

Does double dipping occur? The case of Wiley's hybrid journals

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Does double dipping occur? The case of Wiley's hybrid journals

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Abstract

The number of open access articles published in hybrid journals has increased recently. However, there are concerns over the practice of double dipping, when hybrid journals charge for publishing the same article twice, once for subscription and once for open access. To determine whether double dipping occurs, this study examined the relationship between the subscription prices for hybrid journals and the proportions of open access articles in hybrid journals. Two simultaneous equations of subscription prices and article processing charges for Wiley's 1141 hybrid journals were estimated using the full information maximum likelihood method. The results revealed that the increased proportions of open access articles did not result in lower subscription prices; thus, there is no denying that double dipping occurs. Furthermore, the article processing charges are affected by subscription prices, whereas subscription prices are significantly unaffected by article processing charges. The findings suggest that article processing charges rise in tandem with increased subscription prices; therefore, university libraries and consortiums must exercise caution when making subscription contracts with publishers.

Keywords: article processing charge, double dipping, hybrid journal, subscription price, transformative agreement

JEL Codes: L13; L86

Introduction

In 2004, Springer (the present Springer Nature) converted many subscription journals into hybrid journals by incorporating open access options. Several major publishers followed suit. As a result, the number of hybrid journals have increased. However, librarians and research funders criticize publishers for double dipping in hybrid journals (Björk, 2017). Double dipping refers to paying twice for the same article. Publishers charge research institutions subscription fees and charge authors and related institutions article processing charges (APCs) for open access (Björk, 2017; Mittermaier, 2015). Responding to criticisms from librarians and research funders, Elsevier's staff stated that the publisher does not double dip (Lowe, 2019). Conflicting opinions exist between university librarians and publishers on this issue, but researchers have not yet analyzed it in detail.

The revenues of a hybrid journal incorporating both open and non-open access articles comprise subscription and APC revenues. The subscription revenues of individual journals depend on circulation numbers and subscription prices, whereas the APC revenues are determined by the number of open access articles and APC level. If a publisher does not double dip, the total amount of subscription and APC revenues is fixed regardless of the increase in the number of open access articles in a hybrid journal. A hybrid journal's subscription price without double dipping refers to a price to maintain subscription revenue when all articles in the journal are non-open access. In other words, to avoid double dipping, publishers need to reduce subscription prices with an increased proportion of open access articles to total articles in a journal, under the assumption that the circulation number is unchanged. This study investigates the relationship between the proportion of open access articles in a hybrid journal and the subscription price to determine whether double dipping occurs in the hybrid journals published by Wiley, a leading publisher.

Since the 1990s, several studies investigated the determinants of subscription prices (Chressanthis & Chressanthis, 1994; Coomes et al., 2017; Dewatripont et al., 2007; Liu,

2011; Liu & Gee, 2017; Petersen, 1990, 1992; Zheng & Kaiser, 2011). Empirical studies since 2020 formulated APCs to investigate their determinants for hybrid and fully open access journals (Asai, 2019a, 2019b, 2020; Budzinski et al., 2020; Maddi & Sapinho, 2022; Schönfelder, 2020; Siler & Frenken, 2020). However, these studies did not analyze the double-dipping problem. Mittermaier (2015) investigated publishers' price setting by administering a questionnaire to hybrid journal publishers and found that 13 of the 24 publishers who responded had "no double-dipping policy." Although the findings of the present study regarding Wiley's journals cannot be generalized to other hybrid journals, this study's novelty is that it presents a method for analyzing double dipping, thus serving as a guide for consortiums negotiating subscription contracts with publishers.

Literature Review

Although most journals were initially published by academic societies and universities until the 1950s, for-profit publishers have increased their presence in the academic journal market since the 1970s (Cox, 2002; Eger & Scheufen, 2018). Considering their growth and increased prices, Petersen (1990, 1992) and Chressanthis and Chressanthis (1994) examined the determinants of subscription prices, specifically the influences of publisher types on prices by formulating a subscription price. The three studies used variables representing the number of pages, issues, circulations, publication country, impact factor, advertising, number of years since the journal's inception, and academic disciplines to formulate subscription prices using ordinary least squares (OLS). These studies found that for-profit publishers charge higher prices than academic societies and universities. Dewatripont et al. (2007) formulated the price using OLS and instrumental variables method, employing variables representing the number of citations, publisher type, and academic disciplines, and a few instrumental variables to solve endogeneity between prices and citations. Dewatripont et al. (2007) revealed that for-profit publishers charge higher prices for frequently cited journals. Liu (2011) and Liu and Gee (2017) used OLS

to investigate the determinants of subscription prices and found that for-profit publishers charge higher prices. Zheng and Kaiser (2011) formulated the subscription price using OLS and generalized method of moments. Zheng and Kaiser (2011) revealed that journal type and production costs have a greater influence on journal prices than the journal quality measured by impact factor and the number of citations. Since the 2010s, the market power of a few leading publishers has grown alongside their business expansions. Coomes et al. (2017) formulated subscription prices with variables representing journal share, publisher type, number of articles and citations, and number of years since the journal's inception and revealed that larger market shares enabled publishers to charge higher prices.

As most open access articles were initially published by fully open access publishers, such as BMC and PLOS, researchers explored the APCs. Solomon and Björk (2012) found, using basic statistics, that APCs for fully open access journals differ across academic disciplines. A few studies calculated the correlation coefficient between APCs and citation scores and reported a positive relationship (Björk & Solomon, 2015; Pinfield et al., 2017). Unlike hybrid journals, approximately 70% of fully open access journals do not charge APCs (Crawford, 2021). Therefore, Asai (2019a, 2019b) estimated the APCs using a sample selection model that considers a two-step process that first decides whether to impose APCs and then determines the APC level. Asai (2020) simultaneously formulated the APCs along with the citation scores and the number of articles considering the endogeneity of variables. These studies used variables representing the number of open access articles, publisher type, citation score, market share as measured by the number of articles, and academic disciplines. Siler and Frenken (2020) investigated APCs using impact factors, languages, publishers' countries, and academic disciplines, and found that APCs were high for frequently cited journals published by for-profit publishers.

Since 2020, researchers have examined the determinants of APCs for hybrid journals. Budzinski et al. (2020), Schönfelder (2020), and Maddi and Sapinho (2022) formulated

APCs for hybrid and fully open access journals using variables representing publisher or publisher type, number of articles, publisher's citation shares within an academic discipline, and number of years since the journal's inception. These studies revealed that APCs for hybrid journals were higher than those for fully open access journals, and more frequently cited journals set higher APCs. Asai (2023) examined the relationship between subscription prices and APCs for hybrid journals in the Springer imprint by formulating APCs. Although Asai (2023) revealed that the APCs had positive relationships with citation scores, number of downloads, and subscription prices, the double-dipping problem was not investigated.

Model and variables

The study targets 1141 hybrid journals published by Wiley and indexed in Scopus. It is assumed that Wiley sets subscription prices and APCs for hybrid journals based on the latest available data, such as the number of articles and citation scores. When the publisher set the subscription prices and APCs applicable in 2022 in mid-2021, it used 2020 data on the number of articles and citation scores. The number of articles and citation scores in 2020 are the predetermined variables for subscription prices and APCs applicable in 2022, whereas the two prices are determined simultaneously. Therefore, the following simultaneous equations for subscription prices and APCs for hybrid journals are formulated:

$$Price_t = f(CiteScore_{t-2}, NonopenArticle_{t-2}, Issue_{t-2}, APC_t, Year_t, OpenRatio_{t-2}, Society, Academic\ disciplines) \quad (1)$$

$$APC_t = f(CiteScore_{t-2}, OpenArticle_{t-2}, Price_t, Year_t, OpenRatio_{t-2}, Society, Academic\ disciplines) \quad (2)$$

The two dependent variables, *Price* and *APC*, denote the subscription prices and APCs applicable in 2022, respectively, expressed in USD. The data are sourced from the price

lists available on Wiley's official website. As mentioned in the Literature Review section, previous studies used the variables representing citation scores, number of articles and issues, number of years since the journal's inception, and academic disciplines when they formulated subscription prices and APCs (Asai, 2022; Budzinski, et al. 2020; Coomes et al. 2017; Dewatripont et al. 2007; Liu, 2011; Liu and Gee, 2017; Petersen, 1992; Schönfelder, 2020; Zheng and Kaiser, 2011). This study chose the independent variables based on them. CiteScore in 2020 is the number of citations from 2017 to 2020 divided by the number of documents in the same period. The independent variable *NonopenArticle* is the number of non-open access articles published in hybrid journals in 2020. The variable *Issue* represents the number of issues in 2020. *Year*, defined as the number of years since the journal's inception, is calculated by subtracting the journal's publication year from 2022. *OpenRatio* is calculated as the proportion of open access articles to the total articles in a hybrid journal in 2020. *Society* is set to 1 if the journal is published on behalf of an academic society or other research institution, such as university, and 0 otherwise.

Based on information available on the journal's website, whether each journal is published on behalf of a research institution or published independently by Wiley is determined. For each journal, Scopus reports the academic discipline in accordance with the All Science Journal Classification (ASJC). This study uses ASJC-based academic discipline variables, namely *agriculture*, *arts and humanities*, *chemistry*, *engineering*, *environmental science*, *material sciences*, *mathematics*, *medicine*, *physics*, and *psychology*. The variable *agriculture* is set to 1 if the journal is in agriculture, and 0 otherwise. The other variables representing academic disciplines are defined similarly. As journals in *material sciences* are the base group when estimating *Price* and *APC*, the variable does not appear in the equations. The variable *OpenArticle* in *APC* Equation (2) is defined as the number of open access articles in hybrid journals in 2020. The number of non-open and open access articles and CiteScore are sourced from Scopus, and the

number of issues and publication years are sourced from the journal's website.

Data

Table 1 presents the summary statistics for the variables, excluding the binary ones. The mean APC for Wiley's 1141 hybrid journals is 3478 USD, which is higher than the mean of annual subscription prices (2620 USD). A large coefficient of variation for *Price* (133.8%) indicates that subscription prices vary across hybrid journals, whereas that for *APC* (19.3%) is small. A high mean *CiteScore* of 4.460 indicates that Wiley's hybrid journals are cited frequently. *NonopenArticle* and *OpenArticle* have large coefficients of variation (143.2% and 211.3%, respectively). Furthermore, the skewness values for *NonopenArticle* and *OpenArticle* are 5.58 and 9.26, respectively, indicating that the distribution has a long right tail. The mean of the proportions of open access articles in total articles (*OpenRatio*) is relatively low at 0.128, indicating that most articles are still non-open access. However, the large coefficient of variation (79.2%) indicates that the open access development differs across hybrid journals.

[Table 1 near here]

The journals published on behalf of research institutions accounted for 69.2% of the 1141 hybrid journals. These journals differ from those published independently in certain ways. First, the mean *APC* for journals published independently (3682 USD) is higher than that for journals on behalf of research institutions (3387 USD). Similarly, the mean *Price* for independently published journals (4172 USD) is higher than that for journals published on behalf of research institutions (1930 USD). The mean *NonopenArticle* and *CiteScore* for journals published on behalf of research institutions were 120 and 4.20, respectively, compared with 150 and 5.04 for independently published journals. The null hypothesis that the mean of the four variables (*APC*, *Price*, *NonopenArticle*, and *CiteScore*) is equal between the two journal types is rejected at the 1% and 5% significance levels. Although independently published journals account for

approximately 30% of Wiley's total hybrid journals, the quantitative and qualitative impacts of individual journals are relatively large. In contrast, the means of the number of open access articles in hybrid journals published independently and published on behalf of a research institution (*OpenArticle*) are 19.2 and 19.0, respectively, and the means of the proportions of open access articles (*OpenRatio*) are 0.127 and 0.128, respectively. For *OpenArticle* and *OpenRatio*, the null hypothesis that the mean is equal between the two journal types is not rejected at the 10% significance level. Therefore, the development of open access does not significantly differ between the two groups.

The mean of the proportions of open access articles (*OpenRatio*) by academic discipline ranged from 0.110 in material sciences to 0.168 in physics. Piwowar et al. (2018) and Robinson-Garcia et al. (2020) found that open access is more prevalent in natural sciences than in social sciences and arts and humanities. However, the mean of *OpenRatio* for social sciences as well as arts and humanities in this study is 0.132, which is greater than the mean for all disciplines (0.128).

Table 2 presents the correlation coefficients between the variables. The correlation coefficients between *Price* and *NonopenArticle* and between *Price* and *Issue* are positive at 0.433 and 0.591, respectively. The positive relationship is the same as what Coomes et al. (2017) found. *APC* and *CiteScore* have a relatively high correlation coefficient of 0.523, whereas *Price* and *CiteScore* have a low correlation coefficient of 0.231. These results are identical to those of Asai (2023). High *OpenRatio* shows that a hybrid journal is approaching a fully open access journal. When calculating the correlation coefficient between *Price* and *OpenRatio*, the value (-0.009) is close to zero and the null hypothesis that it is equal to zero is not rejected at the 10% significance level.

[Table 2 near here]

Results

Table 3 presents the estimation results for *Price* and *APC* using the full information maximum likelihood method. All variables, excluding the binary ones, are natural

logarithms. The coefficients of *CiteScore* in the two equations are positive at the 5% and 1% significance levels, and the values (0.1217 and 0.1003, respectively) are almost identical. Several studies found that frequently cited journals charge high subscription prices and APCs (Asai, 2020, 2023; Dewatripont et al., 2007; Petersen, 1992), which apply to Wiley's hybrid journals as well. The coefficients of *NonopenArticle* and *Issue in Price* Equation (1) are positive at the 5% and 1% significance levels, respectively. Although the coefficient of *OpenArticle* in *APC* Equation (2) is also positive at the 1% significance level, its value (0.0302) is lesser than that of *NonopenArticle* (0.0919) in *Price* Equation (1). The coefficient of *OpenRatio* (0.3470) in *Price* Equation (1) is positive at the 10% significance level. The finding indicates that hybrid journals with a high proportion of open access articles charge higher subscription prices, suggesting the occurrence of double dipping. In contrast, the coefficient of *OpenRatio* in *APC* Equation (2) is negative at the 5% significance level, indicating that hybrid journals with high proportions of open access articles charge lower APCs. The absolute value of the *OpenRatio* coefficient in *APC* Equation (2), however, is smaller than that in *Price* Equation (1).

The coefficient of *APC* in *Price* Equation (1) (-0.0815) is small, and the null hypothesis that the value is equal to zero is not rejected at the 10% significance level. In contrast, the coefficient of *Price* in *APC* Equation (2) (0.0417) is positive at the 5% significance level. These findings indicate that although subscription prices influence the APC levels, they do not rely on APCs. In contrast to the long history of most subscription journals, APC setting has a short history. Initial APCs were set based on the price for an article in a subscription journal (Björk, 2012). The APC setting for Wiley's hybrid journals may still be set based on subscription prices.

The coefficients of *Society* in Equations (1) and (2) are negative at the 1% and 5% significance levels, respectively. For-profit publishers charge higher subscription prices and APCs than academic societies (Asai, 2019a; Coomes et al., 2017; Liu & Gee, 2017;

Liu, 2011; Petersen, 1990, 1992); this practice also applies to Wiley's hybrid journals' subscription prices and APCs. However, the absolute value of the coefficient of *Society* in *Price* Equation (1) (-0.5516) is greater than that in *APC* Equation (2) (-0.0338). The means of *Price* and *APC* for journals published independently are 4172 USD and 3682 USD, respectively, and 1930 USD and 3387 USD for journals published on behalf of research institutions, respectively. This indicates that the difference in APCs between the two journal types is less than the difference in subscription prices. Although university libraries can save subscription costs by prioritizing journal purchase from research institutions over independent publications, APC payments are not economical when authors submit their articles to hybrid journals published on behalf of these institutions.

[Table 3 near here]

Discussion and Conclusion

By formulating the two prices, this study revealed that Wiley has not reduced subscription prices in response to the development of open access in hybrid journals. The findings suggest that Wiley charges the same article twice, that is, it double dips. Recently, many research institutions have signed transformative agreements with publishers to promote open access, according to the ESAC compiling information on transformative agreements. The fee system for transformative agreements, called Read and Publish, intend to resolve the double-dipping problem by bundling hybrid journal subscription and APC expenditures of a research institution (Borrego et al., 2021). The ESAC shows that the transformative agreements preset total expenditures of subscription and APC during the agreement period, although the detailed contracts differ across agreements. The total amount paid by a research institution remains constant under the condition that the number of open access articles published by authors belonging to the research institution stays within the upper limit. Therefore, the fee system in transformative agreements is closely related to the double-dipping problem. However, as the fee system applies only to research institutions that have signed transformative agreements with publishers, the

agreement alone cannot be a comprehensive solution to double-dipping problem.

This study also found that setting APCs is dependent on subscription prices, whereas APCs have no significant influence on subscription prices. The findings suggest that APCs are likely to increase with rising subscription prices (Bosch et al., 2020). Research institutions and consortiums must be cautious about subscription prices when negotiating subscription contracts with the publisher.

This study has a few limitations. First, as it examined only Wiley's hybrid journals, the findings cannot be generalized to other hybrid journals. Future research must confirm these findings by investigating more publishers. Second, although this study used the prices on Wiley's websites, other databases on subscription prices and APCs may also be used; whether the results vary depending on the data sources used would be noteworthy. Finally, the number of open access articles in hybrid journals is still small. When the proportion of open access articles increases significantly, studies on subscription prices and APCs can draw more robust conclusions. Continued research can provide useful insights and assist in strengthening transformative agreements.

Declarations

Competing interest: The author has no competing interests to declare that are relevant to the content of this article.

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References

- Asai, S. (2019a). Determinants of article processing charges for medical open access journals. *Journal of Electronic Publishing*, 22(1). <http://doi.org/10.3998/3336451.0022.103>
- Asai, S. (2019b). Changes in revenue structure of a leading open access journal publisher: The case of BMC. *Scientometrics*, 121(1), 53–63. <https://doi.org/10.1007/s11192-019-03200-1>
- Asai, S. (2020). Market power of publishers in setting article processing charges for open access journals. *Scientometrics*, 123(2), 1037–1049. <https://doi.org/10.1007/s11192-020-03402-y>
- Asai, S. (2023). Determinants of article processing charges for hybrid and gold open access journals. *Information Discovery and Delivery*, 51(2), 121–129. <https://doi.org/10.1108/IDD-09-2021-0098>
- Björk, B. C. (2012). The hybrid model for open access publication of scholarly articles: A failed experiment? *Journal of the American Society for Information Science and Technology*, 63(8), 1496–1504. <https://doi.org/10.1002/asi.22709>
- Björk, B. C. (2017). Growth of hybrid open access, 2009–2016. *PeerJ*, 5, e3878. <https://doi.org/10.7717/peerj.3878>
- Björk, B. C., & Solomon, D. (2015). Article processing charges in OA journals: Relationship between price and quality. *Scientometrics*, 103(2), 373–385. <https://doi.org/10.1007/s11192-015-1556-z>
- Borrego, Á., Anglada, L., & Abadal, E. (2021). Transformative agreements: Do they pave the way to open access? *Learned Publishing*, 34(2), 216–232. <https://doi.org/10.1002/leap.1347>
- Bosch, S., Albee, B., & Romaine, S. (2020, April 14). Costs outstrip library budgets: Periodicals price survey 2020. *Library Journal*. <https://www.libraryjournal.com/?detailStory=Costs-Outstrip-Library-Budgets->

Periodicals-Price-Survey-2020#

- Budzinski, O., Grebel, T., Wolling, J., & Zhang, X. (2020). Drivers of article processing charges in open access. *Scientometrics*, *124*(3), 2185–2206. <https://doi.org/10.1007/s11192-020-03578-3>
- Chressanthis, G. A., & Chressanthis, J. D. (1994). The determinants of library subscription prices of the top-ranked economics journals: An econometric analysis. *Journal of Economic Education*, *25*(4), 367–382. <https://doi.org/10.1080/00220485.1994.10844848>
- Coomes, O. T., Moore, T. R., & Breau, S. (2017). The price of journals in geography. *The Professional Geographer*, *69*(2), 251–262. <https://doi.org/10.1080/00330124.2016.1229624>
- Cox, B. (2002). The Pergamon phenomenon 1951–1991: Robert Maxwell and scientific publishing. *Learned Publishing*, *15*(4), 273–278. <https://doi.org/10.1087/095315102760319233>
- Crawford, W. (2021). *Gold Open Access 2015-2020: Articles in Journals (GOA6)*. <https://waltcrawford.name/goa6.pdf>
- Dewatripont, M., Ginsburgh, V., Legros, P., & Walckiers, A. (2007). Pricing of scientific journals and market power. *Journal of the European Economic Association*, *5*(2–3), 400–410. <https://doi.org/10.1162/jeea.2007.5.2-3.400>
- Eger, T., & Scheufen, M. (2018). *The economics of open access: On the future of academic publishing*. Edward Elgar Publishing
- Farley, A., Langham-Putrow, A., Shook, E., Sterman, L. B., & Wacha, M. (2021). Transformative agreements: Six myths busted. *College and Research Libraries News*, *82*(7), 298–2 <https://doi.org/10.5860/crln.82.7.29830>.
- Liu, L. G. (2011). Economics of scholarly publishing: Exploring the causes of subscription price variations of scholarly journals in business subject-specific areas. *Library Quarterly*, *81*(2), 211–232. <https://doi.org/10.1086/658869>

- Liu, L. G., & Gee, H. (2017). Determining whether commercial publishers overcharge libraries for scholarly journals in the fields of science, technology, and medicine, with a semilogarithmic econometric model. *Library Quarterly*, 87(2), 150–172. <https://doi.org/10.1086/690736>
- Lowe, C. (2019, December 11). Double dipping and other bad manners. *Elsevier Connect*. <https://www.elsevier.com/connect/elsevier-chats-double-dipping-and-other-bad-manners>
- Maddi, A., & Sapinho, D. (2022). Article processing charges, altmetrics and citation impact: Is there an economic rationale? *Scientometrics*. <https://doi.org/10.1007/s11192-022-04284-y>
- Mittermaier, B. (2015). Double dipping in hybrid open access: Chimera or reality? *Scienceopen Research*, 1–12. <https://doi.org/10.14293/S2199-1006.1.SOR-SOCSCI.AOWNTU.v1>
- Petersen, H. C. (1990). University libraries and pricing practices by publishers of scholarly journals. *Research in Higher Education*, 31(4), 307–314. <https://doi.org/10.1007/BF00992268>
- Petersen, H. C. (1992). The economics of economics journals: A statistical analysis of pricing practices by publishers (Research Note). *College and Research Libraries*, 53(2), 176–181. https://doi.org/10.5860/crl_53_02_176
- Pinfield, S., Salter, J., & Bath, P. A. (2017). A “gold-centric” implementation of open access: Hybrid journals, the “Total cost of publication,” and policy development in the UK and beyond. *Journal of the Association for Information Science and Technology*, 68(9), 2248–2263. <https://doi.org/10.1002/asi.23742>
- Piwowar, H., Priem, J., Larivière, V., Alperin, J. P., Matthias, L., Norlander, B., Farley, A., West, J., & Haustein, S. (2018). The state of OA: A large-scale analysis of the prevalence and impact of open access articles. *PeerJ*, 6, e4375. <https://doi.org/10.7717/peerj.4375>

- Robinson-Garcia, N., Costas, R., & van Leeuwen, T. N. (2020). Open access uptake by universities worldwide. *PeerJ*, 8, e9410. <https://doi.org/10.7717/peerj.9410>
- Schönfelder, N. (2020). Article processing charges: Mirroring the citation impact or legacy of the subscription-based model? *Quantitative Science Studies*, 1(1), 6–27. https://doi.org/10.1162/qss_a_00015
- Siler, K., & Frenken, K. (2020). The pricing of open access journals: Diverse niches and sources of value in academic publishing. *Quantitative Science Studies*, 1(1), 28–59. https://doi.org/10.1162/qss_a_00016
- Solomon, D. J., & Björk, B. C. (2012). A study of open access journals using article processing charges. *Journal of the American Society for Information Science and Technology*, 63(8), 1485–1495. <https://doi.org/10.1002/asi.22673>
- Zheng, Y., & Kaiser, H. M. (2011). Price premiums for journal quality and journal governance: Evidence from economics journals. *Economics Letters*, 112(1), 125–127. <https://doi.org/10.1016/j.econlet.2011.03.034>

Table 1 Summary of statistics for variables

	<i>Price</i>	<i>APC</i>	<i>CiteScore</i>	<i>NonopenArticle</i>	<i>OpenArticle</i>	<i>OpenRatio</i>	<i>Issue</i>	<i>Year</i>
Mean	2620	3478	4.460	129	19.0	0.128	8.15	44.5
Median	1514	3450	3.600	74	9.0	0.111	6.00	38.0
Max	41110	5100	45.600	2669	716	0.812	72	223
Min	26	1000	0.100	3	0	0	1	3
SD	3506	672	3.824	185	40.2	0.101	6.28	28.6
CV (%)	133.8	19.3	85.8	143.2	211.3	79.2	77.0	64.2

Note: SD: standard deviation; CV: coefficient of variation; *Price*: subscription prices applicable in 2022 (USD); *APC*: article processing charges applicable in 2022 (USD); *CiteScore*: CiteScore in 2020 in Scopus; *NonopenArticle*: the number of non-open access articles in 2020; *OpenArticle*: the number of open access articles in 2020; *OpenRatio*: the proportion of open access articles to the total articles in 2020; *Issue*: the number of issues in 2020; *Year*: the number of years since the journal's inception.

Table 2 Correlation coefficients

	<i>Price</i>	<i>APC</i>	<i>CiteScore</i>	<i>NonopenArticle</i>	<i>OpenArticle</i>	<i>OpenRatio</i>	<i>Issue</i>	<i>Year</i>
<i>Price</i>	1.000							
<i>APC</i>	0.375***	1.000						
<i>CiteScore</i>	0.231***	0.523***	1.000					
<i>NonopenArticle</i>	0.433***	0.357***	0.366***	1.000				
<i>OpenArticle</i>	0.325***	0.289***	0.423***	0.721***	1.000			
<i>OpenRatio</i>	-0.009	0.160***	0.261***	-0.067	0.326***	1.000		
<i>Issue</i>	0.591***	0.459***	0.449***	0.729***	0.606***	0.053	1.000	
<i>Year</i>	0.104***	0.028	-0.012	0.034	0.048	0.052	0.083	1.000

Note: *** denotes 1% significance level

Table 3 Estimation results

Variable	<i>Price</i>	<i>APC</i>
<i>Constant</i>	6.4898 (3.1575)**	7.6948 (0.1382)***
<i>ln CiteScore</i>	0.1217 (0.0525)**	0.1003 (0.0073)***
<i>ln NonopenArticle</i>	0.0919 (0.0366)**	
<i>ln OpenArticle</i>		0.0302 (0.0081)***
<i>ln OpenRatio</i>	0.3470 (0.2096)*	-0.1536 (0.0651)**
<i>ln Issue</i>	0.7203 (0.0757)***	
<i>ln Year</i>	0.0727 (0.0343)**	0.0113 (0.0082)
<i>ln APC</i>	-0.0815 (0.39856)	
<i>ln Price</i>		0.0417 (0.0174)**
<i>Society</i>	-0.5516 (0.0467)***	-0.0338 (0.0139)**
<i>agriculture</i>	-0.1998 (0.1356)	-0.1011 (0.0242)***
<i>arts and humanities</i>	-0.5188 (0.1440)***	-0.0568 (0.0270)**
<i>chemistry</i>	0.0621 (0.1277)	-0.0483 (0.0195)**
<i>engineering</i>	-0.0731 (0.1416)	-0.0471 (0.0222)**
<i>environmental science</i>	-0.5020 (0.1522)***	-0.0894 (0.0428)**
<i>mathematics</i>	-0.1000 (0.1659)	0.0470 (0.0245)*
<i>medicine</i>	-0.3349 (0.1168)***	-0.0032 (0.0202)
<i>physics</i>	-0.0574 (0.1694)	-0.0935 (0.0261)***
<i>psychology</i>	-0.5869 (0.1445)***	-0.0724 (0.0288)**
<i>social sciences</i>	-0.4778 (0.1276)***	-0.0822 (0.0232)***
Adjusted R ²	0.5612	0.4918
Log likelihood	-18235.55	
Akaike information criterion	32.026	

Note: Standard errors are presented in parentheses. ***, **, and * denote 1%, 5%, and 10% significance levels, respectively.