

Hedonic Pricing and the Valuation of Open Access Journals

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Abstract

The emergence of Open Access (OA) publishing has created new economic niches and debates in academic publishing. OA journals offer numerous publication outlets with differing editorial philosophies and business models. Scholars and academic stakeholders must decide which journals offer acceptable value for the direct or indirect costs of academic publishing. Our research uses the Directory of Open Access Journals (N=12,100) to identify various characteristics of OA academic journals that influence journal prices. The Journal Impact Factor (JIF), language, publisher mission, DOAJ Seal, World Bank Economic and Geographic regions of publishers, peer review duration and journal discipline are identified as factors with significant influence over journal price levels. Journals with status endowments (JIF, DOAJ Seal), published in wealthier regions, in medical or science-based disciplines, and with English-based articles are relatively more expensive. Scholarly and political economic inequalities manifest in the prices and benefits offered by different journals and publishers throughout the world.

Introduction

Online scholarly publishing has yielded numerous diverse economic and academic niches for Open Access (OA) journals. These new incentives and institutions shape pricing strategies for publishers, while influencing publication choices for scholars and academic stakeholders. OA scholarly publishing reduces the moral hazard with the subscription journal business model, where librarians and scholarly administrators tend to pay for journal subscriptions, instead of the primary consumers of the product (scholars). With OA journals funded via APCs (Article Processing Charges), prices are strategically set for individual journals, in contrast to subscription-based journals that are often paid for via “big deal” consolidations of large journal bundles. These factors contribute to the OA publishing market being relatively competitive and price-sensitive, since researchers often pay APCs to publish their research out of their own limited professional – and in some cases, personal – funds. The competitive, growing industry of online scholarly publishing reveals the dynamics of knowledge pricing and valuation in contemporary science. Further, given the relatively new institutional challenges of vetting and funding OA research for scholars and scholarly stakeholders, understanding the valuation of OA journals is of particular importance for contemporary scientific policy.

OA scholarly publishing has substantially expanded over the past two decades, occupying complementary and/or competitive niches vis-à-vis established subscription-based journals. Since the early 2000’s, there has been a steady increase in OA journals. These increases were driven both via the founding of new journals, as well as the conversion of subscription-based titles to OA. A wide variety of scholars and institutions have founded thousands of OA journals with different philosophies and business models. These heterogeneous niches coupled with the competitive, growing and relatively nascent nature of the OA publishing market underpin substantial variation in journal prices. This wide variation in the OA journal market also enables the analysis of a wide variety of factors that underpin scholarly and economic value in contemporary academic publishing. Social and cultural influences on economic pricing and behaviour are especially germane to the context of science,

where there are social norms discouraging avarice and self-interested behaviour (Merton, 1942).

Hedonic pricing posits that products possess certain attributes or characteristics that are valuable or desirable to consumers (Rosen, 1974). Pricing is influenced by both actual production costs, as well as socio-political forces that influence the valuation of products on both supply and demand sides of the market (Zelizer, 1995; Beckert, 2011). Prices generate needed revenue, but also can function as status signals which influence valuation perceptions of both producers and consumers (Podolny, 2005). Both objective production costs and social sources of value can influence the pricing and valuation of academic outputs, including scholarly journals.

Past research (Björk and Solomon, 2015; Mueller-Langer and Watt, 2018) has shown that journal pricing linked to citation activity. Journals that receive attention, deference and prestige from other publications and scholars are valuable on both supply and demand sides of the publishing market. At the high end of the market, publishers have floated the notion of \$25,000 USD APCs for outlets such as *Nature* and *Science* (Pollock, 2018), based on the premise that demand for such prestigious publications is highly inelastic. As suggested by a Springer Nature Publishing executive, “In the end, the price is set by what the market wants to pay for it” (Van Noorden, 2013). Such a philosophy may be at odds with the public good ethos of science. However, scholarly publishing is also a context where science interfaces with business, often creating conflicting institutional logics (Thornton and Ocasio, 1999).

Factors Influencing Journal Valuation

Past research found that journals with higher impact factors and more citations received charge higher APCs (Mueller-Langer and Watt, 2018). In turn, there is a dialectic in the OA journal market, where high-quality journals can charge higher APCs, but the revenue raised from higher prices also underpins increased resources to support legitimate journal quality (Siler et al., 2018). High APCs can fund ‘objective’ publishing qualities, such as copy editing, professional editors, statistics editors and high-quality typesetting. Subjectively, exclusive journals are selling a prestigious imprimatur – albeit one that publishers may have curated carefully and invested over time – as well as the social signal of affiliation with fellow high-status scientists who publish in such journals. Revenues from high APCs also enable high rejection rates, which can underpin both actual and perceived quality of journals. This raises questions of how much of an APC for a given journal reflects legitimate value, how much is a luxury good (relatively little objective marginal value, augmented by social signalling), and how much is pure profiteering.

The ability and willingness of consumers to pay influences pricing decisions. Accordingly, APCs are often set according to journal or sectoral prestige, as opposed to actual production costs. For example, Elsevier differentially prices journals based on relative funding levels in various academic disciplines (Björk and Solomon, 2015). A 2018 Springer Nature Initial Public Offering on the Frankfurt Stock Exchange candidly promoted the following business strategy for academic journals: “[W]e intend to employ a price differentiation strategy by tailoring APCs to the discipline and impact factor of the relevant journal[.]... We also aim at increasing APCs by increasing the value we offer to authors through improving the impact factor and reputation of our existing journals” (p. 99).

As rankings from third parties become increasingly influential in professional fields (Espeland and Stevens, 1997; Espeland and Sauder, 2016), merely being measured is an

important sign of legitimacy for institutions in competitive fields. Even if people view metrics or rankings as unfair or poor measures, they remain important because others take them seriously (Sauder and Espeland, 2009). In science, the Clarivate journal impact factor is the most prominent and influential third-party ranking of journals. Davis (2017) found that when a journal receives its first impact factor, this often leads to increased legitimacy and an influx of new submissions. Receiving and maintaining status endowments like a journal impact factor or DOAJ Seal requires continued legitimacy and conformity to institutionalized criteria. Clarivate annually – sometimes controversially – “de-lists” (removes impact factors) of journals deemed to be engaging in excessive self-citation or exhibiting signs of intellectual balkanization (Davis, 2018). In turn, marshalling the resources – financial and personnel – in order for a journal to attain status endowments, (e.g., impact factor, DOAJ Seal) is an important challenge for publishers and journal stakeholders.

Scholarly publishing involves tensions between economic and scholarly priorities. Publishing is both an economic and scientific activity. Different journals and publishers have different underlying goals and philosophies, which can span the entire continuum between purely academic and purely profit-seeking. This variation in publishing institutions contributes to wide variation in journal pricing. Journals published by commercial publishers tend to be more expensive than those published by not-for-profit organizations. (Bergstrom, 2001). Further, large publishers tend to offer higher-status, more expensive publications than smaller publishers (Björk and Solomon, 2012). Publishers of varying size and status occupy different economic and intellectual niches in the scholarly communication market.

The affluence and level of development of the home countries of academics and their institutions influence scholarly productivity (May, 1997; King, 2004). Inclusion in global scientific networks is conducive to scientific productivity for nations and individual scientists alike (Sugimoto et al., 2017). Both geography and politics influence scholarly collaboration and citation behaviour (Frenken et al., 2009). Scientific journals are institutions via which academic communities can either promote or suppress geographic diversity (Chavarro et al., 2014). Topical priorities in the scholarly corpus are shaped by scientific reward structures, which often devalue or balkanize ‘local’ concerns in peripheral locations in the global and scientific political economy (Ciarli and Råfols, 2018). There are also broad concerns that scholarly reward systems tend to overlook and devalue work from peripheral regions and nations (Meneghini et al., 2008). The lowered barriers to entry of online academic publishing creates niches and opportunities for less-wealthy scholars and institutions to contribute to the academic corpus. Some topics and fields of study may have intellectual value to certain communities that are relatively less marketable economically. In turn, the OA publishing market is comprised of many different niches along geographic, linguistic and economic lines.

This article uses a large-scale database of OA journals to examine factors that imbue published science with economic value in the scholarly publishing market.

Methods

Data on current Open Access scholarly journals were acquired from the Directory of Open Access Journals (DOAJ). The DOAJ was founded in 2003 by the non-profit Infrastructure Services for Open Access (IS4OA). The DOAJ is also an index of OA journal legitimacy, as journals must adhere to set criteria to be included. In 2014, stricter quality controls were introduced and 3,776 journals were subsequently culled from the DOAJ (Marchitelli et al., 2017). In 2015, the DOAJ introduced the DOAJ Seal of Approval for Open Access Journals to reward journals on the DOAJ list that adhere to practices deemed particularly meritorious: DOI

usage, submission of metadata, digital archiving, machine-readable licensing, generous Creative Commons licensing, granting authors full copyright. In turn, the DOAJ provides a list of legitimate and distinguished OA journals. The dataset for this study was downloaded from the DOAJ website in December 2018, when the database included 12,100 journals.

Dependent Variables. Total publication costs for authors – the sum of submission and publication fees – is the first dependent variable in the study. Due to the exponential distribution of prices among journals with APCs, the dependent variable is the logarithmic value of the re-centred total cost variable. The second dependent variable is a dummy variable of whether the journal charges APCs and/or submission fees to authors. The majority of journals in the DOAJ dataset are ‘free’ journals and do not involve direct costs to authors. USD was the most common currency in which publishers levied APCs. For APCs levied in other currencies, world currency exchange rates were used as of December 10, 2018 to convert APCs to USD equivalents.

Independent Variables. The 2017 Clarivate Journal Impact Factor (JIF) values for DOAJ journals were culled from the Web of Science Journal Citation Reports. Out of the 12,100 DOAJ journals, only 1,224 had an official journal impact factor. Due to the exclusivity of the JIF, an additional dummy variable was created denoting whether a journal has a JIF.

Journal language(s) were taken from the DOAJ dataset. Peer review duration, the DOAJ Seal of Excellence award, and first listed academic disciplinary affiliation for journals were also taken from the DOAJ list. World Bank Economic and Geographic regions were coded based on the officially listed location of each journal in the DOAJ dataset.

Publisher type was coded based on the listed affiliation of a journal’s main publisher in the DOAJ dataset. Large for-profit publishers were defined as those listed by Larivière et al. (2015) as major oligopolistic publishers – Reed-Elsevier, Wiley-Blackwell, Springer, and Taylor & Francis. Any journal published by those publishers or their subsidiaries was coded as being published by a large for-profit publisher. Small for-profit publishers were operationalized as any for-profit publisher that is not linked to the aforementioned ‘oligopolistic’ publishers. Any publisher affiliated with a college or university was coded as such. However, if the journal was explicitly published by a university press, this was distinguished separately from those journals published by the university as a whole. Professional associations were coded as publishers with a clear mission to serve members of a certain profession, most commonly academic disciplines.

Results

Table 1 reports tabulations of qualities of journals included in the DOAJ dataset.

Table 1 – Tabulations of DOAJ Journal Characteristics

Journal APC		DOAJ Seal	
Free Journal	8,795	DOAJ Seal	1,379
APC Journal	3,305	No DOAJ Seal	10,714
Journal Impact Factor		World Bank Geographic Region	
Journal has JIF	1,224	East Asia & Pacific	1,825
Journal w/o JIF	10,876	Europe & Central Asia	6,101
		Latin America & Caribbean	2,310
Journal Language		Middle East & North Africa	594
English Only	5,663	North America	800
Partial English	3,763	South Asia	351
No English	2,674	Sub-Saharan Africa	119
Journal Publisher Organization Type		World Bank Economic Region	
Large for-profit publisher	1,517		
Not-for-profit organization	944	High	6,191
University Press	378	Upper-middle	3,876
Professional Association	607	Lower-middle	2,003
Small for-profit	1,546	Low	30
University	5,039		
Uncategorized	1,986	First Listed Journal Subject	
		Interdisciplinary	804
		Medicine	2,700
		Social Sciences & Humanities	5,971
		Sciences	2,611

Roughly 73% of DOAJ journal are ‘free’ and do not charge any submission or publication fees. The remaining journals levy APCs, ranging from \$.014 (USD) to \$5600 (USD).

Among the 1,224 DOAJ journals with a JIF, JIFs ranged from .0190 to 23.333, with a mean value of 2.283. There was overlap between journals awarded Clarivate journal impact factors and journals awarded the DOAJ Seal of Approval for Open Access Journals. Of the 1,370 journals in the dataset awarded the DOAJ seal, 452 also had a JIF. Accordingly, status endowments in academic publishing are correlated, but do not necessarily completely overlap.

English-only journals comprise roughly 47% of the total DOAJ dataset, while journals with partial English (i.e. include English as one of two or more languages) comprise another 31% (see Appendix for the full tabulated list of publishing languages). Only 22% of journals in the dataset do not publish in English at all.

A variety of different types of institutions publish OA journals. In the DOAJ dataset, universities and colleges are the most common publisher of OA journals, comprising 42% of the total dataset. The ‘university’ category is distinguished from university presses, which comprised 3% of total journals. Large and small for-profit publishers both comprise 13% of

total journals. Not-for-profit organizations (other than universities and professional associations) comprised 8% of the total, while professional associations accounted for 5%. 16% of total journals were not clearly categorizable based on website analysis.

DOAJ journals are situated in a variety of countries around the world, covering all World Bank geographic and economic regions. Journals published in Europe & Central Asia account for one-half of total journals. Latin America & Caribbean and East Asia & Pacific account for 19% and 15% respectively. Despite the relative prominence of North America in science, the region only accounts for 7% of DOAJ journals. The remaining regions – Middle East & North Africa, South Asia and Sub-Saharan Africa – have relatively smaller presences in the DOAJ dataset. There is also economic stratification in DOAJ representation. High income countries account for 51% of total journals, upper-middle countries account for 32% and lower-middle countries account for 17%. Low income countries only publish 30 total journals listed in the DOAJ dataset, accounting for less than 1% of total journals.

Table 2 reports univariate and multivariate analyses of factors influencing APC prices for DOAJ journals. Due to the exponential distribution of APC price levels, the dependent variable is the logarithm of re-centered APC values. Journals that charge in non-USD currencies were converted based on exchange rates as of December 12, 2018. When considering all 12,100 DOAJ journals, having an official Clarivate journal impact factor is significantly associated with APC levels. As another example of the value of institutional endorsement, journals adorned with the DOAJ Seal also charge significantly higher APCs. Specifically examining the subset of 1,224 articles in the DOAJ dataset with official Clarivate journal impact factors, APC levels were strongly associated with APC levels. In the other models in Table 2, analysis is restricted to the DOAJ journals with a non-zero APC. The English language is significantly associated with APC levels. English-only journals charge significantly more APC than partially-English journals, while journals publishing in one or more languages without any English charge significantly lower APCs.

Table 2 – Regression Analysis of Factors Affecting Prices for APC-based OA Journals

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
Journal Impact Factor											
JIF (yes/no)	3.493*** (.078)										.108*** (.014)
JIF (value)		.437*** (.041)									.139** (.051)
Journal Language											
English only			2.363*** (.060)							1.203*** (.061)	.730*** (.056)
Partially English			[omitted]							[omitted]	[omitted]
No English			-.554*** (.091)							-.203** (.075)	-.315*** (.065)
Publisher Type											
Large for-profit				[omitted]							[omitted]
Not-for-profit organization				-2.049*** (.098)							-1.192*** (.080)
University Press				-1.090*** (.127)							-.496*** (.096)
Professional Association				-1.222*** (.097)							-.578*** (.078)
Small for-profit				-.738*** (.051)							-.548*** (.040)
College/University				-3.197*** (.056)							-1.078*** (.064)
Unclassified				-2.306*** (.068)							-1.018*** (.058)
DOAJ Seal											
DOAJ Seal					1.325*** (.057)						.073 (.038)
World Bank Geographic Region											
East Asia & Pacific						-2.763*** (.096)				-.234*** (.090)	-.052 (.079)
Europe & Central Asia						-.431*** (.082)				-.141* (.062)	-.190*** (.055)
Latin America & Caribbean						-2.165*** (.138)				.140 (.120)	.024 (.108)
Middle East & North Africa						-2.535*** (.140)				-.466*** (.117)	-.301** (.013)
North America						[omitted]				[omitted]	[omitted]
South Asia						-2.360*** (.151)				-.216 (.138)	-.420*** (.123)
Sub-Saharan Africa						-2.175*** (.179)				-.235 (.147)	-.022 (.135)
World Bank Economic Region											
High Income							[omitted]			[omitted]	
Low Income							-2.188*** (.606)			-.804 (.567)	-.591 (.486)
Lower-middle Income							-3.015*** (.049)			-2.152*** (.081)	-1.664*** (.076)
Upper-middle Income							-2.153*** (.054)			-1.481*** (.069)	-.959*** (.063)
Peer Review Duration											
Average weeks for peer review								.072*** (.010)			.027*** (.005)
Average weeks for peer review (squared)								-.001*** (.000)			-.001*** (.000)
Journal Subject											
Medicine									[omitted]		[omitted]
Interdisciplinary									-1.747*** (.094)		-.365*** (.059)
Social Sciences & Humanities									-1.917*** (.067)		-.453*** (.044)
Sciences									-.602*** (.060)		-.309*** (.035)
Constant	1.261*** (.025)	3.856*** (.131)	4.180*** (.055)	7.195*** (.035)	5.543*** (.032)	6.933*** (.077)	6.778*** (.022)	5.300*** (.095)	6.693*** (.060)	5.774*** (.083)	6.408*** (.094)
R-squared	.152	.084	.449	.540	.140	.372	.586	.017	.229	.655	.749
N	12,100	1,224	3,305	3,282	3,301	3,305	3,305	3,305	3,300	3,305	3,273

The types of institutions that publish OA journals are also related to APC levels. In our dataset, journals published by large for-profit publishers were the most expensive. Journals published by smaller for-profit publishers were the next most expensive. The least expensive journals were published by colleges, universities and other not-for-profit organizations. Of note

is that journals published by university presses were more expensive than those from universities. University presses and professional associations occupy a ‘middle ground’ on the pricing continuum between relatively highly priced journals published by for-profit institutions, and less costly journals published by universities and other non-profit organizations.

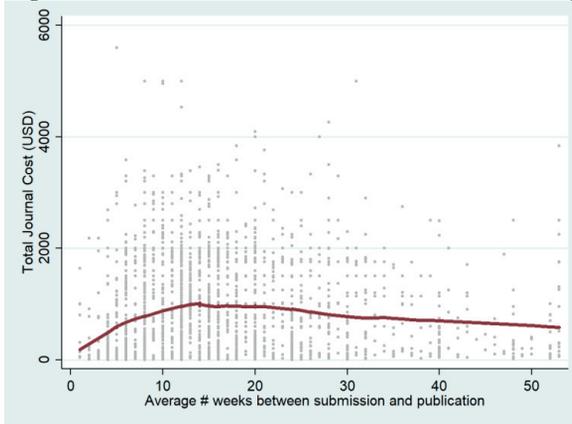
World Bank classifications reveal how geography and political economy are related to OA journal pricing. Journals published in North America were the most expensive, closely followed by the Europe & Central Asia category. The other five geographic regions – Latin America & Caribbean, Sub-Saharan Africa, South Asia, Middle East & North Africa, East Asia & Pacific – all publish journals at significantly lower APC levels than the two wealthiest regions. Analysis of World Bank economic regions reveal that unsurprisingly, journals published in high income countries are significantly more expensive than those published in other economic regions. Moving down the economic hierarchy, journals in upper-middle income countries were more expensive than lower-middle countries. Surprisingly, the few journals published in low income countries were about as expensive as those in middle-income countries, although due to the small number of publishers and journals officially situated in low income countries, this result should be interpreted with caution.

Since geographical, linguistic and economic regions are intertwined, Model 10 combines linguistic and World Bank region data. The effects of English language on journal pricing remain robust, with English-only journals significantly more expensive than partially English journals, and non-English journals significantly less expensive than non-English journals. In contrast to Model 6, when taking linguistic and economic variables into account, journals published in North America were not significantly more expensive than numerous other regions. Pricing in North American journals was not significantly different from journals in Latin America & Caribbean, South Asia or Sub-Saharan Africa. However, even though the relatively small negative coefficient in Model 6 attenuated for Europe & Central Asia, this region remains significantly less expensive than North America in Model 10. This is notable since other regions with much stronger negative coefficients in Model 6 (Latin America & Caribbean, South Asia, Sub-Saharan Africa) attenuated to the point of statistical non-significance in Model 10. Journals in East Asia & Pacific and Middle East & North Africa remain significantly less expensive in Model 10.

Results in the multivariate model in Model 10 for World Bank Economic Regions reveal similar trends to Model 7. As expected, journals published in high-income countries were most expensive, followed by upper-middle income and lower-middle income countries. However, like with Model 7, there is the somewhat counterintuitive finding that journals published in low income countries are relatively highly priced. In Model 10, pricing for journals in low income countries is not significantly different than those for high income countries. Like with Model 8, this result should be interpreted in light of the relative dearth of articles published in low income countries.

Peer review practices are also related to journal pricing levels. Peer review duration has a curvilinear effect (inverted U-shape) on journal pricing. Model 8 includes both the average weeks for journal peer review, as well as the squared value of that variable. Journals with very fast or very slow peer review processes were relatively less expensive. Figure 2 illustrates the curvilinear effect, suggesting that the ‘optimal’ peer review duration for OA journal pricing is roughly 12-13 weeks.

Figure 2 – Peer Review Duration and OA Journal Pricing



These results suggest that both very rapid and very slow peer review are conducive to lower journal value, if not also quality.

Model 9 shows how disciplinary orientation influences OA journal pricing levels. Journals in the field of medicine are the most expensive. Journals in the various applied and theoretical sciences were significantly less expensive than the medical journals. Social science and humanities journals were generally even less expensive than journals in the sciences. In short, there is a disciplinary hierarchy in APC levels. Model 11 reports a multivariate model including all major variables in the study. Overall trends regarding OA journal pricing reported in other models in Table 2 remain robust.

Trends for ‘free’ OA journals were similar to those for APC-based journals. The same variables in Table 2 that were conducive to more expensive OA journals (with APCs) were also conducive to a journal being published without APCs. Due to space constraints, this analysis is not included in this draft.

Discussion

The Open Access publishing market is multifaceted with numerous different economic, institutional, social and scientific niches. Even though APC-based and non-APC OA journals occupy different scientific and market niches in contemporary science, similar factors influence both whether a journal charges authors an APC, and price levels for APC-based journals.

The influence of the JIF – both with merely having a JIF, and if so, possessing a higher JIF – underscores the importance and value of citation metrics and third-party evaluation in contemporary science. In turn, publishers and scientists often attempt to bolster or protect the status endowments bestowed by quantitative metrics like the JIF. For many publishers and journals, achieving eminence and status endowments like the journal impact factor require professional and strategic action (Martin, 2016). Some publishers have more resources, knowledge and savvy to achieve prominence and institutionalized esteem for their journals than others. This is one of many mechanisms underpinning cumulative advantage (Merton, 1948) in

science. Publishers and scientists with more resources are both more competitive and able to be reactive to importance metrics in the intellectual and economic markets of science.

The heterogeneity in journal pricing between different types of publishing institutions reveals normative and philosophical conflicts regarding the relationship between economics and science. Scholarly publishing often involves conflicts between scholarly and economic institutional logics. Our results suggest different types of publishing institutions market journals at various points along the continuum between pure economic and pure scientific logics. The scientific institutional logic is underpinned by Mertonian norms, including disinterestedness – the notion that scientists should work solely for the good of science, as opposed to for personal or financial interests (Merton, 1942). Thornton and Ocasio (1999) identified economic and scholarly tensions in scientific publishing, chronicling the historical shift from an editorial logic to a market logic as larger publishing companies consolidated power in the industry starting in the 1970s. Editorial and market logics are not necessarily diametrically opposed; scientific publishing offers a context where the logics can conflict and/or be complementary.

The pricing hierarchy between large for-profit publishers and universities in our results illustrates various institutional logic hybrids involving scientific and economic logics. Journals published by large for-profit publishers were most expensive, followed by smaller for-profit publishers, who perhaps employ similar economic institutional logics to less lucrative economic and institutional niches. Universities and other non-profit organizations published the least expensive journals on the whole, indicative of a strong scientific logic and weaker economic logic. The relatively moderate prices of journals published by university presses and professional associations suggest hybrid economic-scientific institutional logics. Professional associations are often non-profit, but also often rely on journals as a source of institutional revenue. Non-profit organizations are also capable of aggressive rent-seeking, even if such rents are not officially or legally deemed as ‘profits.’

Results revealed that journals publishing with the English language occupy relatively more lucrative niches in scholarly publishing market. Over the 19th and 20th centuries, English emerged as the predominant language in science, and now often functions as a *lingua franca* in scholarly communication (Gordin, 2015). In turn, the preeminence of English in academia renders English scholarly journals more economically valuable than journals published in other languages. Evaluative biases in favor of English institutions in science have been identified. For example, Monegon and Paul-Hus (2016) presented evidence suggesting that major scholarly journal databases – such as the Web of Science and Scopus – over-represent English-language journals and tend to exclude non-English journals. Supporting non-English scholarly journals is also often a means of promoting language use and community, particularly for languages vulnerable to being supplanted in professional and social contexts by English. Thus, it makes sense that for many non-English journals, economic logics will be relatively absent. For example, SciELO is a successful database that supports and promotes scientific work in Latin America (Packer, 2009). In the DOAJ dataset, OA journals published via the SciELO database contribute to a disproportionate number of free and low-cost Spanish and Portuguese journals situated in Latin America.

Even after accounting for journal language, the geographic location of publishers was influential on journal pricing. A relative lack of DOAJ journals from less-wealthy countries is notable. Even though the low barriers to entry in OA publishing can enable increased participation in scholarly publishing from traditionally excluded groups and regions (Suber, 2012), economic and geographic stratification remain in contemporary OA publishing. Lower income countries are less likely to publish DOAJ journals, as well as the World Bank

geographic regions of Middle East & North Africa, South Asia and Sub-Saharan Africa. In the case of pay journals, the author-pays model of APC-based OA publishing appears to currently be more accessible to scholars situated in wealthier countries and institutions (Siler et al., 2018). If publishers set prices based on the willingness or ability of scholars and institutions to pay APCs, that is another mechanism supporting higher APCs in wealthier contexts. The overrepresentation of Latin America in the DOAJ database suggests the importance of strong publishing institutions, especially in less-lucrative niches that may not attract large for-profit publishers. However, supporting strong publishing institutions also requires economic and scholarly resources that not all regions or countries may possess.

The curvilinear results for peer review duration and journal pricing also reveal the intellectual and economic niches of downmarket – if not ‘predatory’ – scholarly journals. Journals with very rapid peer review are relatively less expensive. Likewise, OA journals with relatively long peer review duration are also less expensive. In the case of very rapid peer review, this could often be reflective of haphazard – or non-existent – quality control. Journals that cannot compete on quality may instead attempt to compete on speed, which may be particularly attractive to naïve or unscrupulous scholars. Relatively lengthy peer review processes can also be evidence of journal unprofessionalism and/or insufficient resources to process and peer review manuscripts expediently. Given that the culture of OA publishing is based in part on leveraging the efficiency and immediacy of online dissemination, longer peer review durations may be a much less legitimate or tolerated practice vis-à-vis established print-based journals. More broadly, there are concerns about the financial incentive structure of APC-based OA, where publishers are remunerated for published articles, and article rejections yield costs but no revenues. In turn, APC-based OA publishing can incentivize less-rigorous peer review and lower quality (Jeon and Rochet, 2010; Gans, 2017: 56). At worst, journals that offer very fast peer review as part are ‘predatory’ journals, which offer haphazard peer review, facilitating the exchange of money for an ‘easy’ publication.

Examining the relationship between journal pricing and academic disciplines reveals an ‘economic’ hierarchy of the sciences. Journals in medicine and the hard sciences are most expensive, while social science and humanities journals are least expensive. This suggests that journals are often priced in part based on the ability of potential consumers to pay, as more pecunious disciplines are expected to tolerate higher APCs. Exploitation of willingness-to-pay in academic publishing may be seen as morally questionable given norms against unbridled profit-seeking in science (Merton, 1948). More generally, profit-maximizing behaviour – or strict adherence to economic logics above all other considerations – is often seen as culturally inappropriate or undesirable in many contexts deemed of societal importance (Zelizer, 1995). The variety of economic niches in scholarly publishing, as well as the various factors that imbue academic journals with economic value reveal the complex interplay between economic and scientific logics in contemporary science.

References

- Beckert, Jens. 2011. “Where do prices come from? Sociological Approaches to Price Formation.” *Socio-Economic Review*, 9: 757-786.
- Bergstrom, Theodore C. 2001. “Free Labor for Costly Journals?” *Journal of Economic Perspectives*, 15(4): 183-198.
- Björk, Bo-Christer and David Solomon. 2012. “Pricing principles used by scholarly open access publishers.” *Learned Publishing*, 25(2): 132-137.
- Björk, Bo-Christer and David Solomon. 2015. “Article processing charges in OA journals: relationship between price and quality.” *Scientometrics*, 103(2): 373-385.

- Chavarro, Diego, Puay Tang, and Ismael Ràfols. 2014. "Interdisciplinarity and research on local issues: evidence from a developing country." *Research Evaluation*, 23(3): 195-209.
- Davis, Phil. 2017. "PeerJ Membership Model and The Paradox Of The Loyal Customer." <https://scholarlykitchen.sspnet.org/2017/05/08/peerj-membership-model-paradox-loyal-customer/>
- Davis, Phil. 2018. "Tipping the Scales: Is Impact Factor Suppression Biased Against Small Fields?" <https://scholarlykitchen.sspnet.org/2018/10/08/tipping-the-scales-is-impact-factor-suppression-biased-against-small-fields/>
- Espeland, Wendy N., and Michael Sauder. 2007. "Rankings and Reactivity: How Public Measures Recreate Social Worlds." *American Journal of Sociology*, 113(1): 1-40.
- Espeland, Wendy N., and Mitchell L. Stevens. 1998. "Commensuration as a social process." *Annual Review of Sociology*, 24: 313-343.
- Frenken, Koen, Shoerd Hardeman, Jarno Hoekman. 2009. "Spatial scientometrics: Towards a cumulative research program." *Journal of Informetrics*, 3(3): 222-232.
- Gans, Joshua S. 2017. *Scholarly Publishing and its Discontents*. Toronto: Core Economic Research.
- Gordin, Michael D. 2015. *Scientific Babel: How Science Was Done Before and After Global English*. Chicago: University of Chicago Press.
- Jeon, Doh-Shin, and Jean-Charles Rochet. 2010. "The Pricing of Academic Journals: A Two-Sided Market Perspective." *American Economic Journal: Microeconomics*, 2(2): 222-255.
- Larivière, Vincent, Stefanie Haustein, and Philippe Mongeon. 2015. "The Oligopoly of Academic Publishers in the Digital Era." *PLOS ONE*, 10(6): 1-15.
- Marchitelli, Andrea, Paola Galimberti, Andrea Bollini and Dominic Mitchell. 2017. "Helping journals to improve their publishing standards: a data analysis of DOAJ new criteria effects." *JLIS.it*, 8(1): 1-21.
- Martin, Ben R. 2016. "Editors' JIF-boosting stratagems – Which are appropriate and which not?" *Research Policy*, 45(1): 1-7.
- Meneghini, Rogerio, Abel L. Packer and Lilian Nassi-Calò. 2008. "Articles by Latin American Authors in Prestigious Journals Have Fewer Citations." *PLOS ONE*, 3(11):e3804.
- Merton, Robert K. 1942. *The Sociology of Science*. Chicago: University of Chicago Press.
- Merton, Robert K. 1968. The Matthew Effect in Science. *Science*, 159: 56-63.
- Monegon, Philippe, and Adèle Paul-Hus. 2016. "The journal coverage of Web of Science and Scopus: a comparative analysis." *Scientometrics*, 106(1): 213-228.
- Mueller-Langer, Frank, and Richard Watt. 2018. "How many more cites is a \$3,000 Open Access fee buying you? Empirical evidence from a natural experiment." *Economic Inquiry*, 56(2): 931-954.
- Packer, Abel L. 2009. "The SciELO Open Access: A Gold Way from the South." *Canadian Journal of Higher Education*, 39(3): 111-126.
- Pollock, Dan. 2018. "News and Views: Open Access Charges." <https://deltathink.com/news-views-open-access-article-processing-charges/>
- Rosen, Sherwin. 1974. "Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition." *Journal of Political Economy*, 82(1): 34-55.
- Sauder, Michael, and Wendy N. Espeland. 2009. "The Discipline of Rankings: Tight Coupling and Organizational Change." *American Sociological Review*, 74(1): 63-82.
- Siler, Kyle, Stefanie Haustein, Elise Smith, Vincent Larivière, and Juan Pablo Alperin. 2018. "Authorial and institutional stratification in open access publishing: The case of global health research." *PeerJ*, 6: e4269.
- Suber, Peter. 2012. *Open Access*. Cambridge: MIT Press.
- Sugimoto, Cassidy R., Nicolas Robinson-Garcia, Dakota S. Murray, Alfredo Yegros-Yegros, Rodrigo Costas and Vincent Larivière. 2017. "Scientists have the most impact when they're free to move." *Nature*, 550: Oct 5., 29-31.
- Thornton, Patricia H., and William Ocasio. 1999. "Institutional Logics and the Historical Contingency of Power in Organizations: Executive Succession in the Higher Education Publishing Industry, 1958-1990." *American Journal of Sociology*, 105(3): 801-843.
- Van Noorden, Richard. 2013. "Open access: The true cost of science publishing." *Nature*, 495: 426-429.
- Zelizer, Viviana A. 1995. *The Social Meaning of Money*. Princeton: Princeton University Press.