Discovering the prime citation periods of scholarly publications in diverse fields: Citation obsolescence of different publication types

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Abstract
This research-in-progress paper analyses the citation obsolescence behavior of different publication types in multiple academic disciplines to discover the differences in ageing speed of scholarly publications between social sciences and other science fields, to determine if deviations are due to fields or publication types. Based on previous studies by the authors, several related indicators will be applied to detect the differences and the overall citation life of all the types and fields will be presented for a systematic comparison. The results of this study are expected to benefit in designing and applying citation impact indicators to quantitative research for the fields not dominated by journals and can also provide as reference for scholars to choose preferred publication type to publish.

Introduction
While applying the citation impact indicators in bibliometric studies, the citation window is among several essential conditions to be considered for citation calculation according to Waltman (2016). Glänzel and Schoepflin (1995) has investigated the differences in ageing and reception speed of journal literature between social sciences and other science fields, and found that obsolescence of the social science journals is slower than for the science journals. Apart from journal articles, publications in conference proceedings play an important role especially in computer science and engineering (see Glänzel et al., 2006; Lisée et al., 2008). Another important scholarly medium to share and disseminate knowledge to academic peers and the general public is monograph. Its significance is even higher in the social sciences and humanities (SSH) due to the specific publication culture and audience in the fields. Previous studies show that books and chapters tend to take longer to reach their citation peaks and have a higher citing rate of older literature than journal articles (Nederhof, 2006). For instance, articles in psychology journals took more than 8 years to reach 50% of their citation impact compared to 4.5–6.5 years for physics articles (Glänzel & Schoepflin, 1994). Although the consensus of suitable citation window was more or less drawn by previous studies (Abramo et al., 2011; Waltman et al., 2011; Wang, 2013), it is mainly applied in the fields dominated by journal articles. For the fields dominated by books and conference proceedings it still lacks systematical comparisons in the topic of ageing behavior of assorted publication types.

In order to extend the known findings regarding citation obsolescence to a broader coverage of all kinds of document types for all research fields, we study the citation ageing characteristics of the three main scholarly publication types, journal articles, proceedings papers and monographs. The goal of this research is to detect the citation ageing patterns of diverse publication types and explore the subject characteristics of citation life among all the academic disciplines. The results are expected to benefit in designing and applying citation impact indicators to quantitative research and can also serve as reference for scholars to choose preferred publication type to publish.

Data and Methods

Data processing

All the data were collected from the ECOOM in-house database with 2022-updated raw data from WoS Core Collection (WoS), including the three journal citation indices (SCIE, SSCI, A&HCI) as well as the conference proceedings and book citation indices (CPCI, BKCI). We limited the publication year of all the samples to 2010 for a long observation period, and counted citations of samples from 2010 to 2021 due to the incomplete citation data of 2022. There were ten subfields at the second level of the modified Leuven-Budapest classification system (see Glänzel et al., 2016) selected from a comprehensive view among diverse fields.

Four document types were investigated in this study: *journal articles*, *proceedings papers, edited book chapters* and *authored books*. Monographs were separated to edited books and authored books because the two types of books have different dissemination and citation patterns (see Chi, 2016). Edited books are not seen as a solo contribution and their individual chapters are more comparable with journal articles, thus we chose to observe the chapters in edited books particularly. Conversely, authored books are treated as a complete works and we counted all the citations to an authored book for both the complete work and its individual chapters. The details of type definition are listed in Table 1.

Table 1. Search criteria of the four selected publication types.

	Authored books	Chapters in edited book	Proceedings papers	Journal articles
WoS edition	BKCI excluding the overlaps with SCIE, SSCI, AHCI and CPCI		CPCI excluding the overlaps with SCIE, SSCI, AHCI and BKCI	all
Pubtype	Book or Book in series		-	Journal
Doctype	all	Review or Article	Proceedings Paper	Review or Article
Author Role	non book_editor	book_editor	–	–
Author Name	The authors of all the chapters of a book should not be more than one different from the authors of that book.	–	–	–

Table 2. Sample size of each document type in seven fields (2010).

Code	Subfield	Authored books			Chapters in edited book			Proceedings papers			Journal articles		
		Items	Cites	Uncited (%)	Items	Cites	Uncited (%)	Items	Cites	Uncited (%)	Items	Cites	Uncited (%)
K3	History & Archaeology	479	10859	6.9	1833	5411	36.6	589	1478	45.5	12473	63356	39.5
L1	Business, Economics, Planning	458	15331	10.9	4908	28379	38.5	14557	9217	81.6	43847	1181592	14.3
H1	Applied Mathematics	224	24018	4.5	1634	11290	36.4	15956	70118	58.2	44364	943612	9.3
N2	Psychology & Behavioral Sciences	115	4218	13.0	2849	32765	32.0	2577	5261	58.7	37226	1376898	5.2
E2	Electrical & Electronic Engineering	174	11051	1.7	1840	8904	30.6	96591	318912	49.6	51153	1299624	10.5
G2	Geosciences & Technology	79	4617	2.5	2100	30914	20.9	6120	13000	54.3	36122	1120038	7.0
P3	Classical Physics	55	6012	3.6	804	5620	39.2	27580	51625	56.5	40899	951763	6.4
C4	Physical Chemistry	32	2425	6.3	750	11238	22.4	5477	12462	50.3	63102	2705988	2.1
B1	Biochemistry/Biophysics/Molecular Biology	27	1056	14.8	4592	76024	16.6	1816	6994	46.3	68924	3102931	1.5
R4	Pharmacology & Toxicology	21	1766	0.0	1784	9495	42.4	112	232	50.0	42641	1379625	3.6

We excluded all the overlapped publications for proceedings papers and book publications to concentrate on their own distinct patterns. In addition, we added an supplemental condition for authored books to focus only on the independent works written by published authors, i.e., the authors of each chapter in a book should be the same as the authors of the book or not more

than one author different from the published authors[1]. Table 2 presents the basic publication and citation indicators of our data set.

Methodology

In this research-in-progress paper, we measured related indicators to investigate the citation obsolescence behavior of different publication types by borrowing a mirror from previous studies (Glänzel & Schoepflin, 1995), in particular share of uncited papers, cumulated mean citation rate and present the overall citation life distribution, i.e., in the available citation window 2010 until present. We will further discuss the relation between year of first citation and conditional mean rate in the final version of this study.

The objectives of this study, as mentioned in the introduction, line in the two dimensions, one is the different patterns among various document types, and the other one is the specific subject characteristics among all the fields. Two hypotheses were stated following these two dimensions. Hypothesis I assumes that book publications would have slower citation obsolescence than journal articles and proceedings papers. In particular, journal articles would have slower citation ageing patterns than proceedings papers, following the found faster speed of obsolescence of conference proceedings than journal literature (Lisée et al., 2008). Furthermore, citation ageing patterns of book chapters are more similar as journal articles than books, resembling the reported citation concentration patterns in Chi, 2016. Hypothesis II is that the SSH fields have longer citation life and slower recognition speed than the science fields than applied sciences fields than medical sciences fields, following the patterns reported in Glänzel & Schoepflin, (1995).

Primary results

Citation ageing distributions

Figure 1 presents the share of citations per year for the four document types in the ten subfields. Except for Psychology & Behavioral Sciences, authored books in all the other subfields have a slower citation ageing pattern than other document types, especially at the opposite of proceeding papers. The citations of authored books show a continuous growth trend over time in most of subfields. In line with the Hypothesis I of this study, proceeding papers have the fastest ageing patterns than other document types, while the book chapters are ageing at the same speed as the journal articles. In terms of the field difference (as Hypothesis II of this study), engineering, physics, chemistry and biology have clear peaks, showing a relatively completed citation life within twelve years and imply a foreseeable ending of citation impact in the future. On the contrary, social sciences, geosciences and mathematics keep accumulating their citations after a decade.

To better present the growth speed of publications in diverse subfields, we further observe the differences by cutting the time period according to the development stage of publications. According to Glänzel & Schopeflin (1995), in citation life-time we can distinguish between three periods: initial, maturing and decline. Books, notably in business and economics, geosciences and mathematics are obviously cited slower than other document types. Their cumulated citation share is lower in the first period, compared to other two periods.

Publications in mathematics are in general slowly but increasingly cited. All document types in mathematics attracted a lesser percentage of citations in the first four years after publication than those in the other sciences and the social sciences fields. The unique citation and

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[1] This is because authored books may contain few chapters written by other scholars from their own published authors, typically for the prolegomenon but also common for a single chapter which may provide a needed specific perspective; thus we allow one author name difference between the set of chapter authors and the set of written book authors in the selecting criteria of authored book.

referencing behaviors of this field distinct from other physical science are confirmed again with reference to previous studies (see Glänzel & Schoepflin, 1995; Chi & Glänzel, 2022).
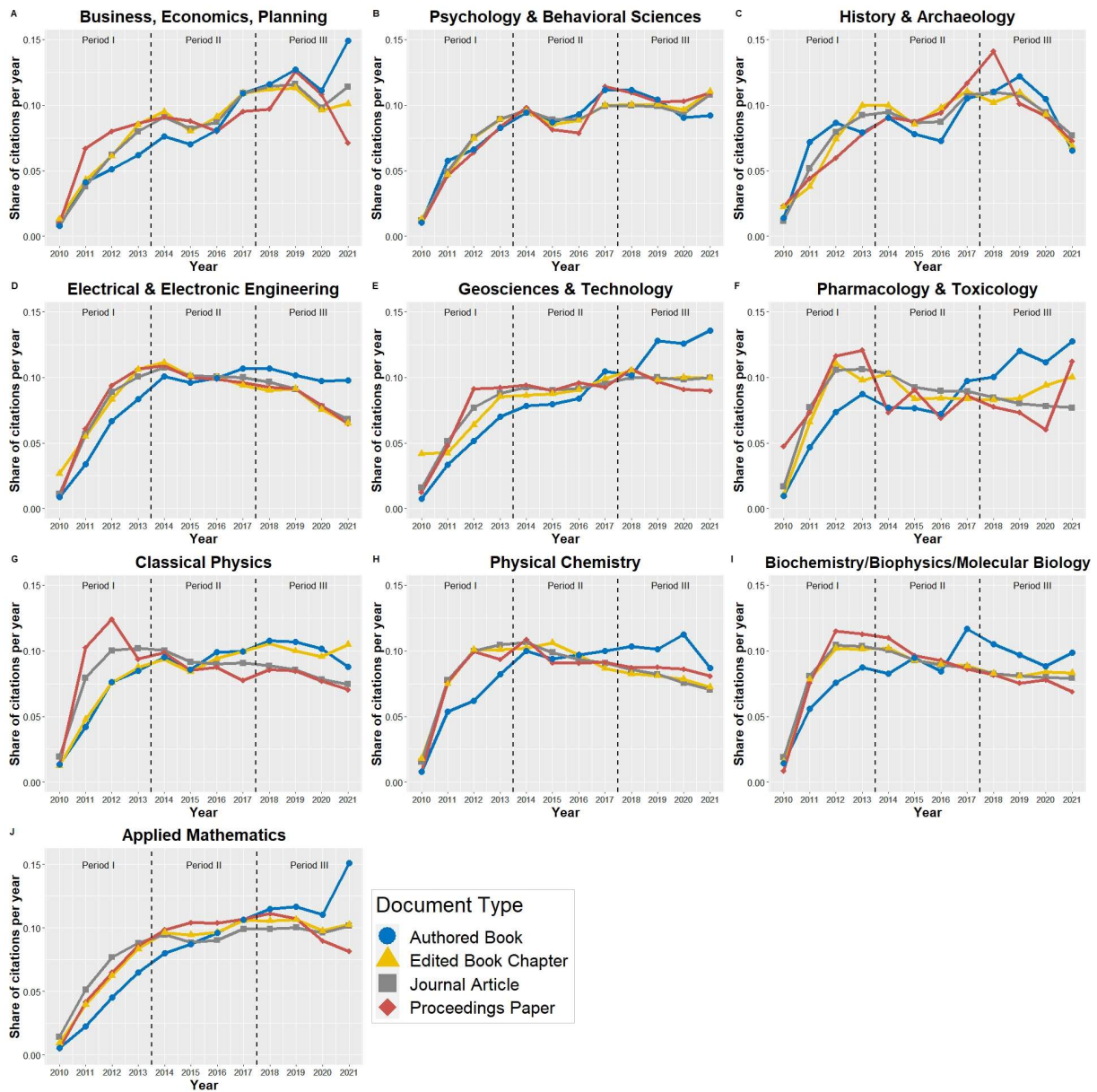

Figure 1. Share of citations per year of four document types in ten subfields.

Cumulative mean citation rate

Figure 2 shows the cumulated mean citation rates over time. In most subfields, especially in physical sciences, the mean citation rates of authored books are grown largely, and even much higher than journal articles. However, in business and economics, psychology, geosciences and molecular biology the journal articles have higher citation impact than books although both types keep in a parallel increasing speed. For a further look at those fields with high citation impact in books, more than 80% of their citations are from journal literature while only History & Archaeology has around 60% of citations from literature and 35% of citations from book literature.

As shown in Table 2, the uncited share could also reveal the specific citation patterns for the selected subfields and distinct document types. For example, journal articles generally have relatively lower uncited rate, but this is not the case for those in humanities.
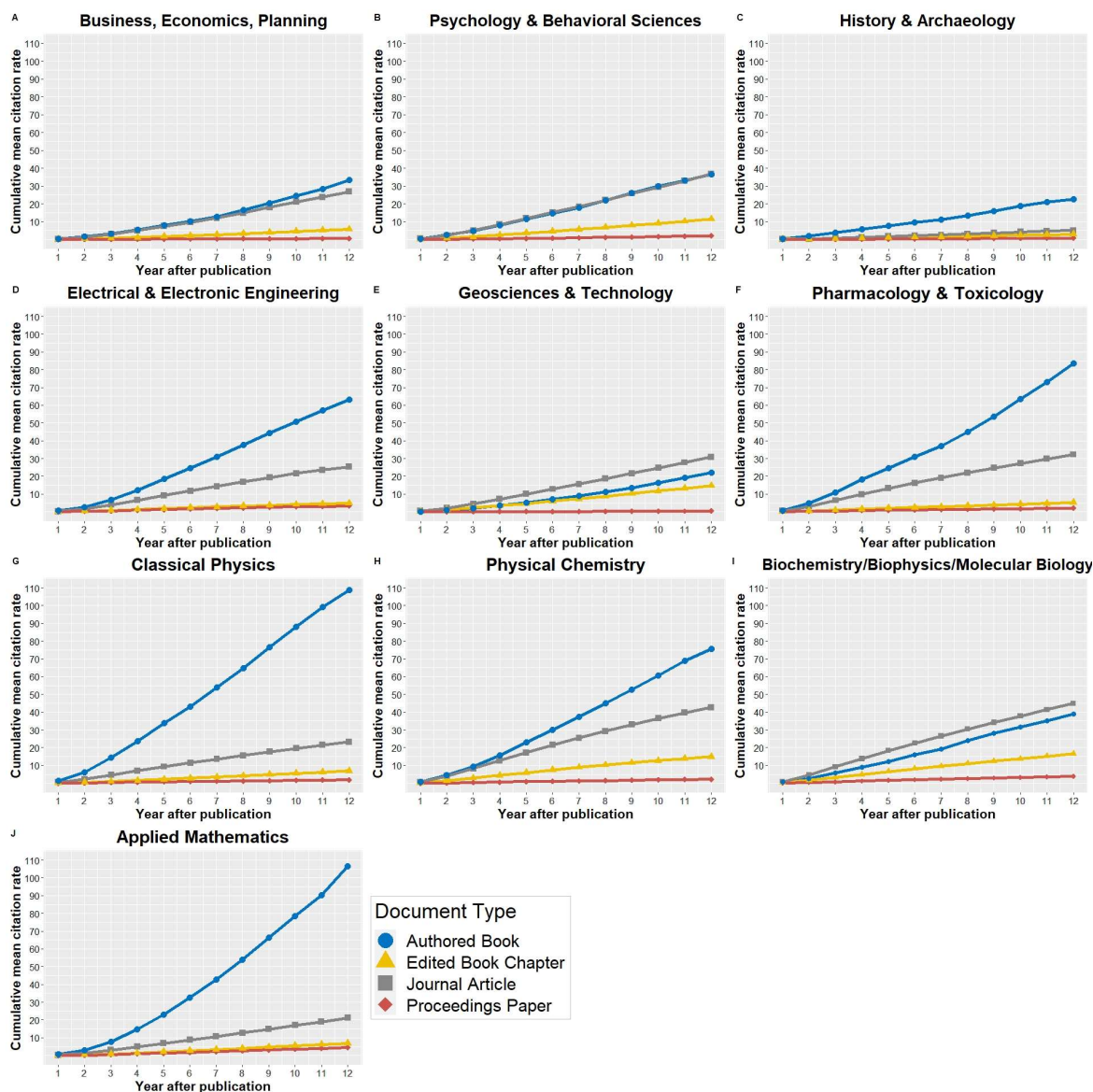
Figure 2. Cumulative mean citation rate of four document types in ten subfields.

Table 3. Comparison of characteristic scores for 10 selected subfields in 2010.

Code	Subfield	Authored books			Chapters in edited books			Proceedings papers			Journal articles		
		b_1	b_2	b_3	b_1	b_2	b_3	b_1	b_2	b_3	b_1	b_2	b_3
K3	History & Archaeology	22.7	60.2	110.0	3.0	7.7	16.6	2.5	8.3	17.7	5.1	18.3	38.4
L1	Business, Economics, Planning	33.5	187.2	1535.0	5.8	24.9	77.5	0.6	3.4	11.1	26.9	83.6	182.9
H1	Applied Mathematics	107.2	433.2	1696.4	6.9	27.2	75.0	4.4	29.2	121.6	21.3	69.7	189.0
N2	Psychology & Behavioral Sciences	36.7	149.0	453.0	11.5	54.4	181.6	2.0	8.8	19.1	37.0	96.3	200.3
E2	Electrical & Electronic Engineering	63.5	203.7	412.3	4.8	14.6	32.2	3.3	13.6	34.8	25.4	80.2	190.1
G2	Geosciences & Technology	58.4	178.6	521.0	14.7	45.0	93.8	2.1	8.4	17.9	31.0	78.5	156.1
P3	Classical Physics	109.3	330.5	606.5	7.0	33.0	84.9	1.9	6.4	15.3	23.3	61.9	128.6
C4	Physical Chemistry	75.8	292.6	387.5	15.0	59.8	163.6	2.3	8.1	18.5	42.9	121.1	294.9
B1	Biochemistry/Biophysics/Molecular Biology	39.1	86.5	149.3	16.6	57.9	171.5	3.9	14.8	37.2	45.0	123.1	298.8
R4	Pharmacology & Toxicology	84.1	362.0	489.0	5.3	23.2	58.8	2.1	7.6	18.5	32.4	80.0	166.6

Authored books in History & Archaeology has much lower uncited rate and higher citation impact than journal articles. This pattern is totally reverse from that in psychology and molecular biology. Through the Characteristics Scores and Scales (CSS) analysis (see, e.g., Glänzel et al., 2016) dissecting citation distributions in Table 3 and 4, the contrary patterns between history and molecular biology can be identified clearly. Books in History &

Archaeology own a higher share of highly cited publications (2.9%) and much higher mean values for each class than journal articles in the subfield (1.9%). The relative superiority of the two publication types is totally opposite in molecular biology as shown in Table 3 and 4.

In general, in Table 4 the citations of authored books are more even distributed than journal articles. Back to Table 2, another interesting point is that the proceeding papers in business are much rarely cited than any other fields. It may be related to the general highly uncited rate among different document types in this subfield, but the less importance of proceedings papers in the field is still self-evident.

Table 4. Comparison of characteristic class for 10 selected subfields in 2010.

Code	Authored books				Chapters in edited books				Proceedings papers				Journal papers			
	CSS 1	CSS 2	CSS 3	CSS 4	CSS 1	CSS 2	CSS 3	CSS 4	CSS 1	CSS 2	CSS 3	CSS 4	CSS 1	CSS 2	CSS 3	CSS 4
K3	72.0%	18.8%	6.3%	2.9%	67.3%	23.5%	6.2%	3.1%	74.4%	18.5%	4.6%	2.5%	77.1%	16.2%	4.8%	1.9%
L1	85.8%	13.3%	0.9%	0.2%	80.6%	15.3%	2.9%	1.2%	81.6%	14.5%	2.9%	0.9%	74.3%	18.7%	5.0%	2.0%
H1	79.9%	17.0%	2.2%	0.9%	78.7%	16.5%	3.4%	1.4%	86.7%	11.1%	1.8%	0.4%	76.7%	18.3%	4.1%	0.9%
N2	80.0%	15.7%	3.5%	0.9%	82.4%	14.1%	2.6%	0.9%	80.1%	14.2%	4.0%	1.7%	71.5%	20.8%	5.6%	2.1%
E2	75.3%	16.7%	5.7%	2.3%	72.7%	19.8%	5.3%	2.3%	79.3%	15.7%	3.8%	1.2%	75.4%	18.5%	4.7%	1.5%
G2	74.7%	21.5%	2.5%	1.3%	73.5%	18.7%	5.2%	2.6%	78.7%	15.1%	4.2%	2.0%	70.6%	21.2%	5.9%	2.3%
P3	70.9%	18.2%	7.3%	3.6%	82.0%	13.2%	3.7%	1.1%	73.3%	19.7%	5.2%	1.9%	71.9%	20.5%	5.7%	1.9%
C4	78.1%	9.4%	6.3%	6.3%	79.3%	15.9%	3.5%	1.3%	76.3%	17.8%	4.3%	1.6%	74.4%	19.7%	4.5%	1.4%
B1	63.0%	25.9%	3.7%	7.4%	77.3%	18.1%	3.5%	1.1%	77.5%	16.7%	4.1%	1.7%	74.3%	19.9%	4.6%	1.3%
R4	81.0%	9.5%	4.8%	4.8%	80.8%	14.2%	3.3%	1.7%	78.6%	16.1%	3.6%	1.8%	71.0%	21.4%	5.6%	2.0%

Brief discussion and work to be completed

The primary results of this paper indicate specific citation ageing patterns among document types and across fields. Not only investigated the ageing speed and its model, we also discovered the growing speed of citation impact. The most striking findings in terms of the two hypotheses are that ageing patterns of information as measured by citation processes show kind of harmonization across different publications types and to a lesser extent across fields, while the citation impact still strongly differs both across both publication types and subject fields. We will further examine the relation between the ageing speed and citation impact of all the document types, and report the final findings regarding their citation obsolescence behaviors.

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