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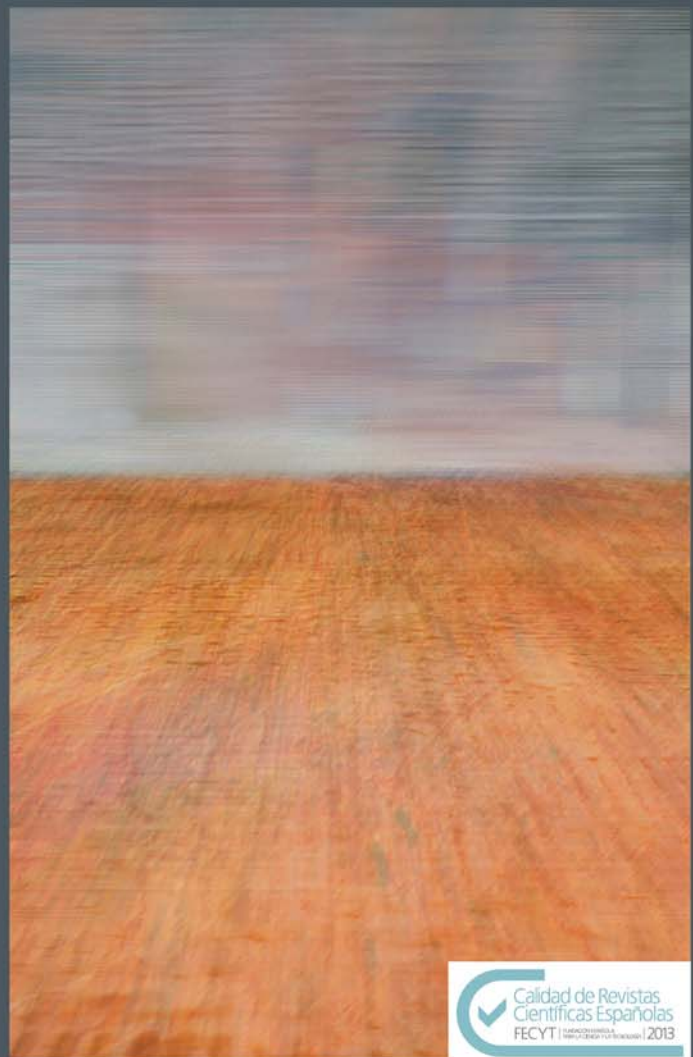


Revistas de educación e investigación educativa. Modelos de negocio y desempeño bibliométrico

Education & educational research journals: business models and bibliometric performance

Jorge Mañana Rodríguez

Elea Giménez Toledo



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Jorge Mañana Rodríguez
Elea Giménez Toledo

Grupo de Investigación ÍLIA, Centro de Ciencias Sociales y Humanas, CSIC.

Abstract:

Education scientific journals are a key element for the progress of educational research. The added value which might be expected from the rising prices of scientific journals has one of its accountable factors in the bibliometric indicators as a measure of performance. The research question addressed in this paper is whether there are significant differences in bibliometric performance of the most expensive (in terms of price per article, price per citation and other related measures detailed in Appendix I) educational research journals in JCR 2013 when compared with the less expensive educational journals or not. For this purpose, data was gathered from Journal Prices and Journal Citation Reports, for Education & Educational Research journals. Statistical analyses comparing the bibliometric performance of the most expensive against the less expensive educational research journals evidences the existence of non-significative differences between the two segments in most of the variables analyzed, thus putting into question the added value of buying and / or publishing in expensive educational research journals. It is concluded that, at least from a bibliometric perspective, expensive educational journals do not add significant value to the contents published. This can be understood as an abnormality in the market of scientific journals and might, in the long run, compromise the knowledge exchange among researchers working in education fields.

Key Words: Scientific Journals, Education, Journals Cost-Efficiency, journal prices, added value.

Resumen:

Las revistas científicas de educación son un elemento fundamental para el progreso de la investigación educativa. El valor añadido que cabría esperar teniendo en cuenta los precios crecientes de las revistas científicas cuenta con un factor subyacente cuantificable: los indicadores bibliométricos, como medida de desempeño. La pregunta de investigación abordada en este artículo es la existencia o no existencia de diferencias estadísticamente significativas en el desempeño bibliométrico de las revistas científicas de educación en JCR más costosas (en términos de precio por artículo, precio por cita y otras medidas relacionadas) comparándolo con el correspondiente a las revistas menos caras. Para este objetivo, se ha reunido información procedente de Journal Prices y Journal Citation Reports relativa a revistas de educación e investigación educativa. Las técnicas estadísticas empleadas para contrastar el desempeño bibliométrico de las revistas más caras y menos caras evidencian la existencia de diferencias no significativas entre ambos segmentos en la mayoría de las variables analizadas, por lo que se pone en entredicho el valor añadido de comprar / publicar en revistas de educación caras. Se concluye que, al menos desde una perspectiva bibliométrica, las revistas más caras de educación no añaden valor de forma significativa a los contenidos que publican, lo que puede entenderse como una anomalía en el mercado de las revistas científicas y podría, a largo plazo, comprometer el intercambio de información entre investigadores en áreas de educación.

Palabras Clave: Revistas científicas, Educación, Coste-eficacia de revistas, precios de revistas, valor añadido.

Introduction

The market of scholarly publications

Scientific research is nowadays conducted in the midst of a huge information market. The publication of scientific journals, the production of bibliographic / bibliometric databases, the payment for publication in OA (in its various modalities) or self-publication are some of the activities related to a big business. Often, that scientific information market has a direct influence on scientific activity, on scientific outputs' assessment and on scientific publishing. In example, the escalating prices of commercial

and reference scientific journals¹ (which is by far not a recent issue, as De Gennaro, 1977, pointed out) drives academic institutions to carefully select their subscriptions to journals and, therefore, to dispense with some journals. This implies that researchers have more difficulties when accessing the scientific information they need, given a constant budget.

The publication of research results is also affected by those market conditionings. Specialized journals, as well as those best considered by research evaluation agencies are largely published by commercial publishing groups, which provide access to their journals through subscription fees (of packages, in many occasions). Some of these groups provide authors with the possibility of publishing OA papers by paying a given fee, usually denominated Article Processing Charges (APCs). This situation also affects the budgets of research projects and competitive funding: the calls for candidate projects, as well as the regulations and laws (both national² and international³) contain recommendations on publishing deadlines which do not coincide with the requirements of commercial publishers, unless the APCs are paid in order to publish the manuscript in OA. Golden OA has resulted in an extraordinary source of revenue for big publishers, as the exponential growth of the so-called “hybrid” journals (commercial journals which accept OA publication after APCs payment) evidences (Björk & Solomon, 2014).

Regarding bibliometric databases, which bibliometric indicators prevail in many assessment exercises have also a high price (Web of Science, in example), which is usually assumed by public institutions (therefore, paid from public budgets). On top of these aspects, there is the free and altruistic work of reviewers of scientific journals all over the world (Bergstrom 2001).

Since the economic dimension of publication and assessment of scientific research outputs does directly affect research and its budgets, it is necessary to deepen into cost-effectiveness of publications. The information from such research might be useful for decision making for researchers, evaluators and policymakers working on scientific policy.

⁽¹⁾ This has been one of the pillars of the boycott to Elsevier's products *The cost of Knowledge*: <http://the-costofknowledge.com/>

⁽²⁾ The Spanish law: 14/2011 Ley de la Ciencia, la Tecnología y la Innovación

⁽³⁾ European Commission (2013). Guidelines on Open Access to Scientific Publications and Research Data in Horizon 2020.

Cost-effectiveness of scientific journals.

From a classical demand law perspective, the prices of journals are a factor to be taken into account when considering its demand and therefore the circulation of the scientific knowledge, achievements and evidences published in their pages. Nevertheless, the elasticity of demand in the case of scientific knowledge as a sellable good might well not be thoroughly comparable to the elasticity on other (not Veblen nor Giffen) goods, given the particularities of its specific market. Each article, subjected to a copyright status, represents a micro-monopoly (Bergstrom & Bergstrom, 2004): the inelasticity of its demand lies (among other factors (Bergstrom 2010; Zheng & Kaiser, 2012) on the originality of scientific manuscripts. Its uniqueness, novelty and the possibility of acquisition of that good by only one source (under the terms and conditions, displayed by the owner of the copy rights on the article) implies one of the pre-conditions for a monopolistic-like status of the scientific paper. Situations like this have been subject, at least in the United Kingdom, to an investigation and subsequent statement by the Office of Fair Trade (Office of Fair Trade, 2002), pointing out the abnormalities of the market of scientific journals, particularly in the case of publishers such as Elsevier. Although the Office did not decide to take action, they stated:

‘In doing so [considering further action], we would be aware that although the UK is an important base for, and user of, scientific journals, it accounts for a fraction of the world market and so would wish to consider whether any action might be best conducted internationally.’

Among the main conclusions of a report on the economics of scientific research publishing commissioned by the Wellcome Trust in 2003 (Wellcome Trust, 2003), two conclusions can be found in its executive summary:

*‘-Price is unimportant at point of use for the research community
-Journals are not easily substitutable for each other.’*

Also, the fact that the end user of a scientific journal is –in many occasions– unaware of the price of the subscription to that journal, since

it is paid by the institution as part of its budgets, contributes to the inelasticity of demand. The prototype of the factors underlying that inelasticity of demand can be found in the case of a highly specialized researcher who will not find a substitute for an also specialized journal covering his research topic, who also does not know how much does his institution pay for the subscription to that journal.

A researcher in that situation, which is a common one, will have little chance to be uncomfortable with the benefit margin of commercializing the papers he sends to that, plausibly expensive (in the case of a non Open Access journal) journal

Coordination games, as Bergstrom (2001) puts it, lies behind the stability of a strongly uneven (but highly profitable) market. The customary tradition of publishing in a given prestigious publication, which serves as meeting point for researchers, which in a given point of its history starts being published by a commercial group, makes it difficult for the community of researchers 'around' that publication to switch to a free or cheaper one. Usually, the need for that journal has been established by previous researchers. This need is then exploited by companies which acquire the publication and generate profitable market in which the work of researchers is free for the journal (both the research, the writing of the manuscript and the blind peer review), but not for the end user (very often, the same community of researchers which produces the research results then published in the journal). If we add to that the plausibly limited added value, in terms of citations received by the works published by the journal, of the new, for-profit journal, the market parameters are sufficiently abnormal as to wonder how this situation can be sustained in time. It is important to note here that the journal prices in this paper are those from subscription fees.

Previous studies (Bergstrom & Bergstrom / McAfee, developers of one of the databases used in this study) analyzing the relationship between the cost-effectiveness and bibliometric behavior of journals in the fields of Economics and Ecology have evidenced (Bergstrom, 2001) that there is not a direct statistical relation between the price per article and the price per citation and their total number of citations or eigenfactor. One of the most solid conclusions of their studies is that scientific community would be benefitted if costly journals are displaced by less expensive journals. This affirmation is strongly based on evidence, pointing in the direction that there is not a straight relationship between the quality

(understood under the prism of citations and citation-based metrics) and the price. Also, other remarkable studies have been published regarding analyses of publications in the field of Geography (Geoforum Editorial, 2006), setting evidence against the added value of the journal being published by a large publishing group or Mathematics (American Mathematical Society, 2011), as can be found in Bergstrom website (<http://www.econ.ucsb.edu/~tedb/Journals/jpricing.html>).

Among the various measures an author can take in order to advance in the direction of paying less for the same quality content, Bergstrom & Bergstrom affirm (Bergstrom & Bergstrom, 2006) 'by refusing to do unpaid referee work for overpriced commercial publications, by self-archiving their papers in preprint archives or institutional repositories, and by favoring reasonably priced journals with their submissions (...)'.

These actions become particularly important in the case of Education journals, since, as will be developed in the results section, the proportion of for-profit journals in the field is 3% higher than in the rest of the population of journals (at least in JCR).

Given the instrumental role of journals for the scientific advancement of research in this field, further analyses, comparing the situation of cost-effectiveness in education journals is relevant for decision making regarding this competitive market.

Given the central role of acquisition policies in university libraries and research facilities, providing information on the cost effectiveness, as Bergstrom and McAfee have been doing, should be recognized as an important service to those audiences. Most of the literature regarding business models of scientific communication spins around open access, but it is important to take into account that the several OA economic models put most of these journals in similar conditions (at least for the calculation of the indicators of cost-effectiveness) to those non OA journals. Therefore, in this study, the analyses will not include OA / Non-OA journals as a splitting variable.

Education & Educational Research journals

There is no controversy regarding the fact that Education is a pillar of the progress and welfare of any society (Burbules & Torres, 2013). Also, there is general consensus around the role of educational research in the

evolution of educational practice worldwide, although the measurement of the impacts of educational research does not lack sharp edges and deep methodological discussions (Francis, 2011). There is also little doubt that publishing the results of educational research through journals (among other means, such as monographs), and setting the basis for the research on the findings detailed in the scientific journals of the field is one of the most important channels for 'making an impact' (not only in terms of citations, but mainly, as policymakers might be expected to consider the best available evidence when taking political decisions which affect millions of people), as well as for setting the basis for the additive accumulation of knowledge in the discipline.

One of the sides of the impacts of educational research is the link between the two activities: research and publication. Regarding this important issue, and not only affecting the diffusion of educational research results, a controversial topic has emerged as a consequence of the development of new models of journal publication: the price of publication and the cost-effectiveness of scientific journals.

Given the central role of Education and, subsequently, educational research in the improvement of a wide range of social parameters, and taking into account that for this research to permeate those making decisions (as well as practitioners and other audiences) it needs to be made available, the question of which is the behavior, in terms of cost effectiveness, of educational scientific journals is a relevant issue.

Objectives

This research had the general objective of testing the empirical relation between the cost, profit status and price per citation / paper of Education & Educational Research journals and their bibliometric performance.

The working hypothesis is that, if the high cost of commercial journals is justified by the added value to editorship and, therefore, their acceptance and impact among research communities, a higher value would also be expected in terms of the values of bibliometric indicators.

Methodology

The variables used in this study are the following:

Journal Title, ISSN, Publisher, Subject, Year First Published, Profit Status, Price per Citation, Composite Price Index, Relative Price index, Value Category, Total citations, Impact Factor, Immediacy Index, Cited Half Life, 5 year Impact Factor, Eigenfactor, Article Influence and Price per Article.

A definition of the cost-effectiveness indicators is provided in Appendix I.

The datasets used in this study are the following ones:

Regarding journal prices information: the 2013 dataset of Journal Cost-Effectiveness retrieved in March, 2013 at <http://www.journalprices.com/>. This source of information, developed by Ted Bergstrom and Preston McAfee, is the most comprehensive freely available database regarding journals cost-effectiveness. The journals covered in the database are 'all journals from which the ISI Web of Science publishes citation counts and for which we were able to find prices' (<http://www.journalprices.com/explanation2013.html>). This concept takes form in two main variables for each of the 10,100 journals in the database: price per article and price per citation. Other variables displayed in the database for the set of journals are: Composite Price Index, Profit status (Non-Profit and For-Profit, depending on the characteristics of the publishing institution), Relative Price Index and Value (Good, medium or bad). More specific information can be found at: <http://www.journalprices.com/explanation2013.html>

Regarding the bibliometric behavior of journals, JCR 2013 data has been crossed with Journal Prices data (for education journals only). Nevertheless, not all education journals have been studied, since some sets of journals are too small for significant statistical analyses. Also, the co-classification of journals involves the possibility of comparing Education & Educational Research journals with others which could show parameters (particularly in the case of bibliometric variables) uncommon to the discipline (such as in the case of Engineering). The sets of journals studied are the following: Education, 145 journals; Education, Social Science, 21 journals; Education, Psychology, 12 journals; Education, Medicine: 28 journals. The sets excluded from the analyses are: Education, Engineering, 4; Education, History, 2; Education, Humanities, 2; Education, Law, 1; Education, Physics, 2; Education, Psychology, Social Science, 2. After the removal of duplicate registers (due to co-classification of journals), the final set of journals had

195 elements. Exceptionally, for the analyses carried out regarding the diachronic evolution of price-related variables all journals under the “Education” subject category in the Journal Prices database have been considered (from 98 in 2004 up to 222 in 2013).

In all cases, the p-value considered has been 0.05, except in those in which the Montecarlo correction has been applied.

Normality tests

Preliminary tests: the first necessary test in order to determine if parametric or non-parametric tests are to be applied to the data is a normal distribution test. In this case, Kolmogorov-Smirnov 1 sample tests have been carried out for all quantitative variables and for all the journals in the database in its 2013 edition. The results shows that none can be considered normally distributed: Price per article K-S (10.100, 0.001) = 30.11; Price per citation K-S (10.100, 0.001) = 38.67; Composite Price Index K-S (10.100, 0.001) = 31.352; Relative Price Index K-S (10.100, 0.001) = 32.350. Therefore, all techniques applied to data will be non-parametric.

Analyses within education journals

a) *Chi-square over profit status and subject*

In order to test the hypothesis of an association between the profit status of journals in each subject and the three subjects (within Education) considered in this second part of the results section, a chi-square test was carried out. The test reveals independence between the two variables in the different categories: $\chi^2(2, N=194) = 3.7, p=0.157$.

b) Mann-Whitney U rank tests on profit status and bibliometric indicators. Can it be expected to get higher impact factor and related measures if publishing in for profit or non for profit journals?

In order to test the hypothesis, Mann-Whitney U nonparametric tests have been applied to all scale (quantitative) variables, comparing the two groups of education journals as a result of the split in for-profit and non-profit status. The results can be found in the following table:

TABLE I. Mann-Whitney U, for-profit / non for-profit

VARIABLE	NON PROFIT (N=79)	FOR PROFIT (N=114)	U	SIG. (TWO- TAILED)	R (EFFECT SIZE)
	MEDIANA	MEDIANA			
PRICE PER ARTICLE	8.62	28.57	1162.00	0.00	-0.63
PRICE PER CITATION	7.17	28.74	1526.5	0.00	-0.56
COMPOSITE PRICE INDEX	7.71	26.27	1253.5	0.00	-0.61
RELATIVE PRICE INDEX	0.86	2.87	1255	0.00	-0.61
IMPACT FACTOR	1.089	0.93	4239	0.58	-0.04
IMMEDIACY INDEX	0.148	0.11	3850.5	0.36	-0.07
CITED HALF LIFE	3.9	6.8	2218	0.00	-0.27
5YR IMPACT FACTOR	1.28	1.22	2209	0.71	-0.03
EIGENFACTOR	0.001	0.001	4133.5	0.41	-0.06
ARTICLE INFLUENCE	0.456	0.433	2243	0.72	-0.03
TOTAL CITATIONS	594	542.5	4359.5	0.82	-0.02

Although it is not surprising that for-profit journals' owners show a significantly higher median for the price per article and price per citation, and therefore (since both are strongly related to it), the composite price index and the relative price index, it is surprising that, according to the results of the test, the differences between Non-profit and For-profit journals in all the indicators related to their bibliometric performance are non-significant, except in the case of the Cited Half Life, in which for-profit journals perform better.

g) Mann-Whitney U rank tests on price per article and bibliometric indicators. Can it be expected to get a higher impact factor and related measures if publishing in the HALF most expensive (in terms of price per article) education journals?

TABLE 2. Mann-Whitney U, half higher tier in price per article / half lower tier in price per article (Currency: USD)

VARIABLE	MEDIAN (HALF LOWER VALUES)	MEDIAN (HALF HIGHER VALUES)	U	Sig. (Two - tailed)	r (Effect Size)
PRICE PER CITATION	7.9	41.03	1082	0	-0.67
COMPOSITE PRICE INDEX	8.66	45.94	347.5	0	-0.80
RELATIVE PRICE INDEX	0.95	4.41	388.5	0	-0.79
TOTAL CITATIONS	535	333	3849	0.029	-0.16
IMPACT FACTOR	0.892	0.667	4290.5	0.29	-0.08
IMMEDIACY INDEX	0.09	0.077	3960.5	0.179	-0.10
CITED HALF LIFE	4.75	6.6	2616	0.002	-0.22
5 YR IMPACT FACTOR	1.151	1.1255	2166.5	0.847	-0.01
EIGENFACTOR	0.00098	0.00086	4234.5	0.229	-0.09
ARTICLE INFLUENCE	0.392	0.398	2182	0.758	-0.02

As might be expected, there are significant differences between price per citation, composite price index and relative price index. Nevertheless, there are not significant differences between the half lower and half higher values in their medians in the case of total citations, impact factor, immediacy index, 5 year impact factor, eigenfactor and article influence. In all these cases, except in article influence, the median is higher (although not enough as to imply a statistically significant difference) in the case of education journals from the tier containing the half lower values of price per article. The cited half life is a sole exception in the analyses: there are significant differences, the median being bigger in the case of the journals with the higher values of price per article.

TABLE 3. Descriptive statistics (half higher tier in price per article / half lower tier in price per article)

Variable	Half with lower values for price per article (n=97)			Half with higher values for price per article (n=97)		
	Range	Mean	SD	Range	Mean	SD
PRICE PER ARTICLE	22.92	9.29	6.97	226.83	53.19	33.23
PRICE PER CITATION	125.00	15.65	23.20	1581.30	93.69	201.42
COMPOSITE PRICE INDEX	43.90	10.74	9.63	619.52	61.63	70.56
RELATIVE PRICE INDEX	6.05	1.17	1.06	62.95	6.25	7.15
TOTAL CITATIONS	8644.00	883.95	1232.52	3864.00	532.64	644.48
IMPACT FACTOR	4.21	0.95	0.73	3.08	0.84	0.59
IMMEDIACY INDEX	1.22	0.19	0.24	0.51	0.11	0.12
CITED HALF LIFE	9.80	4.20	3.30	9.70	5.70	2.92
5YR IMPACT FACTOR	5.90	1.30	0.96	3.72	1.22	0.77
EIGENFACTOR	0.02	0.00	0.00	0.01	0.00	0.00
ARTICLE INFLUENCE	3.09	0.49	0.47	2.28	0.49	0.41

h) Mann-Whitney U rank tests on price per citation and bibliometric indicators. Can it be expected to get higher impact factor and related measures if publishing in HALF the most expensive (in terms of price per citation) education journals.

TABLE 4. Mann-Whitney U, half higher tier in price per article / half lower tier in price per article.

VARIABLE	MEDIAN (HALF LOWER VALUES (n=97))	MEDIAN (HALF HIGHER VALUES) (n=97)	U	Sig. (Two - tailed)	r (Effect Size)
PRICE PER ARTICLE	9.98	42.76	937.5	0	-0.69
COMPOSITE PRICE INDEX	8.66	45.94	149	0	-0.84
RELATIVE PRICE INDEX	0.95	4.66	177.5	0	-0.83
TOTAL CITATIONS	594	293	2660.5	0.001	-0.38
IMPACT FACTOR	1.089	0.545	2460.5	0	-0.41
IMMEDIACY INDEX	0.12	0.069	3171.5	0	-0.25
CITED HALF LIFE	4.8	6.65	2493	0	-0.25
5YR IMPACT F ACTOR	1.4	0.8595	1228.5	0	-0.33
EIGENFACTOR	0.00135	0.00076	2838	0	-0.34
ARTICLE INFLUENCE	0.518	0.279	1393	0	-0.29

There can be observed significant differences between the two sets of journals in all the variables. As in the previous analyses, the differences in price per article, composite price index and relative price index were expected. In all cases, (except in the cited half life), total citations, impact factor, immediacy index, 5 year impact factor, eigenfactor and article influence show a higher median in the group of journals which constitutes the half with lower values in the set of education journals.

TABLE 5. Descriptive statistics (half higher tier in price per citation / half lower tier in price per citation)

Variable	Half with lower values for price per citation			Half with higher values for price per citation		
	Range	Mean	SD	Range	Mean	SD
PRICE PER ARTICLE	51.02	12.74	12.03	243.40	49.74	35.92
PRICE PER CITATION	21.42	8.63	6.56	1562.15	100.71	199.65
COMPOSITE PRICE INDEX	28.70	10.05	8.18	615.18	62.33	70.22
RELATIVE PRICE INDEX	3.20	1.09	0.87	62.51	6.32	7.11
TOTAL CITATIONS	8644.00	1033.76	1278.43	2976.00	382.82	385.17
IMPACT FACTOR	4.21	1.16	0.77	2.56	0.63	0.40
IMMEDIACY INDEX	1.22	0.21	0.24	0.51	0.09	0.09
CITED HALF LIFE	9.80	4.16	3.30	9.70	5.85	2.83
5YR IMPACT FACTOR	5.90	1.57	1.01	2.06	0.86	0.46
EIGENFACTOR	0.02	0.00	0.00	0.00	0.00	0.00
ARTICLE INFLUENCE	3.09	0.62	0.53	0.78	0.31	0.21

Mann-Whitney U rank tests on Composite Price Index and bibliometric indicators. Can it be expected to get higher impact factor and related measures if publishing in HALF the most expensive (in terms of Composite Price Index) education journals?

TABLE 6. Mann-Whitney U, half higher tier in Composite Price Index / half lower tier in Composite Price Index.

VARIABLE	MEDIAN (HALF LOWER VALUES)	MEDIAN (HALF HIGHER VALUES)	U	Sig. (Two-tailed)	r (Effect Size)
PRICE PER ARTICLE	9.08	43.33	386.5	0	-0.79
PRICE PER CITATION	7.59	48.97	190	0	-0.83
RELATIVE PRICE INDEX	0.95	4.66	47	0	-0.86
TOTAL CITATIONS	596	284	2709.5	0	-0.37
IMPACT FACTOR	1	0.578	2937	0	-0.32
IMMEDIACY INDEX	0.1235	0.072	3400	0.004	-0.20
CITED HALF LIFE	4.8	6.7	2482	0	-0.25
5 YR IMPACT FACTOR	1.301	0.903	1523.5	0.002	-0.23
EIGENFACTOR	0.0013	0.00077	3071	0	-0.30
ARTICLE INFLUENCE	0.47	0.333	1713	0.013	-0.18

Since the composite price index is the geometric mean of the price per article and the price per citation, the results of this test are expected to be very similar to ones from the preceding tests. For all variables, the impact factor, immediacy index, 5 year impact factor, eigenfactor and article influence show significantly lower median values in the case of the higher Composite Price Index tier, while the cited half life is the only variable with significantly higher median for the higher composite price index tier.

TABLE 7. Descriptive statistics (half higher tier in Composite Price Index / half lower tier in Composite Price Index)

Variable	Half with lower values for Composite Price Index			Half with higher values for Composite Price Index		
	Range	Mean	SD	Range	Mean	SD
PRICE PER ARTICLE	35.97	10.65	9.01	243.40	51.83	34.47
PRICE PER CITATION	41.93	9.55	8.60	1571.22	99.79	199.99
COMPOSITE PRICE INDEX	23.90	9.46	7.19	606.12	62.92	69.88
RELATIVE PRICE INDEX	3.20	1.04	0.80	61.59	6.38	7.08
TOTAL CITATIONS	8644.00	1010.67	1267.56	2976.00	405.92	453.13
IMPACT FACTOR	4.21	1.11	0.77	2.56	0.68	0.45
IMMEDIACY INDEX	1.22	0.20	0.24	0.51	0.10	0.10
CITED HALF LIFE	9.80	4.15	3.30	9.70	5.85	2.83
5YR IMPACT FACTOR	5.90	1.47	0.99	3.08	0.96	0.61
EIGENFACTOR	0.02	0.00	0.00	0.00	0.00	0.00
ARTICLE INFLUENCE	3.09	0.57	0.52	1.35	0.36	0.27

j) Mann-Whitney U rank tests on Composite Price Index and bibliometric indicators. Can it be expected to get higher impact factor and related measures if publishing in HALF the most expensive (in terms of Relative Price Index) education journals?

TABLE 8. Mann-Whitney U, half higher tier in Relative Price Index / half lower tier in Relative Price Index.

VARIABLE	MEDIAN (HALF LOWER VALUES)	MEDIAN (HALF HIGHER VALUES)	U	Sig. (Twotailed)	r (Effect Size)
PRICE PER ARTICLE	9.08	43.33	386.50	0.00	27.75
PRICE PER CITATION	7.59	48.97	190.00	0.00	13.64
COMPOSITE PRICE INDEX	8.66	45.94	0.00	0.00	0.00
TOTAL CITATIONS	594.00	284.00	2709.50	0.00	194.53
IMPACT FACTOR	1.00	0.58	2937.00	0.00	210.86
IMMEDIACY INDEX	0.12	0.07	3400.00	0.00	244.11
CITED HALF LIFE	4.75	6.70	2482.00	0.00	178.20
5 YR IMPACT FACTOR	1.30	0.90	1523.50	0.00	109.38
EIGENFACTOR	0.00	0.00	3071.00	0.00	220.48
ARTICLE INFLUENCE	0.48	0.31	1713.00	0.01	122.99

As well as in the case of the previously analyzed cost-effectiveness indicator, significantly higher median values for total citations, impact factor, immediacy index and 5-year impact factor can be observed in the journals belonging to the half lower values tier of Relative Price Index.

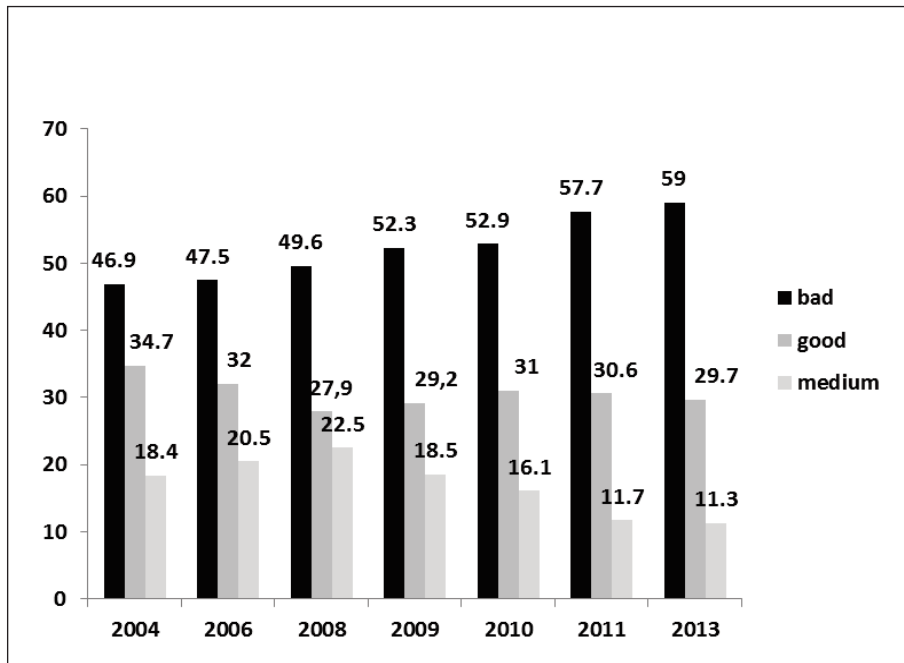
TABLE 9. Descriptive statistics (half higher tier in Relative Price Index / half lower tier in Relative Price Index)

Variable	Half with lower values for price per citation			Half with higher values for price per citation		
	Range	Mean	SD	Range	Mean	SD
PRICE PER ARTICLE	35.97	10.82	9.30	243.40	51.66	34.60
PRICE PER CITATION	41.93	9.57	8.62	1571.22	99.77	200.00
COMPOSITE PRICE INDEX	25.52	9.55	7.36	610.56	62.82	69.94
RELATIVE PRICE INDEX	2.59	1.02	0.76	61.40	6.39	7.07
TOTAL CITATIONS	8644.00	1007.43	1269.07	2976.00	409.15	453.25
IMPACT FACTOR	4.21	1.11	0.77	2.56	0.68	0.45
IMMEDIACY INDEX	1.22	0.20	0.24	0.51	0.10	0.10
CITED HALF LIFE	9.80	4.09	3.32	9.70	5.92	2.77
5YR IMPACT FACTOR	5.90	1.47	0.99	3.08	0.96	0.61
EIGENFACTOR	0.02	0.00	0.00	0.00	0.00	0.00
ARTICLE INFLUENCE	3.09	0.58	0.52	1.35	0.36	0.27

General diachronic overview

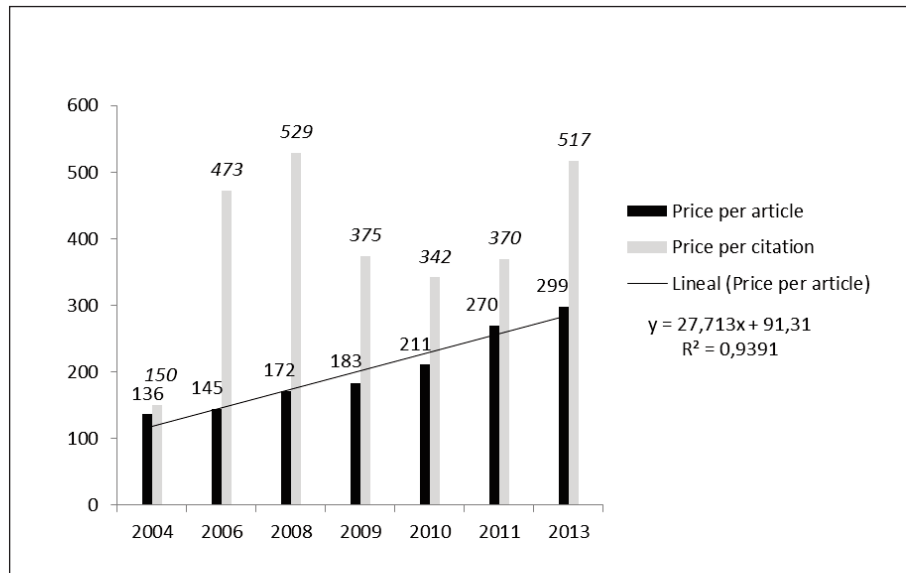
In order to offer a general image of the evolution of some of the most relevant indicators taken into account in this research, the values for the years 2004, 2006, 2008, 2010, 2011, and 2013 (those available at Journal Prices website) are reflected.

CHART I. Percentage of 'value category' values for education journals from 2004



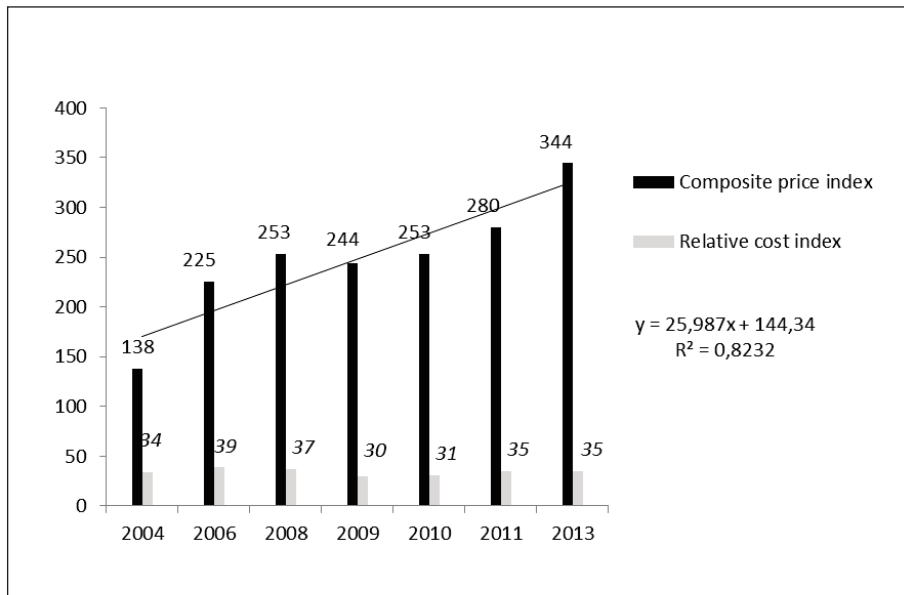
As it can be easily observed, there is a clear tendency towards the increase in the percentage of journals with bad value categories, in detriment of the good and medium value categories.

CHART 2. Evolution of mean Price per article and price per citation. Education journals from 2004



As it is consistent with previously reported data, there is also an increase in the price per article. This increase is linear, while the fluctuations in the price per citation are strong.

CHART 3. Evolution of mean Composite Price Index and Relative Price Index. Education journals from 2004



The increase of the Composite Price Index (The Composite Price Index is the geometric mean of the Price Per Article and the Price Per Citation.) is linear since 2009, which is congruent with the data shown above. It is important to note, nevertheless, that since Journal Prices is based on data from JCR, it cannot be affirmed that this tendency (although it seems a plausible hypothesis) can be generalized to the rest of the population of journals, since the selection policy of that product might bias the composition of the educational journals population in one particular direction.

Conclusions

According to the evidence presented in this paper, there are no statistically significant differences in the average ranks of the main

bibliometric indicators between for-profit and non-for-profit educational journals, between the half most expensive and the half less expensive in terms of price per article nor price per citation. Moreover, in the case of journals with higher Composite Price Index, the median is significantly lower for impact factor, eigenfactor and article influence than in the case of journals with lower Composite Price index (with the sole exception of the cited half life), and the same situation can be also observed when comparing the tier with half lower values of Relative Price Index.

The added value, in terms of bibliometric performance, of for profit, with high price per article, price per citation, Composite Price Index and Relative Price Index journals in Education in JCR is strongly questionable. From this evidence, it can be concluded that, assuming a certain degree of stability in the data analyzed, publishing papers in expensive journals does not involve a higher probability of adding (bibliometric) value for that specific research, and outlines the role of inexpensive journals in the path of scientific communication. It also puts into question which is the added value of expensive journals and the publishing groups behind them, and therefore, it also puts into question the balance of the market of educational scientific journals. If no (bibliometric) or little added value can be expected from expensive journals in educational scientific journals, the perspective of the institutions which acquire the enormously expensive licenses of these journals would have some evidence supporting a less expensive but probably equally relevant collection of titles.

As well, the linear increase in the frequency of bad value category in the set of journals studied (with the consequent decrease in the good and medium value categories), as well as the linear increase in the price per article involves a serious threat to the accessibility of scientific information in educational journals which can only be counterbalanced by the sum of individual decisions by both researchers (publishing in non expensive journals or pure OA journals) and librarians (taking cost-effectiveness of journals when choosing the titles in their collections).

Discussion

The bibliometric behavior of educational journals shows that inexpensive is not synonym for lack of interest or low scientific quality, as it has been

attempted to show in some scientific works (Bohannon, 2013). Organizations such as OASPA watch over the quality of OA publications and therefore argue against the results in that study (OASPA, 2013). Predatory journals have contributed to the creation of a misleading image of OA journals and, as a secondary effect, to non-for-profit journals; nevertheless, the commercial interests of the groups behind highly expensive journals might be benefitted from such discredited free journals in the competition for placing their products.

There are no comparable bibliometric indicators for other non-for-profit educational journals although the efforts by OASPA and DOAJ in order to identify OA journals with correct publishing practices deserve attention.

On the concept of profitability in the book publishing sector, Mario Muchnik(2012) points out an idea that can be perfectly applied to scientific journals:

“Prestigious French publishers, such as Le Seuil or Gallimard, had fixed and keep profit margins under 3% while Random House- and its new owner, Bertelsmann group- expect profit margins of at least 15%. The result is unavoidable: the impoverishment and standardization of their catalogues, the disappearance of editorial lines (and with them, entire sectors of thought and creativity of authors), and the consequently aridity of the reading offer and therefore social dialogue. “

The lack of evidences supporting the acquisition and use of expensive journals while considering its effectiveness and value in bibliometric terms should be taken into account by practitioners, researchers, policymakers and librarians involved in educational activities. The shift towards publishing and accessing free or cheap educational journals needs evidence, some of which was intended to be presented in this paper.

Regarding the limitations of the analyses carried out, it is worth mentioning that factors such as inflation or different standard prices in the various countries publishing education journals, the geographical expansion of Journal Citation Reports might affect the reliability of cross-country or diachronic analyses.

Also, further analyses on the source of variance for the variables studied such as publishing country or type of publishing institution could shed light into the research problem analyzed.

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APPENDIX I. Indicators definition.

According to the information stated by Journal Prices (Journal Prices, 2013, available at <http://www.hss.caltech.edu/~mcafee/Journal/explanation.html>), the indicators are defined as follows.

Price Per Article: The number of articles published by each journal in the five years 2002-2006 (the most recent years with data available) is retrieved from the JCR database. The price per article is simply the price of this journal for a year's subscription to an academic library (see below under «Calculation of Price» for details) divided by the average number of articles published per year.

Price Per Citation: From the JCR database, we obtain a «recent citation rate», for each journal in 2006. This is the number of times that volumes of a journal published between 2002 and 2006 were cited in 2006, divided by 5. The price per citation is the price of this journal for a year's subscription to an academic library (see below under «Calculation of Price» for details) divided by the recent citation rate.

Composite Price Index: The Composite Price Index (CPI) is the geometric mean of the Price Per Article and the Price Per Citation.

Profit Status: The profit status of the journal. This was determined by hand using various internet resources. Errors should be submitted to

the website manager. A few have unknown status, and these default to for-profit for the purposes of calculations since only non-profits contribute to the average non-profit price (see below). They are labeled «unknown» in this category.

Relative Price Index: 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.

Value: The value category is a broad categorization of a journal as «high value» «low value» or intermediate. A journal with an RPI less than 1.25 is classified as «good value», more than 2.5 as «bad value» and everything else as «medium».

Contact address: Jorge Mañana Rodríguez. Centro de Ciencias Sociales y Humanas. Grupo de Investigación ÍLIA. Calle Albasanz, 26-28. 28037 Madrid. E-Mail: jorge.mannana@cchs.csic.es

APPENDIX II. Frequency of publishers in the dataset used (Source: Journal Prices).

PUBLISHER	FREQUENCY	PUBLISHER	FREQUENCY
Taylor Francis	55	AMERICAN PHYSICAL SOC	1
Sage	24	UNIV HAWAII, NATL FOREIGN LANGUAGE RESOURCE CENTER	1
Self Owned - Non-Profit Society	22	HELDREF PUBLICATIONS	1
SPRINGER	17	BAYWOOD PUBL CO INC	1
Wiley Blackwell	16	INT READING ASSOC	1
ELSEVIER INC	5	AMER ASSOC MENTAL RETARDATION	1
University published non-profit	4	LOVE PUBLISHING COMPANY	1
Elsevier	4	AMERICAN ANNALS OF THE DEAF	1
Oxford	3	GUILFORD PUBLICATIONS INC	1
UNIV CHICAGO PRESS	3	AMER PSYCHIATRIC PUBLISHING, INC	1
BLACKWELL PUBLISHERS	3	LIPPINCOTT WILLIAMS & WILKINS	1
Council for Exceptional Children	2	Universidad Nacional de Colombia	1
HUMAN KINETICS PUBL INC	2	IEEE	1
AMER EDUCATIONAL RESEARCH ASSOC	2	SciELO	1
CAMBRIDGE UNIV PRESS	2	Self Owned - Mid Sized - Unknown Profit Status	1
INFORMA HEALTHCARE	2	TEMPUS PUBLICATIONS	1
society for development of teaching	1	VERLAG JULIUS BELTZ	1
SLACK INC	1	Royal Soc of Chemistry	1
John Benjamins Publishing Co.	1	BRITISH SOC DEVELOPMENTAL DISABILITIES	1
TESOL	1	Biomed Central	1
M E SHARPE INC	1	AUSTRALIAN ACAD PRESS	1
JOHNS HOPKINS UNIV PRESS	1	Adult Learning association	1

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