Three decades of research on ecological economics domain: a bibliometric analysis

Sajad Bagow
National Institute of Technology Srinagar, Srinagar, India
Nufazil Altaf
Department of Humanities, Social Sciences and Management, National Institute of Technology Srinagar, Srinagar, India, and
Ahra Qayoom and Bilal Wani
National Institute of Technology Srinagar, Srinagar, India

Received 1 March 2024
Revised 24 August 2024
Accepted 9 February 2025

Abstract

Purpose – This study presents a comprehensive analysis of the literature in the domain of ecological economics together with bibliometric analysis. The aim is to retrospect on the evolution of the research work so far done in the domain of ecological economics. Further, our focus of attention is to know the publication trend and citation structure along with the most cited papers, contributions by authors, most influential papers, prominent journals and topmost affiliations contributing to the research domain under study.

Design/methodology/approach – A sample of 6,493 documents from Scopus databases is retrieved, and the papers are reviewed using the methods of bibliometrics to identify publication trends, top cited articles, topmost authors, author affiliations, etc. We employ VOSviewer for performance analysis on Scopus data to examine trends in publications, citations and citation indices over time and science mapping analysis for analyzing keyword-level and author-level networks. Additionally, we regress citations as a proxy for the impact factor of the ecological economics' research articles on various attributes of the articles.

Findings – The results reveal that the research in the domain of ecological economics has evolved significantly since 1989 and emerged as one of the top research domains to encompass critical contemporary issues such as sustainability, acid rain, global warming, species extinction and wealth distribution. Approximately, 94.17% of the publications have received at least one citation. The bibliometric analysis revealed that the most productive year was 2018, with 364 publications, the highest number between 1989 and 2023. In terms of citations, the most influential year was 2009, with 25,123 citations. However, the papers published in 2002 received the highest average citations per paper. Robert Costanza and Van Den Bergh are the most prolific authors, with 40 and 32 articles, respectively, followed by Nick Hanley with 32 articles. The most cited article is "Update on the environmental and economic costs associated with alien-species in the United States" by Pimentel, Zuniga and Morrison (2005) with 3,351 citations. The article by Groot *et al.*, "Update on the Environmental and Economic Costs Associated with Alien-Invasive Species in the United States," was the most influential work published in 2005. While an average of 85.58 articles was published annually between 1989 and 2005, the number increased significantly to an average of 278.72 articles per year between 2005 and 2023, surpassing the pre-2005 level.

Practical implications – This study positively contributes to the comprehensive understanding of new trends and emerging themes in the research domain of ecological economics. Further, it will help researchers to consider the attributes of research articles that significantly impact the citations of the articles in the research domain under study.

Originality/value – To the best of the author's knowledge, this is the first study that conducts a bibliometric on the publications in the subject under study.

Keywords Bibliometric analysis, Performance analysis, Keyword analysis, Co-authorship analysis

Paper type Literature review

EconomiA
Vol. 27 No. 2, 2026
pp. 207-231
Emerald Publishing Limited
e-ISSN: 2358-2820
p-ISSN: 1517-7580
DOI 10.1108/ECON-03-2024-0031

Introduction

Ecological economics is a multidisciplinary field that incorporates principles from both ecology and economics to study the complex relationships between humans and the environment. By examining the interdependence of the natural and economic systems, ecological economics seeks to develop sustainable solutions that address environmental degradation and promote social welfare. With the growing influence of the ecological environment on people and the deepening of ecological research, the theoretical research of ecological economics has gradually improved. Ecological economics serves as an alternative to traditional environmental economics by taking a more holistic approach. Instead of viewing environmental resources as externalities that can be exploited for economic gain, ecological economics recognizes the inherent value of natural ecosystems and considers them as essential components of economic systems. By integrating ecological principles into economic analysis, ecological economics aims to achieve a more balanced and equitable approach to resource management and development. In today's increasingly interconnected world, the need for a comprehensive understanding of how human activities impact the environment is more crucial than ever.

In 1988, it got recognition as a formalized and well-structured body of knowledge with the advent of the International Society for Ecological Economics. The term "ecology" and "economics" have a common origin in the Greek word "oikos," which translates to "house." Ecology can be understood as the "study of the house," while economics refers to the "management of the house," with the house representing the world as a whole. Consequently, ecological economics involves examining and overseeing the world in a unified manner, making the most of our comprehensive knowledge and comprehension of both the natural and social components of the system. Ecological Economics was envisioned as a fusion and amalgamation of economics and ecology, going beyond their limited perspectives at that time. Rather than merely studying conventional economic and social systems, ecological economics aimed to understand them in the context of their integration and interdependence with ecological life support systems. These relationships encompassed critical contemporary issues such as sustainability, acid rain, global warming, species extinction, and wealth distribution, which existing disciplines failed to adequately address. Ecological Economics covers a broad spectrum of interdisciplinary research approaches concerning the environment. At one end, it combines economic and ecological modeling in innovative and highly quantitative ways, as demonstrated by researchers such as Ma and Stern (2006), Røpke (2005), and Spash (1999). On the other end, it involves philosophical and methodological inquiries at the intersection of political economy, ecology, and philosophy, exemplified by the work of (Martinez-Alier, Munda, & O'Neill, 1998; Max-Neef, 2005). In between these extremes, various strategies draw from social sciences, business studies, engineering, and systems analysis. These strategies aim to address significant problems that require insights from multiple disciplines or research traditions. For instance, Wiedmann, Lenzen, Turner, and Barrett (2007) and Reed, Fraser, and Dougill (2006) exemplify approaches that integrate economic and ecological modeling in a quantitative manner to tackle complex environmental issues effectively. Studies based on bibliometric analysis are increasingly utilized because they offer crucial insights into the influence, specializations, and trends within a research field, allowing for a more objective evaluation of scientific research patterns (Van Raan, 1998; Silva & Teixeira, 2008, 2009). Although bibliometric analyses have been conducted in the ecological research domains (Smith, 2010; Silva & Teixeira, 2011), they generally do not address the evolution of the topics examined or the methodologies employed in ecological economics. This paper seeks to contribute to a clearer understanding of the current state of ecological economics by providing a quantitative and comprehensive overview of the field's development. It highlights trends in research topics and methodologies used in studies published within the domain of ecological economics, using bibliometric techniques. So, this paper complements the existing research done so far in this domain by explicitly throwing light on the evolution of the ecological

economic using descriptive analysis, science mapping, publications trend, authorship, and quality various indices to reveal the impact factor as well.

To retrospect on its long journey of research domain that started in 1989, we present a bibliographic overview of articles published in the research domain of ecological economics. Retrospectively, bibliometric studies are not new, but they are now a common practice among researchers. For instance, a number of studies have done bibliometric analysis in diverse research areas on various topics (Zabavnik & Verbi, 2021; Farooq, 2022; Vaz da Fonseca & Nascimento Jucá, 2020). Moreover, researchers have also shown their interest in the bibliometric analysis of different journals (Naveen, Kumar, Mukherjee, Pandey, & Lim, 2021; Farooq, 2022; Burton, Kumar, & Pandey, 2020; Valenzuela, Merigó, Johnston, Nicolas, & Jaramillo, 2017). The exponential growth of academic and scientific publications in the mid-20th century marked a pivotal moment in the emergence of the big science era (Bagow & Altaf, 2023; Bornmann & Mutz, 2015). However, this surge in scientific literature makes it challenging for researchers to stay updated on existing research, thereby complicating the process of synthesizing previous findings (Bagow & Altaf, 2023; Broadus, 1987).To address such a problem, bibliometric is one of the approaches that use statistical methods and techniques to organize and present the literature systematically in such a way that it brings forth not only meaningful insights but also helps in unveiling the research gaps.

In this paper, we aim to propose answers to the following questions based on the bibliometric analysis:

RQ1. What is the publication trend and citation structure of articles published between 1989 and 2022?

RQ2. Who are the most influential authors and affiliated-institutions and countries in ecological economics?

RQ3. What are the most cited documents?

RQ4. What are the main keywords of the ecological economics publications?

RQ5. What is the authorship pattern of articles in the research domain of ecological economics?

RQ6. What are the various attributes of the articles in the subject domain under study that explain its impact?

Methods and data

Bibliometrics, a well-known technique to investigate bibliometric data, is commonly referred to as scientometrics and is applied to various fields in science, like quantitative studies of science, studies related to communication in science, and policies that are scientific in nature (Small, 1973). It is referred to as "bibliometric" source of science in the peer-reviewed scientific publications. Its application to various disciplines has been widely used to analyze a broad spectrum of recorded discourse (Baker, Larcker, & Wang, 2021; Gil-Domenech, Berbegal-Mirabent, & Merigo, 2020). According to (Pritchard, 1969), bibliometric tool can summarize the bibliometric data in a well-structured and organized form by using statistics and mathematics. The advent of "big science" era post 1950s acted as a catalyst to open up the scope of bibliometric techniques. This ensured the structural analysis of the literature. Moreover, the science mapping analysis, a sub field of the bibliometric methodology brings forth prospective benefits by ensuring reliability and the objectivity in systematizing literature (Aria & Cuccurullo, 2017). The publications in the scientific domain show intellectual similarity that is manifested by how they exhibit common reference patterns and cite common

sources (Kessler, 1963).There are several other concepts that are frequently used in bibliometric literature like the co-authorship, co-occurrence of keywords etc. In the co-authorship analysis, interlink among collaborating authors and different patterns of authorship are revealed (Koseoglu, 2016) and the conceptual or intellectual structure of the published articles are analyzed in co-occurrence of keyword analysis (Huang *et al.*, 2018). The methods used in bibliometric analysis fall into two main categories: (1) performance analysis and (2) science mapping. Essentially, performance analysis evaluates the contributions of different research components, while science mapping examines the connections between these research components. We use performance analysis with Scopus data to address our first four questions. This analysis helps us examine trends in publications, citations, and citation indices over time. Additionally, we identify the key authors, institutions, and articles that significantly contribute to ecological economics research domain. To explore the relationship between keywords and authors we employ science mapping by analyzing keyword-level and author level networks using Scopus data. We employ VOS viewer for bibliographic and cluster analysis at both the keyword and author levels. To assess the impact of ecological economics article's attributes on citations we perform a regression analysis using Scopus data, where we regress the number of citations for each article on its specific attributes.

We obtained bibliographic data for this study from Scopus, the largest multi-disciplinary database of peer-reviewed literature in social science research, which is widely recognized and frequently used for quantitative analysis (Duran-Sanchez, Del Río-Rama, Álvarez-García, & García-Vélez, 2019; Bartol, Budimir, Dekleva-Smrekar, Pusnik, & Juznic, 2014). Scopus contains a total of 6,493 documents published between 1989 and 2023, including 5,764 articles, 178 short survey, 49 editorials, 274 notes, 94 reviews, 49 erratum, 47 conference paper, and 38 letter. Only articles among these documents were considered for analysis.

Descriptive analysis

To answer the first research question of the study, we conducted a descriptive analysis of 5,704 articles to figure out the ongoing trend of the articles and the citation structure.

In the year 1989, 18 articles have been published and the publications have increased substantially in number since then. In Table 1, we summarized the yearly growth of the articles and total citations received by articles per year. It is clearly revealed that the most productive year in terms of total publications (364) was 2018 with total cited documents (361). Total citations of 11,564 were received during this year, with an average citation of 31.77 for each document. By focusing on average citations per cited article instead of the crude measure of average citations per article (Bagow & Altaf, 2023), we find that the most influential year, based on the highest number of citations received, was 2002.On an average each article is cited at least 126.5 times in 2002S, followed by 2004 (118.55). The article by Groot *et al.* "Update on the Environmental and Economic Costs Associated with Alien-Invasive Species in The United States" was the most influenced work published in the year 2005.

In terms of the quality parameters of research publications, the year 2008 topped the list with an (h-index = 86), (g-index = 159), and m-index = 0.54).Further, the Table 1 also shows that the 461 articles (8.08%) received at least 250 citations, 873 articles (15.30%) received at least 100 citations, 1703 articles (29.85%) received at least 50 citations, 2,884 articles (50.56%) received at least 25 citations and 5,372 articles (94.17%) were cited at least once between the period of 1989 and 2023.

We have plotted total publications and average citation per cited publication in Fig. Between 1989 and 2023, the annual growth rate of the publications was 6.94%. The study covers two important time periods; Millennium Development Goals (2005), Sustainable Development Goals (2015). Figure 1 revealed that the production of total publications has two sharp peaks around the year 2005 and 2015. The growth of publications has increased exponentially 2005 onwards that could be attributed the Millennium Development Goals especially the goal 7 that explains the promotion of environmental sustainability and led to an

Table 1. Publications trend

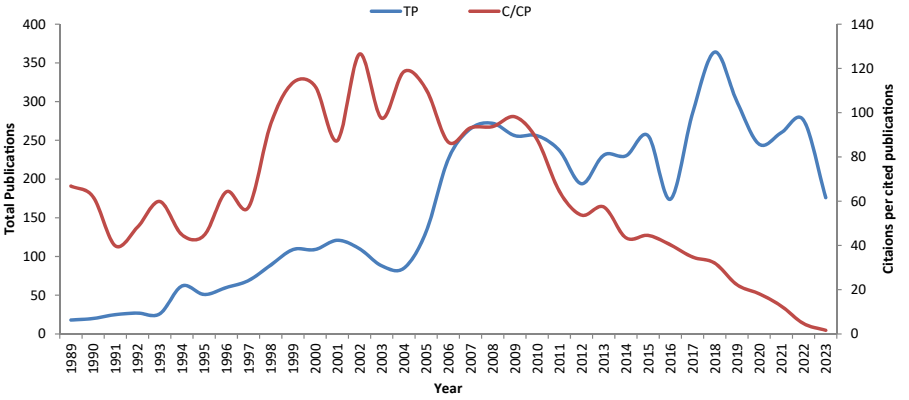
Year	TP	NCP	TC	C/P	C/CP	H	G	m	250	100	50	25	1
1989	18	18	1,203	66.83	66.83	12	18	0.66	1	3	8	10	18
1990	20	20	1,239	61.95	61.95	11	20	0.55	1	2	3	6	20
1991	25	24	956	38.24	39.83	17	25	0.68	0	2	6	13	24
1992	27	27	1,304	48.29	48.29	14	27	0.51	2	3	5	8	27
1993	26	26	1,557	59.88	59.88	17	26	0.65	1	2	5	15	26
1994	62	58	2,600	41.93	44.82	22	50	0.44	2	5	14	19	58
1995	51	49	2,184	42.82	44.57	25	46	0.54	1	6	13	25	49
1996	60	60	3,855	64.25	64.25	32	62	0.51	4	9	21	42	60
1997	69	69	3,952	0.75	0.75	35	62	0.56	1	15	27	40	69
1998	89	89	8,449	94.9	94.9	44	89	0.49	9	20	38	62	89
1999	109	109	12,378	113.56	113.56	49	109	0.45	11	26	49	73	109
2000	109	109	12,201	111.94	111.94	57	109	0.52	10	34	64	79	109
2001	121	121	10,572	87.37	87.37	50	102	0.49	10	30	51	89	121
2002	110	110	13,915	126.5	126.5	58	110	0.53	9	37	51	92	110
2003	88	88	8,579	97.49	97.49	46	88	0.52	6	24	44	62	88
2004	85	85	10,077	118.55	118.55	48	85	0.56	5	26	47	61	85
2005	132	132	14,590	110.53	110.53	57	120	0.48	11	32	64	103	132
2006	226	226	19,592	86.69	86.69	74	139	0.53	21	52	107	159	226
2007	265	264	24,597	92.82	93.17	80	156	0.51	17	67	133	193	264
2008	272	271	25,402	93.39	93.73	86	159	0.54	20	70	128	205	271
2009	256	256	25,123	98.14	98.14	82	158	0.52	20	66	123	182	256
2010	256	255	22,387	87.45	87.79	79	158	0.5	15	56	122	190	255
2011	237	235	15,156	63.95	64.49	66	123	0.54	10	41	94	145	235
2012	194	193	10,362	53.41	53.69	56	101	0.55	1	29	64	119	193
2013	231	231	13,257	57.39	57.39	62	115	0.54	7	35	83	142	231
2014	230	229	9,947	43.25	43.44	57	99	0.58	1	24	70	127	229
2015	256	255	11,361	44.38	44.55	55	106	0.52	5	18	66	139	255
2016	174	174	7,011	40.29	40.29	41	83	0.49	3	8	30	88	174
2017	285	285	9,904	34.75	34.75	50	99	0.51	3	8	30	88	174
2018	364	361	11,564	31.77	32.03	49	107	0.46	3	10	48	121	361

(*continued*)

Table 1. Continued

Year	TP	NCP	TC	C/P	C/CP	H	G	m	250	100	50	25	1
2019	300	299	6,650	22.17	22.24	39	81	0.48	0	9	24	81	299
2020	245	243	4,421	18.04	18.19	32	66	0.48	1	2	10	51	243
2021	260	248	3,126	12.02	12.6	25	55	0.45	0	2	9	27	248
2022	276	222	1,041	3.77	4.69	12	32	0.38	0	0	2	3	222
2023	176	41	68	0.39	1.66	3	6	0.5	0	0	0	0	41
Total	5,704	5,482	330,580	2169.85	2181.54	1,542	2,991	18.22	461	873	1,703	2,884	5,372

Note(s): Publications with citations ≥
Source(s): Created by the authors



Source(s): The authors

Figure 1. Graphical presentation of annual production of articles and the average citations per cited publication

increased research growth in the domain of environmental economics. Further the rise of SDGs 2015 motivated researchers to explore various new dimensions and methods to achieve the predetermined goals of "The 2030 Agenda for Sustainable Development" that has also led to a greater extent the rise in the research articles in the domain of Ecol. Econ. Between 1989 and 2005, an average of 85.58 articles were published annually, whereas this number rose significantly to 278.72 articles per year between 2005 and 2023—well above the pre-crash level of 2005. The following section presents the results of keyword co-occurrence analysis, followed by co-citation analysis and bibliographic coupling. While the number of citations per referenced publication has declined in recent years, this trend is expected given the recency of the later publications in the field. Overall, the research domain of Ecol. Econ exhibits a strong and positive growth trend in both publications and citations.

Table 2 presents the most influential articles, ranked by total citations, followed by average citations per year, for publications from 1989 to 2023. At first glance, citation counts serve as an indicator of a research publication's influence, as noted by Tsay (2009). These highly cited articles exemplify academic excellence and high-quality contributions within their respective fields. For instance, Pimentel, Zuniga, and Morrison (2005) in their study discussed environmental damages and the associated economic costs caused by the invasion of alien species in the United States. They concluded that the major environmental damages are primarily caused by invasion of alien species in the United States which adds to losses up to $120 billion per year. Furthermore, the study by De Groot, Wilson, and Boumans (2002) made a comparative analysis of ecosystem functions, goods and services in a more analytical and comprehensive manner. They explored a wide range of 23 ecosystem functions together with the goods and services that they provide and finally described various valuation methods linked to these goods and services. Among other quality works in the same line of research is the study by Dinda (2004) who surveyed the existing literature on Environmental Kuznets Curve and gave a broad overview of conceptual insights, background history and the methodological critique. It is observed from the table that the paper by Korhonen, Honkasalo, and Seppala (2018) tops the list in terms of average citations per year with 287 cites per year.

The publications presented in the Table 2 study a diverse set of topics pertaining to the ecological goods and services, valuation methods, Environmental Kuznets Curve etc. whose empirical and theoretical contributions have advocated the discussion and expanded the research domain in the ecological economics. Therefore, the presentation of such diversity of research topics highlights the growth and expanded dimensions pertaining to the research on ecological economics that aids in the development of new theories and hypotheses.

Table 2. Most cited articles

TC	Title	Authors	Year	CPY
3,351	"Update on The Environmental and Economic Costs Associated with Alien-Invasive Species in The United States"	Pimentel, D., Zuniga, R., Morrison, D	2005	186
3,020	"A Typology for the Classification, Description and Valuation of Ecosystem Functions, Goods and Services"	De Groot, R.S., Wilson, M.A., Boumans, RM.J	2002	144
2,159	"Environmental Kuznets Curve Hypothesis: A Survey"	Dinda, S	2004	114
2,018	"Defining and Classifying Ecosystem Services for Decision Making"	Fisher, B., Turner, R.K., Morling, P	2009	144
1,829	"Ecosystem Services in Urban Areas"	Bolund, P., Hunhammar, S	1999	76
1,631	"Economic Valuation of the Vulnerability of World Agriculture Confronted with Pollinator Decline"	Gallai, N., Salles, J.M., Settele, J., Vaissiare, B.E	2009	117
1,531	"Designing Payments for Environmental Services in Theory and Practice: An Overview of the issues"	Engel, S., Pagiola, S., Wunder, S	2008	102
1,502	"Redefining Innovation - Eco-Innovation Research and the Contribution from Ecological Economics"	Rennings, K	2000	65
1,434	"Circular Economy: The Concept and its Limitations"	Korhonen, J., Honkasalo, A., Seppala, J	2018	287
1,399	"What are Ecosystem Services? The Need for Standardized Environmental Accounting Units"	Boyd, Banzhaf, S	2007	87
1,390	"Stirpat, Ipat and Impact: Analytic Tools for Unpacking the Driving Forces of Environmental Impacts"	York, R., Rosa, E.A., Dietz, T	2003	70
1,192	"Ecological Goods and Services of Coral Reef Ecosystems"	Moberg, F., Folke, C	1999	50
1,033	"Energy Consumption, Carbon Emissions, and Economic Growth in China"	Zhang, X.P., Cheng, X.M	2009	74
1,030	"Classifying and Valuing Ecosystem Services for Urban Planning"	Gomez-Baggethun, E., Barton, D.N	2013	103
1,007	"Ecosystem Services and Dis-Services to Agriculture"	Zhang, W., Ricketts, T.H., Kremen, C., Carney, K., Swinton, S.M	2007	63
979	"National Natural Capital Accounting with the Ecological Footprint Concept"	Wackernagel, M., Onisto, L., Bello, P., Linares, A.C., Falfa¸N, I.S.L., Garcaa, J.M., Guerrero, A.I.S., Guerrero, MaG.S	1999	41
972	"The History of Ecosystem Services in Economic Theory and Practice: From Early Notions to Markets and Payment Schemes"	Gomez-Baggethun, E., De Groot, R., Lomas, Pl., Montes, C	2010	75
963	"Energy Consumption, Income, and Carbon Emissions in the United States"	Soytas, U., Sari, R., Ewing, B.T	2007	60
927	"Spatial Scales, Stakeholders and the valuation of Ecosystem Services"	Hein, L., Van Koppen, K., De Groot, Rs., Van Ierland, Ec	2006	55
866	"A Tale of Two Market Failures: Technology and Environmental Policy"	Jaffe, Ab, Newell, R.G., Stavins, R.N	2005	48
838	"Determinants of Eco-Innovations by type of Environmental Impact - The Role of Regulatory Push/Pull, Technology Push and Market Pull"	Horbach, J., Rammer, C, Rennings, K	2012	76

(*continued*)

Table 2. Continued

TC	Title	Authors	Year	CPY
836	"Does Urbanization Lead to Less Energy Use and Lower Co2 Emissions? A Cross-Country Analysis"	Poumanyvong, P, Kaneko, S	2010	64
833	"Income, Inequality, and Pollution: A Reassessment of The Environmental Kuznets Curve"	Torras, M., Boyce, J.K	1998	33
812	"From Production-Based to Consumption-Based National Emission Inventories"	Peters, G.P	2008	54
807	"The Sharing Economy: A Pathway to Sustainability or A Nightmarish Form of Neoliberal Capitalism?"	Martin, C.J	2016	115

Source(s): Created by the authors

In Table 3, we presented the highly contributing authors to Ecol. Econ, their affiliated institutes and countries. Their contribution is evaluated on the basis of their publications, total citations, average citations, citation per cited publication. Other quality parameters of their work are evaluated based on h-index, g-index and m-index. Further, we use five threshold levels of citation categories to enable a more clear understanding of the citation structure of the publications.

Table 3 results show that the Robert Costanza from University of Maryland is at the top place considering his contribution of 40 articles to Ecol. Econ between 1989 and 2023, followed by Van Den Bergh from University of Amsterdam and Nick Hanley from University of Stirling with each contributing 32 articles. Also these authors have the highest number of highly cited works, with 40 for Costanza and 32 for both Van Den Bergh and Hanley.

Regarding total citations, Robert Costanza from the University of Maryland is in the lead with 6,492 citations, followed by Van Den Bergh from University of Amsterdam, who has been cited 3,631 times between 1989 and 2023. Wunder tops the list of authors in terms of average citations and citations per cited article (315.08), followed by Turner from the University of East Anglia with 264.14 average citations and citations per cited article. Robert Costanza has the highest h-index, indicating that 30 of his articles have been cited at least 30 times during that period and g-index equals to 40, signifying that 40 of his highly cited articles have been cited at least 40 times, as shown in the g-index. Lanzem (1.00) ranks first in terms of m-index, signifying that all his cited works are among the most highly cited. Additionally, the table reveals that Robert Costanza has contributed the highest number of Ecol. Econ publications cited at least 250, 100, 50, 25, or 1 times.

The productivity and influence of the authors can be assessed from various perspectives. Therefore, we provide an additional ranking method in Table 4, utilizing the dominance factor. The dominance factor is determined by the proportion of first-authored articles among the multi-authored contributions. Analysis of Table 4 reveals that the authors with the highest rankings include Ekins, P., Muradian, R., Wang, H., and Lenzen, M. However, it is important to note that there is a possibility that the authors of certain articles are listed alphabetically, which could potentially introduce biases and restrict the inferences drawn from the scientific influence based on the dominance factor.

In Figure 2, we have plotted graphically the distribution of articles involving one, two, three or multiple authors. Around 22.06% of the articles (1,258 out of 5,344) are written by a single author, while the majority (77.94%) is co-authored. Among the co-authored articles, 29.81% involve two authors (1700 articles), 23.22% have three authors (1,324 articles), 12.29% involve four authors (701 articles), 6.10% have five authors (348 articles), and the remaining 6.52% are authored by six to twelve or twenty nine individuals.

Table 3. Most influential authors between 1989 and 2023

Authors	Affiliation	Country	TP	NCP	TC	C/P	C/CP	h	G g	m	250	100	50	25	1
Costanza R	University of Maryland	United States	40	40	6,492	162.3	162.3	30	40	0.75	7	20	27	34	40
VanDen Bergh	University Amsterdam	Netherlands	32	32	3,631	113.47	113.47	26	32	0.81	6	9	15	26	32
Hanley N	University of Stirling	Scotland	32	32	2003	62.59	62.59	21	32	0.66	2	7	13	20	32
Krausmann F	University of Alpen Adria Klagenfurt	Austria	24	24	2,718	113.25	113.25	20	24	0.83	2	8	15	19	24
Jackson T	University of Surrey	United Kingdom	21	21	1927	91.76	91.76	18	21	0.86	2	5	11	15	21
Lenzen M	University of Sydney	Australia	16	16	2,773	173.31	173.31	16	16	1	4	11	13	16	16
Pascual U	University of Cambridge	United Kingdom	20	18	1,501	75.05	83.39	16	20	0.8	2	2	5	12	18
Brouwer R	University of Waterloo	Canada	20	20	1,170	58.5	58.5	15	20	0.75	1	3	7	12	20
Nijkamp P	Free University of Amsterdam	Netherlands	16	16	1,603	100.19	100.19	15	16	0.94	1	5	9	14	16
Shogren JF	Iowa State University, Ames	United States	25	22	1,396	55.84	63.45	14	25	0.56	1	4	8	10	22
Ayres RU	Insead	France	13	13	1,175	90.38	90.38	13	13	1	0	5	8	13	13
Farley J	University of Vermont	United States	13	13	1823	140.23	140.23	13	13	1	2	4	8	13	13
Haberl H	University of Natural Resources and Life Sciences	Austria	16	16	1958	122.38	122.38	13	16	0.81	2	5	8	10	16
Turner RK	University of East Anglia	United Kingdom	14	14	3,698	264.14	264.14	13	14	0.93	3	4	8	11	14
Erb KH	Alpen Adria University	Austria	12	12	1887	157.25	157.25	12	12	1	2	6	7	9	12
Kallis G	Universitat Autonoma De Barcelona	Spain	14	14	1,272	90.86	90.86	12	14	0.86	1	3	5	9	14
Vatn A	Norwegian University of Life Sciences	Norway	14	14	1,365	97.5	97.5	12	14	0.86	1	4	6	8	14
Wunder S	Centre for International Forestry Research	Brazil	13	13	4,096	315.08	315.08	12	13	0.92	5	8	9	11	13
Ekins P	University College London	United Kingdom	12	12	1,083	90.25	90.25	11	12	0.92	1	1	6	9	12
Hubacek K	University of Leeds	United Kingdom	12	12	1,425	118.75	118.75	11	12	0.92	1	6	8	9	12
Kaufmann RK	Boston University	United States	12	12	1,195	99.58	99.58	11	12	0.92	2	3	6	8	12

(*continued*)

Table 3. Continued

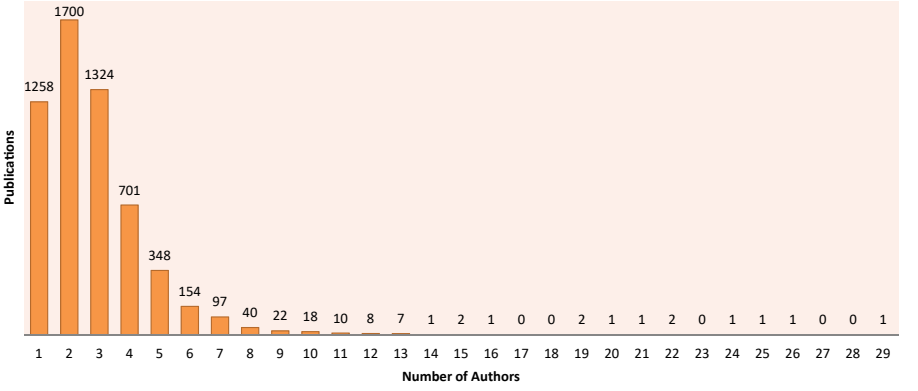
Authors	Affiliation	Country	TP	NCP	TC	C/P	C/CP	h	G g	m	250	100	50	25	1
Managi S	Yokohama National University	Japan	14	13	659	47.07	50.69	11	14	0.79	0	1	4	8	13
Muradian R	Universitat Autonoma De Barcelona	France	11	11	2050	186.36	186.36	11	11	1	3	6	6	9	11
Perrings C	University of York	England	14	14	868	62	62	11	14	0.79	1	3	6	8	14
Schandl H	Institute for Interdisciplinary Studies of Austrian Universities	Austria	11	11	629	57.18	57.18	11	11	1	0	2	5	10	11
Wang H	Policy Research Center For Environment and Economy	China	13	13	632	48.62	48.62	11	13	0.85	0	3	4	8	13
Bateman IJ	University of East Anglia	United Kingdom	11	11	728	66.18	66.18	10	11	0.91	0	2	6	9	11

Note(s): Publications with citations ≥
Source(s): Created by the authors

Table 4. Most influential authors based on dominance factor

Rank	Author	Dominance factor	Number of articles	Single-authored	Multi-authored	First-authored	Rank by articles
1	Ekins P	0.67	12	3	9	6	10
2	Muradian R	0.56	11	2	9	5	11
3	Wang H	0.42	13	1	12	5	9
4	Lenzen M	0.38	16	0	16	6	7
4	Farley J	0.38	13	0	13	5	9
5	Turner Rk	0.31	14	1	13	4	8
6	Krausmann F	0.29	24	0	24	7	4
6	Haberl H	0.29	16	0	14	4	7
7	Brouwer R	0.28	20	2	18	5	6
8	Costanza R	0.26	40	2	38	10	1
8	Jackson T	0.26	21	2	19	5	5
9	Kallis G	0.25	14	2	12	3	8
9	Managi S	0.25	14	1	12	3	8
10	Kaufmann Rk	0.22	12	3	9	2	10
11	Ayres Ru	0.2	13	8	5	1	9
12	Nijkamp P	0.19	16	0	16	3	7
13	Wunder S	0.18	13	2	11	2	9
13	Bateman Ij	0.18	11	0	11	2	11
14	Shogren Jf	0.16	25	0	25	4	3
15	Vatn A	0.14	14	7	7	1	8
16	Hanley N	0.13	32	0	32	4	2
17	Van Den Bergh	0.1	32	3	29	3	2
18	Perrings C	0.09	14	3	11	1	8
18	Schandl H	0.09	11	0	11	1	11
19	Erb Kh	0.08	12	0	12	1	10
19	Hubacek K	0.08	12	0	12	1	10
20	Pascual U	0.05	20	1	19	1	6

Source(s): Created by the authors



Source(s): The authors

Figure 2. Distribution of articles involving one, two, three or multiple authors

The prominent figure of authors is two who have mostly published in the subject domain under study. The current scenario of the research activities portrays the image that the researchers have a high collaboration network (Su, Zhai, & Landström, 2015; Acedo, Barroso,

Casanueva, & Galan, 2006) in terms of authorship, institute and country affiliations (Finardi & Buratti, 2016). As briefly described by Yazit and Zainab (2017), the authors' productivity and their institutional affiliations show a strong correlation.

Table 5 further demonstrates the Wageningen University shows dominance across all citation categories, with 18, 36, 57, 80, and 84 articles having citations greater or equal to 100, 50, 25, 10, and 1 respectively. One notable example of an article that have received the highest citation, as indicated in Table 2, is the work by Hein, L., Van Koppen, K., De Groot, R.S., and Van Ierland, E.C., which has received 927 citations according to Scopus.

Science mapping analysis

Figure 3 illustrates the network of co-authorship among authors who have published a minimum of five co-authored documents, each cited at least 100 times, spanning from 1989 to 2023. The most prominent co-authorship cluster consists of Fridolin Krausmann from University of Alpen Adria Klagenfurt and Helmut Haberl from University of Natural Resources and Life Sciences, who together have collaborated on eight publications in Ecol. Econ. Robert Costanza from University of Maryland and Brendan Fisher from University of Vermont also form the most significant co-authorship group, having contributed 4 co-authored works to the research domain under study.

Besides the networks of co-authorship among authors, the co-authorships involving institutions and countries affiliated with the authors are also significant aspects of these networks. In Figure 4, strong co-authorship networks are observed among various pairs of institutions, such as University of Leeds and University of Cambridge, Autonomous University of Barcelona and Catalan Institution for Research and Advanced Studies (ICREA), Vrije University Amsterdam and Wageningen University, University of Maryland and Duke University, Stockholm University and Royal Swedish Academy of Sciences, University of Groningen and University of St Andrews, and University of Vermont and McGill University. Table 4 includes almost all the universities represented. Furthermore, the table indicates that co-authorship collaborations are more prevalent among institutions located in close geographic proximity.

Figure 5 illustrates the co-authorship patterns among the affiliated countries of the authors. The countries involved are England and the United States, Australia and the United States, Germany and the United States, and France and the United States, Netherlands and the United States. This indicates that a significant number of Journal of Ecol. Econ authors' affiliated institutions are located in the United States, which serves as the central hub for co-authorship publications from 1989 to 2023.

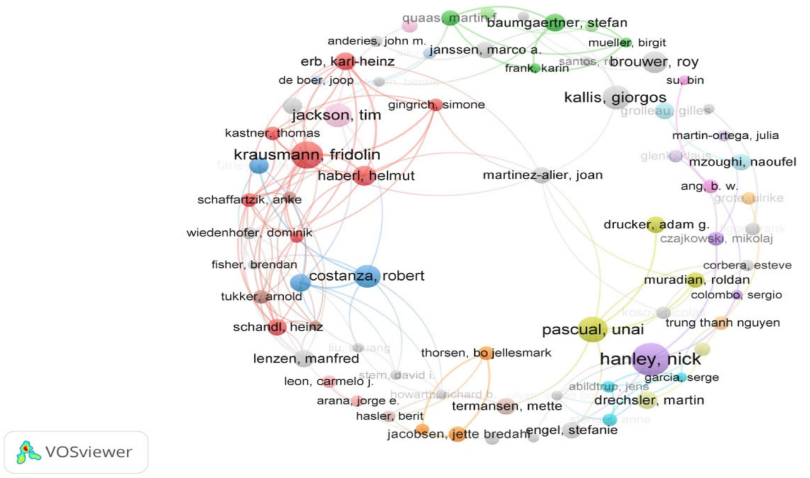
Apart from the network analysis like co-authorship of authors, institutes and countries, there is another important aspect to consider that is bibliographic coupling reflecting the intelligence convergence among authors, their affiliated institutions, and countries. To visualize these connections, we utilize the bibliographic coupling of authors, as proposed by Kessler in 1963. Figure 6 represents this coupling, focusing on articles in Ecol. Econ that have been cited at least 150 times in a minimum of 10 articles. We can identify a set of clusters, 4 in number, indicating the presence of four major intellectual groups among the highly contributing Ecol. Econ authors. The proximity of authors in space reflects their intellectual affinity or closeness to one another. For instance, the nodes of bibliographic coupling between the top co-authors, Fridolin Krausmann and Helmut Haberl, highlight their prominence within the network.

In Figure 7, the bibliographic coupling of authors affiliated institutions is shown. We have set the coupling threshold to include institutions with at least 10 documents having 100 citations at least. We have set the coupling threshold to include institutions with at least 10 documents cited at least 100 times between 1989 and 2023. Among these institutions, Lund University and Vrije University demonstrate the most robust bibliographic coupling, followed by the couple consisting of Autonomous University of Barcelona and Catalan Institution for

Table 5. Most affiliated institutions with Ecol. Econ authors

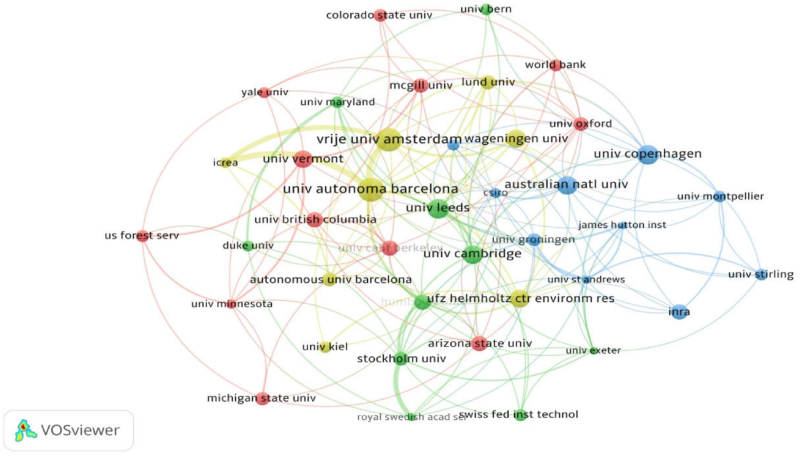
Affiliation	Country	TP	NCP	TC	C/P	C/CP	h	g	m	100	50	25	10	1
University of California	United States	102	99	6,000	58.82	60.61	33	77	0.42	10	24	53	79	99
Wageningen University	Netherlands	90	88	9,035	100.4	102.7	43	95	0.45	18	36	57	80	88
Australian National University	Australia	41	40	2,197	34.33	54.93	24	46	0.52	2	16	34	43	60
University of Maryland	United States	45	45	1908	32.34	41.48	29	43	0.67	4	15	26	41	58
University of East Anglia	United Kingdom	60	59	2,334	37.05	39.56	34	48	0.70	3	9	21	51	59
Norwegian University of Life Sciences	Norway	53	47	7,418	114.1	157.8	27	65	0.41	18	30	45	61	65
University of Leeds	United Kingdom	58	58	3,856	66.48	66.48	30	58	0.51	8	19	36	47	57
University of Cambridge	United Kingdom	58	57	4,921	84.84	86.33	30	57	0.52	18	24	31	46	58
University of Vermont	United States	65	65	3,420	74.35	52.62	36	58	0.62	12	16	27	36	46
Stockholm University	Sweden	53	50	3,840	72.45	76.8	28	50	0.56	9	18	31	45	50
Colorado State University	United States	49	48	9,859	164.3	205.4	27	60	0.45	21	30	39	51	59
University of British Columbia	Columbia	45	39	6,617	147	169.7	26	45	0.57	15	25	31	41	45
Arizona State University	United States	64	60	4,890	101.9	81.5	29	48	60.41	6	13	27	41	47
University of Copenhagen	Denmark	59	58	4,285	87.45	73.88	26	59	0.44	12	20	28	44	48
University of Florida	United States	63	59	1738	38.62	29.46	24	41	0.58	5	11	18	41	45
Autonomous University of Barcelona	Spain	46	46	2,640	60	57.39	26	46	0.56	8	14	19	30	41
Michigan State University	United States	48	47	4,346	101.1	92.47	27	48	0.56	1	7	14	32	42
Mcgill University	Canada	45	45	4,205	93.44	93.44	22	45	0.48	10	16	26	35	39
Oregon State University	United States	42	40	2,626	49.55	65.65	23	42	0.54	8	18	28	41	47
Vu University Amsterdam	Netherlands	49	48	1,754	41.76	36.54	28	41	0.68	5	11	23	31	40
Lund University	Sweden	40	37	2,765	56.43	74.73	24	40	0.6	7	17	29	40	48
University of Groningen	Netherlands	39	39	3,305	80.61	84.74	27	39	0.69	11	17	23	33	40
University of Helsinki	Finland	39	34	3,262	81.55	95.94	19	39	0.48	9	19	24	30	37
Cornell University	United States	43	42	2,853	73.15	67.93	20	43	0.46	11	20	28	37	39
University of Wyoming	Wyoming	44	41	1,277	32.74	31.15	21	35	0.6	2	8	14	30	34

Note(s): Publications with citations ≥
Source(s): Created by the authors



Source(s): The authors

Figure 3. Co-authorship network

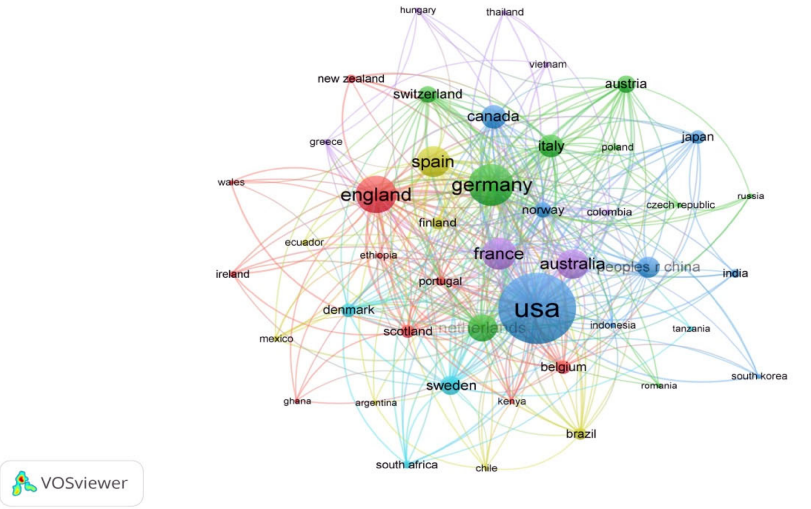


Source(s): The authors

Figure 4. Co-authorship network among institutions

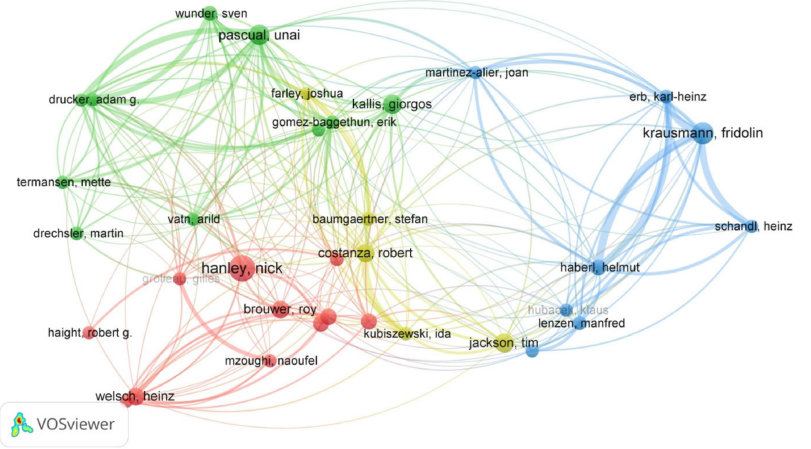
Research and Advanced Studies (ICREA). This network reveals that these institutions share the highest level of similarities in terms of the intellectual influences reflected in the research domain of Ecol. Econ publications.

Figure 8 illustrates the bibliographic coupling among the affiliated countries of Ecol. Econ authors. For this analysis, we chose the countries having a minimum of 50 articles published that have received 750 citations at least between 1989 and 2023. The United States is positioned at the center of the figure, indicating its prominent role in this network. Among the various bibliographic couples, the coupling between the England and the United States, as well as Germany and the United States, exhibits the strongest coupling strength.



Source(s): The authors

Figure 5. Co-authorship network among countries

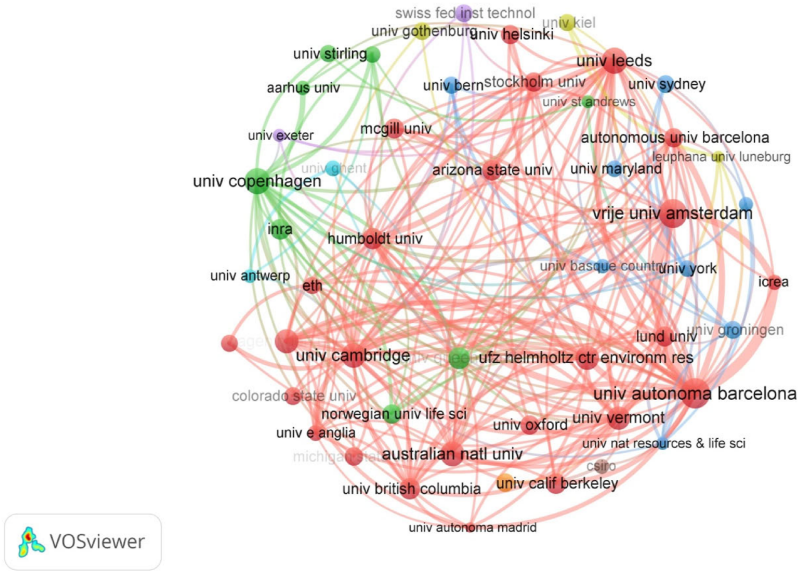


Source(s): The authors

Figure 6. Bibliographic coupling based on author's articles

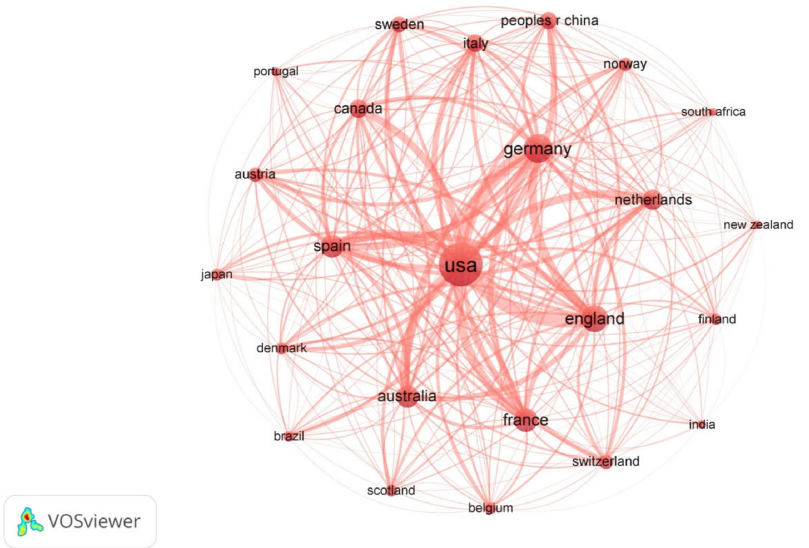
This strength is established by the frequent occurrence of Ecol. Econ authors from these countries and their shared referencing patterns in Ecol. Econ publications between 1989 and 2023. These couplings align with the findings presented in Table 5, which indicate that the United States, England, and Australia are the most commonly affiliated countries among authors. The representation of multiple countries suggests that Ecol. Econ publications encompass global perspectives and are not solely focused on business insights from the United States.

Figure 9 displays the results of a co-occurrence analysis of the most commonly discussed themes in publications between 1989 and 2023, which have been mentioned at least 25 times.



Source(s): The authors

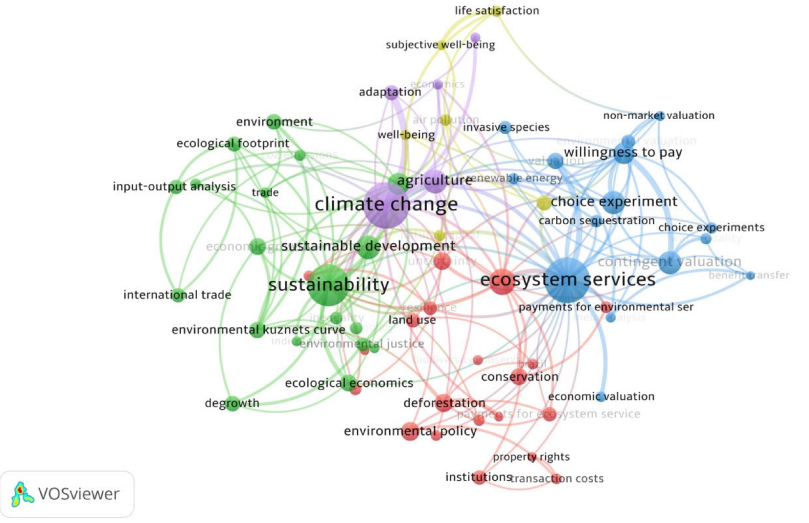
Figure 7. Bibliographic coupling based on author's affiliated institutions



Source(s): The authors

Figure 8. Bibliographic coupling among institutions

Word combinations like "climate change-adaption," "ecosystem services-valuation," "sustainability-EKC," and "contingent valuation-willingness to pay" demonstrate stronger connections due to their more frequent co-occurrence between 1989 and 2023.



Source(s): The authors

Figure 9. Co-occurrence analysis

Regression analysis of citations on articles attributes

The last research of this study is to analyze the attributes of the articles that have an impact on the citation score of the article. We retrospect on the studies conducted by Baker, Kumar, and Pandey (2020), Baker, Kumar, and Pattnaik (2020), Baker, Kumar, and Pandey (2021), Baker, Larcker, and Wang (2022), Valtakoski (2020), Stremersch, Tellis, Franses, and Binken (2007), and got the idea about the model specification to validate how different attributes of Ecol. Econ articles are associated with the citation score. Table 6 presents the description of variables, followed by their summary statistics.

Variables

Dependent variable: Total citations refer to the number of references made to other sources in an article. It serves as a measure of the impact an article has within the academic community (Pieters & Basumgartner, 2002; Burton & Phimister, 1995; Laband & Piette, 1994; Diamond, 1989). So, we used total citations as a proxy for impact of an article. Table 6 revealed that the average citation score of articles is 62.6 with a standard deviation of 128.63. Following (Baker *et al.*, 2020a, b, 2021b, 2022; Valtakoski, 2020; Stremersch *et al.*, 2007), we used negative binomial regression to estimate the regression coefficients as this is the most appropriate distribution to be used when we encounter count data.

Independent variable: In their 2007 publication, Stremersch *et al.* (2007) introduce a theoretical framework that encompasses three different viewpoints to investigate the relationship between scientometric features of articles and authors and their impact on citation counts. Additionally, they perform a practical evaluation utilizing a selection of five notable marketing journals to confirm the validity of this framework. The Universalist perspective posits that citations of articles are primarily driven by the content itself, including its quality and breadth. In contrast, the social constructivist viewpoint suggests that citations are influenced by the authors themselves, taking into account their visibility and self-promotion. On the other hand, the presentation perspective highlights the importance of how authors communicate their message, considering elements like the title length, attention-grabbing techniques, and clarity of presentation. The number of citations received by an article

Table 6. Regression analysis

Variable	Description	Type	Expected sign	Max	Min	Mean	Std. dev
Dependent variable							
Total citations	Total number of citations received by an article since its publication	Count	*	3,351	2	62.6	128.63
Control variables							
Article age	Total number of years since an article's publication	Count	±	33	2	12.37	7.4
Demeaned age squared	The square of the difference between an article's age and the mean of the ages of all the articles	Count	±	162.56	0.06	43	41.56
Independent variables							
Article length	Total number of pages in an article	Count	+	92	6	10.6	4.18
Funding	1 if an article receives funding otherwise 0	Dummy	+	1	0	0.54	0.49
Number of authors	Total number of authors involved in the article	Count	+	29	1	2.8	1.92
Length of title	Total number words in a title of an article	Count	±	34	3	12.53	4.34
Number of keywords	Total number of keywords in an article	Count	+	18	3	4.87	1.75

Source(s): Created by the authors

is affected by its attributes, such as its quality and field of study. Consequently, five factors utilized in our analysis are derived from the article content (Baker *et al.*, 2020a, b, 2021b, 2022; Dang & Li, 2020; Meyer, Waldkirch, Duscher, & Just, 2018; Stremersch *et al.*, 2007).

(1) Article length: The length of an article refers to the number of pages it contains. As lengthier articles are more prone to being referenced by other sources, there is a potential positive correlation between article length and citations (Baker *et al.*, 2020a, b, 2021b, 2022; Dang & Li, 2020; Meyer *et al.*, 2018; Stremersch *et al.*, 2007). Therefore, it is anticipated that the coefficient estimation for article length will be positive.

(2) Number of authors: The number of authors in an article signifies the total count of individuals who contributed to its creation. Articles with a higher number of authors are often more socially connected and visible, which can lead to receiving more citations compared to articles with fewer authors. As a result, it is anticipated that the coefficient estimate for the variable "Number of authors" will be positive.

(3) Length of title: The length of the title refers to the overall word count of an article's title. According to Stremersch *et al.* (2007), it is challenging to predict the impact of title length on an article's citations. They discovered that the length of the title does not have an effect on the number of citations (Burgess *et al.*, 2017). Therefore, the coefficient estimate for the variable "Length of title" is anticipated to be either positive or negative.

(4) Number of keywords: It refers to indicate the count of keywords present in an article. Keywords play a crucial role in assisting potential readers in locating articles across different sources (Baker *et al.*, 2020a, b, 2021b, 2022; Valtakoski, 2020; Stremersch *et al.*, 2007). Articles that contain a greater number of keywords are more likely to

receive additional citations. Consequently, it is anticipated that the coefficient estimate for the variable "Number of keywords" will be positive.

(5) Funding: It is a dummy variable that takes value 1 if the research study is financially supported by any organization and 0 otherwise. When a research study is supported by financial resources, it is more likely to have access to better research sources (Baker *et al.*, 2020a, b, 2021b, 2022; Dang & Li, 2020). This implies higher quality and the potential to attract more citations. As a result, it is expected that the coefficient estimate for the "Funding" variable will be positive. Out of the total 5,701 publications, this variable is assigned a value of 1 in 3,131 publications.

(6) Control variables: The variable "Article age" is used as a control variable in our model. It is measured as the difference between the last year of the study (e.g. as the year 2023 in our study) and the published date of the article. The inclusion of this variable is based on existing literature in bibliometric studies, which suggests that an article's age influences its citation count (Baker *et al.*, 2020a, b; Stremersch *et al.*, 2007; Ayres & Vars, 2000; Landes and Posner, 2003).

Furthermore, previous research, such as Stremersch *et al.* (2007) and Meyer *et al.* (2018), confirmed a nonlinear association between the citation and the article age, even after considering a squared time term. To account for this non-linearity, we introduce the control variable "Demeaned age squared." Based on the findings of Stremersch *et al.* (2007), it is expected that the coefficient estimate for "Article age" will be positive, while the coefficient estimate for "Demeaned age squared" will be negative.

In Table 7, the correlation matrix of all the variables used in our regression model is drawn. Our primary aim is to examine how an article's attributes impact its citations, so we specifically analyze the association between "Total citations" and the other variables using correlation analysis.

The results from the correlation analysis revealed a significant positive correlation between "Article age" and "Total citations" at the 5% level, aligning with the expectations of our investigation. The same was shown for the "Demeaned age squared" and "Total citations" but the correlation is negative and statistically significant.

Table 7. Correlation matrix

	Total citation	Article age	Dm age squared	Article length	Funding	Number of authors	Length of title	Number of keywords
Total citation	*1.0000*							
Article age	*0.6393*	*1.0000*						
	0.0000							
Dm age	*−0.6472*	*0.9835*	*1.0000*					
squared	*0.0000*	*0.0000*						
Article length	*0.1985*	*−0.2771*	*−0.1959*	*1.0000*				
	0.0000	*0.0000*	*0.0000*					
Funding	*0.1454*	*0.2591*	*0.2539*	*−0.0455*	*1.0000*			
	0.0000	*0.0000*	*0.0000*	*0.0018*				
Number of	*−0.0964*	*0.2049*	*0.1981*	*−0.0629*	*0.0691*	*1.0000*		
authors	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*			
Length of title	*−0.0679*	*0.1494*	*0.1387*	*−0.0394*	*0.0432*	*0.1500*	*1.0000*	
	0.0000	*0.0000*	*0.0000*	*0.0068*	*0.0011*	*0.0000*		
Number of	−0.0581	0.1106	0.0928	−0.0590	0.0414	0.0776	0.0832	1.0000
keywords	0.0000	0.0000	0.0000	0.0001	0.0017	0.0000	0.0000	

Source(s): Created by the authors

The empirical study examines whether the characteristics of an article impact the number of times it is cited. The regression model is analyzed in the following manner:

$$\text{Total citations}_i = \alpha + \beta\text{Controls}_i + \gamma\text{Attributes}_i + \epsilon_i$$

where Total citations$_i$ is the number of citations of article i, Controls$_i$ is the vector of article i's control variables and Attributes$_i$ is the vector of article i's attributes.

The results from Table 8 are presented as follows: In model I, where only the control variables are included, the coefficient estimate for Article age is positive and highly significant at the 1% level. This aligns with previous findings in the literature (Baker *et al.*, 2020a, b, 2021b, 2022; Stremersch *et al.*, 2007), indicating a strong positive relationship between Article age and citations. The coefficient estimate for Demeaned age squared, which captures the nonlinearity of the relationship, is negative and is also significant at the 1% level. All the independent variables have shown a significant effect on the citation score (a proxy for Journal Impact factor). While the article length and funding variables have shown negative effect, the other variables like number of authors, length of title and number of keywords have shown the positive effect.

Summary and conclusion

In the year 1989, 18 articles have been published. Since then, the number of publications has grown exponentially, reaching an impressive 5,704 documents by 2023. Between 1989 and 2023, the annual growth rate of the publications was 6.94%. Over a period of time, the quality of the publications has increased. Approximately, 94.17% of the publications have received at least one citation. The bibliometric analysis revealed that the most productive year was 2018, with 364 publications, the highest number between 1989 and 2023. In terms of citations, the most influential year was 2009, with 25,123 citations. However, the papers published in 2002 received the highest average citations per paper. Robert Costanza and Van Den Bergh are the most prolific authors, with 40 and 32 articles respectively, followed by Nick Hanley with 32 articles. The most cited article is "Update on the environmental and economic costs associated with Alien-species in the United States" by Pimentel *et al.* (2005) with 3,351 citations. The most commonly affiliated institutions with authors are the VU Amsterdam, Autonomous University of Barcelona and French National Centre for Scientific Research. The United States is the dominant country among the authors' affiliated countries, surpassing the England, Germany, Australia, and Netherlands by a significant margin. In terms of countries, the United States (1,735 publications) and the United Kingdom (714 publications) have the highest number of publications. Regarding the quality parameters of research publications, the year 2008 ranked highest, with an h-index of 86, a g-index of 159, and an m-index of 0.54. Furthermore, as shown in Table 1, 461 articles (8.08%) received at least 250 citations, 873

Table 8. Regression results

Variables	Coeff	Std. err
Constant	1.425115	0.022991
Article age	0.181108	0.002658
Demeaned age squared	−0.00541	0.000437
Article length	0.00197	0.000877
Funding	0.0007	0.005645
Number of authors	−0.000863	0.001343
Length of title	−0.001388	0.000641
Number of keywords	−0.001565	0.001527

Note(s): The table reports the regression results at 5% level of significance
Source(s): Created by the authors

articles (15.30%) received at least 100 citations, 1,703 articles (29.85%) received at least 50 citations, 2,884 articles (50.56%) received at least 25 citations, and 5,372 articles (94.17%) were cited at least once during the period from 1989 to 2023. Wageningen University shows dominance across all citation categories, with 18, 36, 57, 80, and 84 articles having citations greater or equal to 100, 50, 25, 10, and 1 respectively.

Co-authorship networks reveal that Fridolin Krausmann and Helmut Haberl have the strongest co-authorship link. Among the affiliated institutions of authors, University of Leeds and University of Cambridge, as well as Autonomous University of Barcelona and Catalan Institution for Research and Advanced Studies (ICREA), exhibit the strongest co-authorship links. Similarly, the co-authorship link between England and the United States, as well as the Australia and the United States, is the strongest.

The bibliographic coupling analysis visually represents the intellectual associations among the most prolific authors, their affiliated institutions, and countries. Additionally, the co-occurrence of author-specified keywords demonstrates the spatial proximity between various discussed themes. Combinations such as "climate change-adaption", "ecosystem services-valuation", and "sustainability-EKC" exhibit strong coupling strength due to their frequent appearance in publications.

References

Acedo, F. J., Barroso, C., Casanueva, C., & Galan, J. L. (2006). Co-authorship in management and organizational studies: An empirical and network analysis. *Journal of Management Studies*, *43* (5), 957–983. doi: 10.1111/j.1467-6486.2006.00625.x.

Aria, M., & Cuccurullo, C. (2017). bibliometrix: An R-tool for comprehensive science mapping analysis. *Journal of Informetrics*, *11*(4), 959–975. doi: 10.1016/j.joi.2017.08.007.

Ayres, I., & Vars, F. E. (2000). Determinants of citations to articles in elite law reviews. *The Journal of Legal Studies*, *29*(S1), 427–450. doi: 10.1086/468081.

Bagow, S., & Altaf, N. (2023). Monetary policy and corporate investment: A bibliometric analysis. *Journal of Economic and Administrative Sciences*, *ahead-of-print*(ahead-of-print). doi:10.1108/jeas-05-2023-0116.

Baker, H. K., Kumar, S., & Pandey, N. (2020a). A bibliometric analysis of European Financial Management's first 25 years. *European Financial Management*, *26*(5), 1224–1260. doi: 10.1111/eufm.12286.

Baker, H. K., Kumar, S., & Pattnaik, D. (2020b). Fifty years of the financial review: A bibliometric overview. *Financial Review*, *55*(1), 7–24. doi: 10.1111/fire.12228.

Baker, H. K., Kumar, S., & Pandey, N. (2021a). Forty years of the journal of futures markets: A bibliometric overview. *Journal of Futures Markets*, *41*(7), 1027–1054. doi: 10.1002/fut.22211.

Baker, H. K., Kumar, S., & Pandey, N. (2021b). Thirty years of small business economics: A bibliometric overview. *Small Business Economics*, *56*(1), 487–517. doi: 10.1007/s11187-020-00342-y.

Baker, A. C., Larcker, D. F., & Wang, C. C. (2022). How much should we trust staggered difference-in-differences estimates? *Journal of Financial Economics*, *144*(2), 370-395.

Bartol, Budimir, G., Dekleva-Smrekar, D., Pusnik, M., & Juznic, P. (2014). Assessment of research fields in Scopus and Web of Science in the view of national research evaluation in Slovenia. *Scientometrics*, *98*(2), 1491–1504. doi: 10.1007/s11192-013-1148-8.

Bornmann, L., & Mutz, R. (2015). Growth rates of modern science: A bibliometric analysis based on the number of publications and cited references. *Journal of the Association for Information Science and Technology*, *66*(11), 2215–2222. doi: 10.1002/asi.23329.

Broadus, R. (1987). Toward a definition of bibliometrics. *Scientometrics*, *12*(5-6), 373–379. doi: 10.1007/bf02016680.

Burgess, T. F., Grimshaw, P., & Shaw, N. E. (2017). Research commentary—diversity of the information systems research field: A journal governance perspective. *Information Systems Research*, *28*(1), 5–21. doi: 10.1287/isre.2016.0657.

Burton, M. P., & Phimister, E. (1995). Core journals: A reappraisal of the diamond list. *Economic Journal*, *105*(429), 361–373. doi: 10.2307/2235496.

Burton, B., Kumar, S., & Pandey, N. (2020). Twenty-five years of the European journal of finance (EJF): A retrospective analysis. *The European Journal of Finance*, *26*(18), 1817–1841. doi: 10.1080/1351847x.2020.1754873.

Dang, C., & Li, Z. (2020). Drivers of research impact: Evidence from the top three finance journals. *Accounting and Finance*, *60*(3), 2759–2809. doi: 10.1111/acfi.12350.

De Groot, R. S., Wilson, M. A., & Boumans, R. M. (2002). A typology for the classification, description and valuation of ecosystem functions, goods and services. *Ecological Economics*, *41*(3), 393–408. doi: 10.1016/s0921-8009(02)00089-7.

Diamond, J. (1989). Government expenditure and economic growth: An empirical investigation. IMF Working Paper, WP-89-45.

Dinda, S. (2004). Environmental Kuznets curve hypothesis: A survey. *Ecological Economics*, *49*(4), 431–455. doi: 10.1016/j.ecolecon.2004.02.011.

Duran-Sanchez, A., Del Río-Rama, M.d.l.C., Álvarez-García, J., & García-Vélez, D. F. (2019). Mapping of scientific coverage on education for entrepreneurship in higher education. *Journal of Enterprising Communities: People and Places in the Global Economy*, *13*(1/2), 84–104. doi: 10.1108/jec-10-2018-0072.

Farooq, R. (2022). A review of knowledge management research in the past three decades: A bibliometric analysis. *VINE Journal of Information and Knowledge Management Systems*, *54*(2), 339–378.

Finardi, U., & Buratti, A. (2016). Scientific collaboration framework of BRICS countries: An analysis of international coauthorship. *Scientometrics*, *109*(1), 433–446. doi: 10.1007/s11192-016-1927-0.

Gil-Domenech, D., Berbegal-Mirabent, J., & Merigo, J. M. (2020). STEM education: A bibliometric overview.

Huang, F., Zhou, Q., Leng, B. J., Mao, Q. L., Zheng, L. M., & Zuo, M. Z. (2018). A bibliometric and social network analysis of pelvic organ prolapse during 2007–2016. *Journal of the Chinese Medical Association*, *81*(5), 450–457. doi: 10.1016/j.jcma.2017.08.012.

Kessler, M. M. (1963). Bibliographic coupling between scientific papers. *American Documentation*, *14*(1), 10–25. doi: 10.1002/asi.5090140103.

Korhonen, J., Honkasalo, A., & Seppälä, J. (2018). Circular economy: The concept and its limitations. *Ecological Economics*, *143*, 37–46. doi: 10.1016/j.ecolecon.2017.06.041.

Koseoglu, M. A. (2016). Growth and structure of authorship and co-authorship network in the strategic management realm: Evidence from the *Strategic Management Journal*. *BRQ Business Research Quarterly*, *19*(3), 153–170. doi: 10.1016/j.brq.2016.02.001.

Laband, D. N., & Piette, M. J. (1994). A citation analysis of the impact of blinded peer review. *JAMA*, *272*(2), 147–9. PMID: 8015128. doi: 10.1001/jama.1994.03520020073020.

Landes, W. M., & Posner, R. A. (2003). *The Economic Structure of Intellectual Property Law*. Harvard University Press.

Ma, C., & Stern, D. I. (2006). Environmental and ecological economics: A citation analysis. *Ecological Economics*, *58*(3), 491–506. doi: 10.1016/j.ecolecon.2005.07.023.

Martinez-Alier, J., Munda, G., & O'Neill, J. (1998). Weak comparability of values as a foundation for ecological economics. *Ecological Economics*, *26*(3), 277–286.

Max-Neef, M. A. (2005). Foundations of transdisciplinarity. *Ecological Economics*, *53*(1), 5–16. doi: 10.1016/j.ecolecon.2005.01.014.

Meyer, M., Waldkirch, R. W., Duscher, I., & Just, A. (2018). Drivers of citations: An analysis of publications in "top" accounting journals. *Critical Perspectives on Accounting*, *51*, 24–46. doi: 10.1016/j.cpa.2017.07.001.

Naveen, Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*, *133*, 285–296. doi: 10.1016/j.jbusres.2021.04.070.

Pieters, R., & Baumgartner, H. (2002). Who talks to whom? Intra- and interdisciplinary communication of economics journals. *Journal of Economic Literature*, *40*(2), 483–509. doi: 10.1257/jel.40.2.483.

Pimentel, D., Zuniga, R., & Morrison, D. (2005). Update on the environmental and economic costs associated with alien-invasive species in the United States. *Ecological Economics*, *52*(3), 273–288. doi: 10.1016/j.ecolecon.2004.10.002.

Pritchard, A. (1969). Statistical bibliography or bibliometrics?. *Journal of Documentation*, *25*, 348–349.

Reed, M. S., Fraser, E. D., & Dougill, A. J. (2006). An adaptive learning process for developing and applying sustainability indicators with local communities. *Ecological Economics*, *59*(4), 406–418. doi: 10.1016/j.ecolecon.2005.11.008.

Røpke, I. (2005). Trends in the development of ecological economics from the late 1980s to the early 2000s. *Ecological Economics*, *55*(2), 262–290. doi: 10.1016/j.ecolecon.2004.10.010.

Silva, E. G., & Teixeira, A. A. (2008). Surveying structural change: Seminal contributions and a bibliometric account. *Structural Change and Economic Dynamics*, *19*(4), 273–300.

Silva, S. T., & Teixeira, A. A. (2009). On the divergence of evolutionary research paths in the past 50 years: A comprehensive bibliometric account. *Journal of Evolutionary Economics*, *19*, 605–642.

Silva, M. C., & Teixeira, A. A. (2011). A bibliometric account of the evolution of EE in the last two decades: Is ecological economics (becoming) a post-normal science?. *Ecological Economics*, *70* (5), 849–862. doi: 10.1016/j.ecolecon.2010.11.016.

Small, H. (1973). Co-Citation in the scientific literature: A new measure of the relationship between two documents. *Journal of the American Society for Information Science*, *24*(4), 265–269. doi: 10.1002/asi.4630240406.

Smith, D. R. (2010). Citation analysis and bibliometric research in the field of ergonomics. *Human Factors and Ergonomics in Manufacturing and Service Industries*, *20*(3), 202–210. doi: 10.1002/hfm.20175.

Spash, C. L. (1999). The development of environmental thinking in economics. *Environmental Values*, *8*(4), 413–435. doi: 10.1177/096327199900800402.

Stremersch, S., Tellis, G. J., Franses, P. H., & Binken, J. L. G. (2007). Indirect network effects in new product growth. *Journal of Marketing*, *71*(3), 52–74. doi: 10.1509/jmkg.71.3.052.

Su, J., Zhai, Q., & Landström, H. (2015). Entrepreneurship research in China: Internationalization or contextualization?. *Entrepreneurship and Regional Development*, *27*(1-2), 50–79. doi: 10.1080/08985626.2014.999718.

Tsay, M. Y. (2009). Citation analysis of Ted Nelson's works and his influence on hypertext concept. *Scientometrics*, *79*(3), 451–472. doi: 10.1007/s11192-008-1641-7.

Valenzuela, L. M., Merigó, J. M., Johnston, W. J., Nicolas, C., & Jaramillo, J. F. (2017). Thirty years of the *Journal of Business and Industrial Marketing*: A bibliometric analysis. *Journal of Business and Industrial Marketing*, *32*(1), 1–17.

Valtakoski, A. (2020). The evolution and impact of qualitative research in *Journal of Services Marketing*. *Journal of Services Marketing*, *34*(1), 8–23. doi: 10.1108/jsm-12-2018-0359.

Vaz da Fonseca, P., & Nascimento Jucá, M. (2020). The influence of taxes on foreign direct investment: Systematic literature review and bibliometric analysis.

Van Raan, A. (1998). The influence of international collaboration on the impact of research results: Some simple mathematical considerations concerning the role of self-citations. *Scientometrics*, *42*(3), 423–428. doi: 10.1007/bf02458380.

Wiedmann, T., Lenzen, M., Turner, K., & Barrett, J. (2007). Examining the global environmental impact of regional consumption activities—Part 2: Review of input–output models for the assessment of environmental impacts embodied in trade. *Ecological Economics*, *61*(1), 15–26. doi: 10.1016/j.ecolecon.2006.12.003.

Yazit, N., & Zainab, A. N. (2017). Publication productivity of Malaysian authors and institutions in LIS. *Malaysian Journal of Library and Information Science*, *12*(2), 35–55.

Zabavnik, D., & Verbič, M. (2021). Relationship between the financial and the real economy: A bibliometric analysis. *International Review of Economics and Finance*, *75*, 55–75. doi: 10.1016/j.iref.2021.04.014.

Corresponding author
Nufazil Altaf can be contacted at: nahangar113@gmail.com