,0
	2007	Count	1225	981	333	694	4433	1443	2612	140	534	12395
		Expected count	1143,1	926,8	330,0	683,6	4779,1	1379,8	2497,1	145,3	510,3	12395,0
	2008	Count	1175	924	306	645	4549	1405	2425	124	488	12041
		Expected count	1110,5	900,3	320,6	664,1	4642,6	1340,4	2425,8	141,1	495,7	12041,0
	2009	Count	653	400	192	450	3719	635	1368	81	328	7826
		Expected count	721,7	585,2	208,4	431,6	3017,4	871,2	1576,6	91,7	322,2	7826,0
Totale		Count	3990	3235	1152	2386	16681	4816	8716	507	1781	43264
		Expected count	3990,0	3235,0	1152,0	2386,0	16681,0	4816,0	8716,0	507,0	1781,0	43264,0

Table 4 compares outcomes by faculty and by type of output; a crosstab analysis shows the expected distribution per row and per column, should the row and column variables independent of each other.

Table 4: publications patterns by faculty; different work types.

		Article	Book chapter	Conference Proceedings	Books	
AGRICULTURE	Count	1988	330	1551	121	3990
	Expected count	2233,9	314,5	1266,9	174,8	3990,0
	% Faculty	49,8%	8,3%	38,9%	3,0%	100,0%
	% work type	8,2%	9,7%	11,3%	6,4%	9,2%
	% total	4,6%	,8%	3,6%	,3%	9,2%
PHARMACY	Count	2405	97	702	31	3235
	Expected count	1811,2	255,0	1027,2	141,7	3235,0
	% Faculty	74,3%	3,0%	21,7%	1,0%	100,0%
	% work type	9,9%	2,8%	5,1%	1,6%	7,5%
	% total	5,6%	,2%	1,6%	,1%	7,5%
LAW	Count	453	337	99	263	1152
	Expected count	645,0	90,8	365,8	50,5	1152,0
	% Faculty	39,3%	29,3%	8,6%	22,8%	100,0%
	% work type	1,9%	9,9%	,7%	13,9%	2,7%
	% total	1,0%	,8%	,2%	,6%	2,7%
LETTERS	Count	570	778	367	671	2386
	Expected count	1335,8	188,1	757,6	104,5	2386,0
	% Faculty	23,9%	32,6%	15,4%	28,1%	100,0%
	% work type	2,4%	22,8%	2,7%	35,4%	5,5%
	% total	1,3%	1,8%	,8%	1,6%	5,5%
MEDICINE	Count	9962	576	5945	198	16681
	Expected count	9339,1	1314,8	5296,5	730,6	16681,0
	% Faculty	59,7%	3,5%	35,6%	1,2%	100,0%
	% work type	41,1%	16,9%	43,3%	10,4%	38,6%
	% total	23,0%	1,3%	13,7%	,5%	38,6%
VETERINARY	Count	2654	98	2022	42	4816
	Expected count	2696,3	379,6	1529,2	210,9	4816,0
	% Faculty	55,1%	2,0%	42,0%	,9%	100,0%
	% work type	11,0%	2,9%	14,7%	2,2%	11,1%
	% total	6,1%	,2%	4,7%	,1%	11,1%
MATHEMATICS, PHYSICS, NATURAL SCIENCES	Count	5325	567	2663	161	8716
	Expected count	4879,8	687,0	2767,5	381,8	8716,0
	% Faculty	61,1%	6,5%	30,6%	1,8%	100,0%
	% work type	22,0%	16,6%	19,4%	8,5%	20,1%
	% total	12,3%	1,3%	6,2%	,4%	20,1%
SPORT SCIENCES	Count	270	8	220	9	507
	Expected count	283,9	40,0	161,0	22,2	507,0
	% Faculty	53,3%	1,6%	43,4%	1,8%	100,0%
	% work type	1,1%	,2%	1,6%	,5%	1,2%
	% total	,6%	,0%	,5%	,0%	1,2%
POLITICAL SCIENCES	Count	595	619	168	399	1781
	Expected count	997,1	140,4	565,5	78,0	1781,0
	% Faculty	33,4%	34,8%	9,4%	22,4%	100,0%
	% work type	2,5%	18,2%	1,2%	21,1%	4,1%
	% total	1,4%	1,4%	,4%	,9%	4,1%
Total	Count	24222	3410	13737	1895	43264
	Expected count	24222,0	3410,0	13737,0	1895,0	43264,0
	% Faculty	56,0%	7,9%	31,8%	4,4%	100,0%
	% work type	100,0%	100,0%	100,0%	100,0%	100,0%
	% total	56,0%	7,9%	31,8%	4,4%	100,0%

If we look at the differences in terms of publication stocks for different faculties, we see not surprisingly that the most productive faculty in terms of publication stock is the Faculty of Medicine, with a stock of 16.681 publications, accounting for 38% of the total references archived in AIR. If we add Veterinary Medicine, the percentage rises to 48% (4.816 publications). The second Faculty in term of publication stock is Physics, Mathematics and Natural Sciences, with 8.716 works archived. After Veterinary Medicine, we find the Faculties of Agrarian Studies and Pharmacy. Faculty members of Humanistic Faculties contribute for a minor part to the publication stock of AIR. Letters, Law and Political Sciences represent together 12.3% of the repository. Sport Sciences Faculty, although cannot be classified with humanistic faculties, follows the same path and accounts for 1.2%. On the whole the least represented Faculty is Law (2.7% of the references in AIR).

Concerning the kinds of works published, an important distinction emerged from data analysis is between faculties more used to write articles and faculties more focused on book chapters publication.

The hard writers of articles are the members of scientific faculties, Medicine at the first place, representing more than 50% of the total articles (together with Veterinary Medicine) archived in AIR repository in the period 2006 – 2009. Almost 60% of the works published by faculty members of Medicine are articles. Also the faculty members of Physics, Mathematics and Natural Sciences write a consistent number of articles with respect to their colleagues of other faculties. Their articles represent 22% of the total articles archived in AIR and 61.4% of their works are articles. The least productive faculty in terms of articles is the Sport Science Faculty, which represents 1.1% of the total articles. A similar pattern is present for the faculties of Law, Letters and Political Sciences. Medicine and Physics, Mathematics and Natural Sciences have a consistent number of publications also for other kinds of works; in particular their works represent respectively 20% and 16.9% of book chapters in AIR. Concerning this kind of publication, the Faculty of Letters is the most productive, representing almost 23% of the total of book chapters. For this Faculty, even tough the publication of books chapters has higher percentage respect to that of articles (32,6% vs. 23,9%), the difference among publication channels is less evident with respect to scientific faculties.

Contrary to common wisdom, the publication flow of faculty does not stop once tenure is attained. Quite the contrary, tenured faculty are responsible for a high number of publications. For all the three categories (Researchers, PhD Students, Tenured Professors), journal articles represent the most used publication channel, representing almost half of the publication stock of the three categories. Not surprisingly, tenured faculty tend to publish an increased number of books, while PhD students, tend to be

overrepresented as far as the incidence of conference proceedings (41.3%) is concerned.

Table 5 : distribution of outcomes per academic seniority

			WORK TYPE				
			Article	Book chapter	Conference proceedings	Book	Total
	Professors	Count	13154	1956	6932	1164	23206
		Expected count	12992,2	1829,1	7368,3	1016,4	23206,0
		% Role	56,7%	8,4%	29,9%	5,0%	100,0%
		% work type	54,3%	57,4%	50,5%	61,4%	53,6%
		% total	30,4%	4,5%	16,0%	2,7%	53,6%
	PhD Students	Count	1744	128	1340	32	3244
		Expected count	1816,2	255,7	1030,0	142,1	3244,0
		% Role	53,8%	3,9%	41,3%	1,0%	100,0%
		% work type	7,2%	3,8%	9,8%	1,7%	7,5%
		% total	4,0%	,3%	3,1%	,1%	7,5%
	Researchers	Count	9324	1326	5465	699	16814
		Expected count	9413,6	1325,3	5338,7	736,5	16814,0
		% Role	55,5%	7,9%	32,5%	4,2%	100,0%
		% work type	38,5%	38,9%	39,8%	36,9%	38,9%
		% total	21,6%	3,1%	12,6%	1,6%	38,9%
Total		Count	24222	3410	13737	1895	43264
		Expected count	24222,0	3410,0	13737,0	1895,0	43264,0
		% Role	56,0%	7,9%	31,8%	4,4%	100,0%
		% work type	100,0%	100,0%	100,0%	100,0%	100,0%
		% total	56,0%	7,9%	31,8%	4,4%	100,0%

Finally, Table 6 analyses the internationalisation pattern of faculty publications.

Even in this case, there is a clear distinction between scientific and humanistic disciplines. Faculty members from scientific disciplines are used to publish in English. For the Faculty of Physics, mathematics and natural sciences, as well as Pharmacy, the majority of contributions are written in English. If we report the numbers of table 6 to the total publication stock, we see that 61.4% of faculty members' publications are in English and only 37.2% are in Italian. The rest is published in other languages. A similar situation characterises faculty members of Sport Sciences. For Medicine we find a major balance between English and Italian publications: 46.9% of publications are in English and 40.6% are in Italian.

Table 6: publications for different languages.

	OTHER	eng	fre	ger	ita	spa	Total
AGRICULTURE	1	138	3	0	90	1	233
PHARMACY	0	167	0	0	62	0	229
LAW	6	48	13	3	85	12	167
LETTERS	33	101	67	41	173	29	444
MEDICINE	24	194	19	3	168	6	414
VETERINARY	7	92	13	2	100	13	227
MATHEMATICS, PHYSICS AND NATURAL SCIENCES	4	383	3	0	232	2	624
SPORT SCIENCES	0	50	0	1	26	5	82
POLITICAL SCIENCES	25	151	31	11	206	34	458
Total	100	1324	149	61	1142	102	2878

For humanistic disciplines, the majority of contributions is written in Italian (39%) and only a minor part in English (22.7%). What is interesting is that faculty members of Letters have a good number of publications in other languages too, showing a remarkable international attitude. The least international Faculty is that of Law, with almost 60% of contributions written in Italian.

Results so far confirm the existence of different publication patterns across disciplines and different publication strategies related to seniority. Journal articles are increasingly becoming the most common publication outcome across disciplines, although books are more relevant in humanistic disciplines and are generally published when faculty reach academic maturity. Younger scholars start building their reputation through participation to conferences across all disciplines and gradually publish on academic journals and edited books. Medicine is the most prolific discipline in terms of publication outputs, while Law (but also Veterinary and Political Sciences) is the least international. For hard sciences English is more common than Italian, while humanistic disciplines show a broader spectrum of languages covered.

The second step of our analysis looks at the acceptance of open access publications as viable alternatives to traditional journals for authors across different disciplines. Due to the characteristics of the repository we could only track gold open access journals and not other forms of open repositories.

We therefore identified five disciplines and tracked the evolution of open access publication between 2006 and 2009. The five disciplines are chemistry, physics, letters, medicine and computer science.

Chemistry, like physics, is considered an advanced scientific discipline for the use of alternative publishing routes [23], whereas the opposite can be said for letters, whose authors are traditionally less appreciative of the digital features of journals [52] and favour books to articles in journals as the preferred mode of publication [40]. Medicine, and scientists in general, are used to conduct systematic directed searches in aggregated databases on line to validate their findings and to look for early visibility for their works. Concerning Computer Sciences, faculty members are supposed to have the necessary skills to use IT tools and, for what concerns their publishing strategies, they are influentially driven by monetary return and this fact could have deep influences on their approach to open access [40].

Four years is not a very long time span, but it allows looking at the growth in acceptance of Open Access across different disciplines. In order to analyse authors' publication strategies with respect to the introduction of Open Access, we looked at individual authors' behaviour in five disciplines over the time span analysed.

On the whole, open access publications represent 2.3% of the total publication records in AIR by the considered disciplines, which is quite modest in absolute terms. If we look at the faculties who have the greatest percentages of OA articles, Computer Science is the discipline with the highest number of publications (3%), followed by Medicine (2,7%). This result can be explained by the international orientation of some of the faculty in these disciplines and by the presence of high reputation open access journals both these disciplines have been early exposed to changes of scientific publication tools and have developed an early aptitude to openness.

Chemistry follows the same pattern while, contrary to letters, physics is underrepresented among open access journals in our sample. University of Milano has opened several positions in physics for researchers and tenured professors between 2006 and 2008. Given the fact that open access journals are a relatively recent phenomenon, it may be that authors have preferred more traditional publication outcomes so as to maximise their chances of complying with the criteria set by evaluation committees.

Table 7: evolution of open access articles for the five disciplines considered over the time span considered.

	2006	2007	2008	2009
Number of OA articles	85	74	142	80
Number of articles	4,227	4,294	4,567	3,462

If we focus on the number of Open Access publications deposited by scholars of different academic positions, we see that tenured faculty is more keen to publish OA; their works represent 57,5% of the total OA publications in AIR by the considered disciplines. Researchers represent 39.4% and PhD students only 3.1%.

Table 8: number of open access articles.

			open access		
			no	yes	Total
	Professors	Count	9866	219	10085
		Expected Count	9852,8	232,2	10085,0
		% Role	97,8%	2,2%	100,0%
		%open access	61,0%	57,5%	60,9%
		% total	59,6%	1,3%	60,9%
	PhD Students	Count	663	12	675
		Expected Count	659,5	15,5	675,0
		% Role	98,2%	1,8%	100,0%
		%open access	4,1%	3,1%	4,1%
		% total	4,0%	,1%	4,1%
	Reseachers	Count	5640	150	5790
		Expected Count	5656,7	133,3	5790,0
		% Role	97,4%	2,6%	100,0%
		%open access	34,9%	39,4%	35,0%
		% total	34,1%	,9%	35,0%
Total		Count	16169	381	16550
		Expected Count	16169,0	381,0	16550,0
		% Role	97,7%	2,3%	100,0%
		%open access	100,0%	100,0%	100,0%
		% total	97,7%	2,3%	100,0%

This result is consistent with findings of past researches on this topic: younger faculty tend to prefer more established channels in order to get legitimization; senior faculty, who has also access to higher funding, has more

degrees of freedom and therefore can experiment with a wider range of publication activities.

Table 9: averages per discipline.

	chemistry	physics	letters	computer sciences	medicine
Average number of articles per author	11,32	11,32	11,31	11,37	11,39
Average number of publications for the top 20 of authors in terms of articles published	31,05	33,3	18,45	15	100,15
% of OA articles	2%	0,5%	1,1%	3%	2,7%

Not surprisingly, OA publications tend to concentrate among authors with the highest publication rate. We find a mild correlation between the number of publication and the number of OA publications. Yet, the numbers are too small for a generalisation.

Table 10: regression output.

Model	R	R-square	Standard deviation
1	,344[a]	,119	,782

		publications	oa
pub	Pearson	1	,344**
	Sig. (2-tail)		,000
	N	1452	1452
oa	Pearson	,344**	1
	Sig. (2-tail)	,000	
	N	1452	1452

5. Conclusions

In this paper, we were interested in exploring different publication strategies put in place by authors from different disciplines and seniority, in order to identify common trends and peculiarities within the same institutions; not

surprisingly, the first result is that each discipline shows idiosyncratic patterns, particularly as far as the preferred publication outcomes are concerned: books are the preferred form of publication among scholars in the humanities, whereas journal articles are preferred in science. Moreover, internationalisation patterns are quite different across disciplines, with some (namely physics) being a global academic field with English as the language of reference, while others show the need to address both the local and the international audience; in the humanities, English is not a lingua franca, rather, other languages are also used to communicate scientific outcomes.

Yet, the analysis of results shows remarkably common patterns across disciplines. Within the academia, only a limited number of faculty members publish and an even smaller number of them publishes regularly and a significant number of contributions per year; yet, those who publish are quite active even when they reach tenure, and this is true across disciplines. Incentives do play a role: opening of positions within the university is correlated to a sharp increase in the number of publications.

As publications alternatives multiply, it is becoming increasingly important for the author to be aware of what rights, opportunities and limitations are associated with different channels. At the same time, the increased variety of juridical options associated with each of them makes publication decisions more complex than in the past. In this respect, authors in our sample tend to follow a quite conservative approach in choosing where to publish; younger faculty members tend to be more active in conference participation, while more senior faculty progressively publish journal articles and books. Open access is still a very small percentage of outcomes and there is a mild correlation between tendency towards open access and intensity of publications.

Incentives seem to be the most effective way to modify publication strategies: as scientific communities tend to be quite resilient, changes in the patterns are likely to be introduced either by relatively senior and active authors or by specific policies put in place at the faculty level.

From this emerging perspective, new publication ways can be integrated in the knowledge creation process of science and they can be considered important vectors for the final steps of diffusion, in parallel with traditional channels. For some of these channels there is a lack of transparency for what concerns the consideration by academic communities and the evaluation for promotion and tenure decision within departments and Universities. Current incentive mechanisms of universities can therefore represent an obstacle to a wider diffusion of new publication models [55], when they are not aligned with the trends of the scholarly publishing sector, reflecting the established norms of the traditional academic environment.

Authors seem to be rational in their publication strategies: apart from the selected few who are systematic authors "no matter what", academic authors in our sample respond to career advancement opportunities and publish in established channels defined up by their departments / communities of peers. Although we could not measure it, impact factor most likely drives journal selection. New alternative models for early visibility or publication (such as repositories like SSRN or PLoS) are clearly showing that it is possible to offer an alternative to traditional journals, provided that they are able to attract significant numbers of readers, offer high IF in addition to open access. Should they be able to comply with academic requirements, they will undoubtedly succeed in attracting to authors.

We do not have enough data to statistically verify this datum. Yet, it is likely that gold open access is more available to senior faculty, which is likely to have more access to financial resources. This needs to be taken into consideration in resource allocation, should the gold open access model be encouraged.

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