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Open Science Alternatives to Scopus and the Web of Science: A Case Study in Regional Resilience

Irina D. Turgel and Olga A. Chernova



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Open Science Alternatives to Scopus and the Web of Science: A Case Study in Regional Resilience

Irina D. Turgel ^{1,*}  and Olga A. Chernova ² ¹ Graduate School of Economics and Management, Ural Federal University, 620002 Yekaterinburg, Russia² Faculty of Economics, Southern Federal University, 344006 Rostov-on-Don, Russia;
chernova.olga71@yandex.ru

* Correspondence: i.d.turgel@urfu.ru

Abstract: The recent years have seen increasing support for open science in academic circles. However, the large number of scientometric databases calls into question the comparability of the search and analysis tools they provide. Using the subject area of regional resilience as an example, in this study, the aim was to analyze the capabilities of widely used databases to serve as alternatives to Scopus and Web of Science in solving research problems. As alternatives, in the present article, the following open, free scientometric databases were considered: AMiner, Wizdom.ai, the Lens, Dimensions, and OpenAlex. Their capabilities were demonstrated for the subject area under study, and the obtained results were compared. The study results showed that alternative databases provide essential data on trends in scientific development. It is noteworthy that they largely replicate the provided data, supplementing and expanding them by using different types of data sources. However, open databases do not guarantee a high quality of materials and exhibit a relatively low level of metadata. Thus, it is premature to abandon the use of Scopus and Web of Science in research activities. Since scientometric databases were developed in different contexts, they are characterized by structural and functional heterogeneity, which complicates their comparison. Therefore, a selective approach should be adopted for the choice of scientometric databases, taking into account financial and other constraints, as well as the specifics of research problems.

Keywords: scientometric databases; open science; regional resistance; scientometric research

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1. Introduction

Scientometric databases currently constitute an indispensable tool for conducting research. They provide a means of assessing the state of science as a whole, the development of its fields, as well as the relationships between the subject areas of research and their mutual influence. With the help of scientometric databases, scientists can assess the current state of a certain subject area, as well as extrapolate conclusions, predict the vector of development, and identify critical points of bifurcation by identifying stable connections with other subject areas.

One of the subject areas that is actively studied in scientometrics is regional resilience. This fact can be attributed to the growing interest in identifying the factors and prerequisites that maintain the viability of socioeconomic systems at various levels under an ongoing series of shocks of various natures. Traditionally, such research is conducted with the use of Scopus and Web of Science (WoS) databases, which reflect the frontiers of world science and demonstrate the academic leadership hierarchies of researchers and universities.

In recent years, however, academic circles have become increasingly supportive of open science. Published in 2023, the Barcelona Declaration on Open Research Information calls for collective action to accelerate the transition to being “as open as possible” while keeping information “as closed as necessary” [1]. As noted by Robinson-Garcia et al., the implementation of the open science policy should be supported by indicators reflecting

the possibility of using databases alternative to Scopus and WoS in shaping the landscape of scientific research [2]. However, the large number of scientometric databases calls into question the comparability of the search and analysis tools they provide. These factors determined the aim of this study, which was to use the subject area of regional resilience as an example, to analyze the capabilities of open databases widely used in modern academic circles to serve as an alternative to Scopus and WoS in solving research problems. To this end, the following objectives were set, which determined the logic of this study:

- characterize the main lines of scientometric research in the subject area of regional resilience;
- review the subject area of regional resilience using alternative open scientometric databases;
- comparatively analyze the capabilities, features, and limitations in the use of open databases to shape the landscape of scientific research in the field of regional resilience.

This article has the following structure. The first part of this study characterizes the main lines of scientometric research in the subject area of regional resilience using Scopus and WoS, as well as justifying the possibility of using alternative scientometric databases to provide insights into the landscape of scientific research. Then, the methodology for this study is described, including the selection of alternative scientometric databases. The next section presents the study results outlining the characteristics of the subject area obtained with the use of open databases. The final part focuses on the comparative analysis interpretation and future directions for this study.

2. Review of Scientific Sources: Theoretical Framework of the Study

Scientists around the world most commonly rely on Scopus and WoS to conduct scientometric analysis as they provide tools for working with vast amounts of information. A 2020 report of a global study on the value of bibliometric databases shows that an average of 145,000 researchers working in various scientific fields from 139 countries query WoS daily to search for the key literature and study bibliometric data [3]. As evidenced by the analysis conducted by Rafi et al., the use of scientometric databases by researchers significantly increases their scientific productivity [4].

This is largely the reason why Scopus and WoS are actively used in many countries to justify state scientific and educational policies. To have publications presented on these platforms constitutes a condition for receiving state grant support, as well as serving as a quality criterion for scientific activities. Through the comparison of a set of metrics (normalized citation rates, journal impact factors, etc.), the built-in data analysis and visualization capabilities of Clarivate Analytics and Elsevier provide a means of determining the top research areas and checking whether the research topic of authors is included in the QS subject rankings.

Recent years, however, have seen the digital economy become a major game changer in the academic world, offering researchers a vast, open scientific infrastructure, with the assumption that this openness should become the norm for research data. Supporting the open access policy, a large number of leading universities (Harvard University, Sorbonne, Leiden University, University of Singapore, University of Utrecht, etc.) are moving to an open development model, constantly increasing the number of their publications in open access and declaring the priority of open data. Thus, in December 2023, the Sorbonne University resolutely abandoned the use of proprietary bibliometric products, discontinuing its subscription to the WoS database and Clarivate's bibliometric tools and redirecting its efforts to the study and use of open and free tools [5]. As an alternative, the Sorbonne proposes to use open access. The Leiden University plans to introduce a new university ranking in 2024 that is based entirely on open data [6]. The benefits of using open databases are stated by the University of Houston, the University of Milan, the Laboratory of Utrecht University, and many others [7–11]. The Japanese Ministry of Science plans to make all scientific research open to the community, allocating about JPY 10 billion (about USD 63 million) to the creation of digital repositories [12].

Open databases and their capabilities attract increasing attention from the scientific community, and the policy of open science prompts much scholarly debate. For exam-

ple, Kwon and Motohashi believe that in the short term, data-disclosing research arouses greater interest from the academic community while noting the role of the scientific reputation of journals in which research is published [13]. Dengis and de Bal noted that the promotion of open science is the main tool for monitoring progress and a driving force for innovation [14]. While drawing attention to the potential of open science, researchers note that it significantly increases the trust of the public and their engagement with scientific research, thus promoting transparency and collaboration [15]. According to Tennant et al., this is especially important for developing countries since open science facilitates citizen science initiatives and ensures that their scientists have equal ability to disseminate their work [16]. Even marginalized communities are given the opportunity to contribute to the advancement of knowledge, which makes science more inclusive [17].

Raju et al. postulated that the open science policy promotes social justice for researchers in the Global South and Africa, fostering inclusivity in science [18]. The opposite view on this matter was expressed by Kleeva and Maksimov. The scientists believe that open science devalues scientific ideas as it involves the loss of intellectual property rights and, as a result, the negative exploitation and privatization of the scientific data of the Global South by the Global North [19]. Manco believes that open science largely replicates the existing data asymmetry, which is most widely discussed in non-English articles [20].

It is noteworthy that the attitude toward open science practices varies across academic fields. For example, sociologists are generally in favor of open access which enables them to replicate the research and verify the reliability and validity of results [21]. The benefits of open access for the development of evidence-based medicine are pointed out by Logullo et al. [22]. However, some scientists have expressed concerns that open science increases the risk of using unverified data, which could lead to significant negative consequences in psychology [23,24].

The publishers of many journals are also reluctant to choose an open access model as they believe that it creates a financial barrier for the authors of publications [25] or lacks incentives for such a transition [26].

Thus, a dilemma of choice between exclusivity and inclusivity exists in the context of open access or subscription access. By creating restrictions for those members of the public who cannot afford paid access, exclusivity becomes a major impediment to the spread of knowledge. However, inclusivity in the form of unrestricted access to content for the general public often implies that the financial burden shifts to the authors of papers, thus limiting their ability to publish research findings. Therefore, it is unlikely that this dilemma can be fully resolved, as researchers and publishers will adopt different solutions at different stages of scientific and socioeconomic development. Nevertheless, the emergence of multiple scientometric databases greatly promotes the inclusivity of science by providing additional information retrieval resources. The problem, however, is to ensure the quality and reliability of information provided by them, which may make researchers lean toward subscription models.

Nevertheless, open and free scientometric databases are becoming an important source of information for researchers since they are free, and have free licenses and data analysis tools. Although free databases are inferior to classical databases, they provide a means of solving many problems.

Researchers discuss the advantages and disadvantages of individual open sources as compared to Scopus and WoS. For example, Gureyev et al. demonstrated the benefits of the Lens and Dimensions in terms of publication details (metadata) as compared to commercial platforms [27]. Lutai and Lyubushko also compared the quality of metadata available in open scientific databases having free data export capabilities [28]. A similar study was conducted by Lorena Delgado-Quirós and José Ortega who compared the quality of metadata available in the seven databases that are most popular in the scientific world, as follows: Dimensions, Google Scholar, Microsoft Academic, OpenAlex, Scilit, Semantic Scholar, and the Lens [29]. Analyzing citation data provided by Microsoft Academic, Dimensions, and COCI, Martín-Martín et al. considered the coverage of scientific sources

in different subject categories [30]. Borrego, Ardanuy, and Arguimbau concluded that the CrossRef platform has more sources than Scopus, including journals from Eastern and Southern Europe and the Global South, which makes it more promising in terms of scientific fields with a distinct national focus and focus on local audiences [31].

In this study, the aim is to demonstrate the capabilities of alternative open resources in identifying trends in the development of scientific knowledge and priority topics, using the topic “regional resilience” as an example.

As a distinct line of scientific research, regional resilience emerged in 2016. Then, the new reality of the world economy marked by the financial crisis of 2008–2009 led to a paradigm shift in sustainable regional development [32,33]. Researchers became actively engaged in identifying factors that contribute to maintaining the viability of socioeconomic systems at a time when conventional tools and mechanisms for maintaining sustainable development proved their inadequacy in the face of new challenges [34–36]. The COVID-19 pandemic and the ensuing COVID-19 crisis further intensified interest in the problems of regional resilience, resulting in an exponential increase in publications. This led researchers to realize the need to organize ideas about the global status of academic development of this subject area, which prompted a number of review articles in the field of regional resilience relying on a scientometric methodology.

As a rule, researchers focus on individual industrial markets [37–39] or regions [40,41]. A very limited number of comprehensive studies are available that review the entire subject area of regional resilience using scientometric analysis [42–44]. Nevertheless, a comparative analysis of scientometric search tools is not sufficiently represented in the modern scientific literature covering only certain aspects of using the capabilities of open databases alternative to Scopus and WoS in scientific research. In this study, the aim is to partially fill this gap.

3. Materials and Methods

In practice, the terms “citation database”, “bibliometric database”, and “scientometric database” are often used interchangeably, as major databases such as Web of Science and Scopus offer both bibliometric and scientometric features. However, these concepts have differences. A citation database is more focused on the citation connections between documents, while a scientometric database uses a wide range of metadata and indicators for more holistic analyses of the research landscape at the level of authors, journals, institutions, and thematic areas. Scientometric databases integrate citation features but extend them with tools to map, describe, and monitor the development of science in all its components. And again, bibliometric databases focus on publications and their citation metrics, while scientometric databases adopt a broader systemic vision, also exploring the dynamics of knowledge, research fields, and collaboration networks.

In the present study, the open, free scientometric databases AMiner, Wizdom.ai, the Lens, Dimensions, and OpenAlex are considered, which have tools for processing analytical and search queries, as alternatives to Scopus and WoS. We define these databases as scientometric since all of them offer features that go beyond simple bibliometric analyses and aim to map and analyze the structure and dynamics of scientific research in a broader sense.

Data from scientometric databases were selected using the PRISMA method, which is the most widely used method for conducting systematic reviews of scientific studies [45]; however, it can also be used for the purposes of this study. To this end, a query was entered into the Google search engine using the key expression “scientometric database”, yielding a list of 30 databases, including BASE, CORE, Baidu, Microsoft Academic, Science Direct, MedLine, etc. After that, highly specialized (subject) databases, academic search engines, and a professional network (ResearchGate), as well as paid access scientometric databases, were removed from the list. The final selection of scientometric databases for the purposes of this study was carried out according to the following criteria: open access without prior registration, provision of free tools for scientometric analysis, and data export capabilities. As a result, a list of five scientometric databases was formed, as follows:

AMiner, Wizdom.ai, the Lens, Dimensions, and OpenAlex (Table 1). The use of PRISMA protocols helped to avoid duplication of the data and database selection bias, thus ensuring comprehensiveness of the search strategy and transparency of exclusion criteria.

Table 1. Characteristics of the scientometric databases selected for the analysis.

Scientific Database	Country	Creator and Current Owner
AMiner	China	Tsinghua University
Wizdom.ai	UK	Informa Group plc (British publishing, business intelligence, and exhibitions group)
The Lens	Australia	Cambia (nonprofit organization)
Dimensions	UK	Digital Science (international technology company operated by Holtzbrinck Publishing Group)
OpenAlex	USA	OurResearch (nonprofit organization)

In order to demonstrate the capabilities of the specified databases in solving research problems related to identifying trends in the development of scientific knowledge and identifying priority topics in the subject area of regional resilience, we comparatively analyzed the selected scientometric databases using the analytical tools that they provide.

For this analysis, the query “regional resilience” was entered into the search bar, indicating the subject area—economics.

The research methodology involved a comparative analysis of the search query “regional resilience” in the selected databases and the results of a similar query in Scopus. In particular, it was considered to what extent data obtained from different sources differ or coincide in terms of content and to what extent data obtained from each source are consistent with the literature review conducted by the present authors in 2022 in the field of regional resilience using Scopus data and the SciVal tool [32].

The obtained results were compared according to the following indicators: completeness (number of sources of various types) and time coverage of data; capability of characterizing the scientific community, identifying the most authoritative countries and universities in this area, as well as existing collaborations; capability of identifying centers of scientific knowledge (countries and universities); and capability of identifying and characterizing journals in which research in a given subject area is published. These indicators were selected in view of considering these databases as alternatives to Scopus and WoS, given that these tasks were accomplished using the analytical tools they offered (specifically, the SciVal tool). When selecting the specified comparison criteria, we proceeded from the following assumptions: they should be based on clear quantitative and qualitative indicators reflecting the capabilities of scientometric databases to accomplish research tasks that are related to the determination of research frontiers, development of a research program, visualization of analytical results, etc.

4. Results

4.1. AMiner

A total of 2589 sources were found in the AMiner bibliometric database. Of note is that the database distinguishes between research in the field of theoretical and applied economics, which is not inherent in other databases and may be of interest from the point of view of determining the strategic vector of scientific development (theoretical aspects) and setting research tasks for scientific teams (applied aspects). However, for the problem under consideration, the absolute majority of studies belonged to both categories (98%), and only 2% fell exclusively under the category of applied research.

The most published researchers in the field of regional resilience are Adam Rose, Bernard Fingleton, and Robert Hassink. When characterizing the scientific community, the system provides a means of determining the geographic distribution of researchers, gender, as well as the Hirsch indices of authors. In particular, according to AMiner, research in the field of regional resilience is carried out primarily by men (75% of the total number of

authors in this subject area). Geographically, researchers mainly reside in the USA, China, Australia, Great Britain, and the Netherlands. Russian researchers in this subject area are not represented in AMiner.

Interestingly, AMiner identifies up-and-coming researchers in the subject area, providing scientometric data on them, as well as the research areas of interest and affiliations, which gives insight into new growth points and their location. In particular, up-and-coming researchers include those involved in the creation of management systems for sustainable development using modern digital technologies. The centers of this new knowledge are the Wageningen University (Netherlands), the Stockholm University, and the University of California.

Unfortunately, AMiner does not offer visualization tools, which makes working with data somewhat difficult. However, this disadvantage is largely compensated for in the amount of unique information provided on the research topic.

AMiner also provides a means of sampling publications according to Science Citation Index (SCI) categories. The list of top ten journals that publish research in the field of regional resilience includes *Ecological Economics* (137), *Energy Policy* (105), *World Development* (93), *Regional Studies* (49), *Forest Policy and Economics* (46), *Transport Policy* (37), *Futures* (34), *Cambridge Journal of Regions Economy and Society* (34), *Socio-Economic Planning Sciences* (30), and *Journal of Transport Geography* (26). However, this list does not include the following journals that are widely known in the scientific community for publishing research results in the field of regional resilience: *Sustainability*, *European Planning Studies*, *Regional Science*, and some others. This suggests that AMiner currently covers publications in the UK, the Netherlands, and the USA to a greater extent. Publications from other countries (specifically European countries) are less represented. It is noteworthy that AMiner indexes a fairly large number of publications in French, Spanish, Italian, and some other languages.

4.2. Wizdom.ai

A search in the Wizdom.ai scientometric database using the keyword “regional resilience” identified 13,000 publications exploring the ability of various types of ecosystems to respond to environmental disturbances with subsequent recovery under the topic of “ecological resilience”.

An advantage of this database is its ability to visualize various scientometric indicators in a subject area. For example, unlike other scientometric databases, it provides a means of visualizing the geography of research (Figure 1), generate a keyword cloud (Figure 2), identify organizations that are most active in publishing research on the subject area (Figure 3), and much more. In Figure 1, the color intensity indicates the level of involvement of the scientific community in the study of ecological resilience, which is determined by the number of publications in this subject area. In particular, the figure shows that the USA, as well as Australia and China, are most actively engaged in this field.

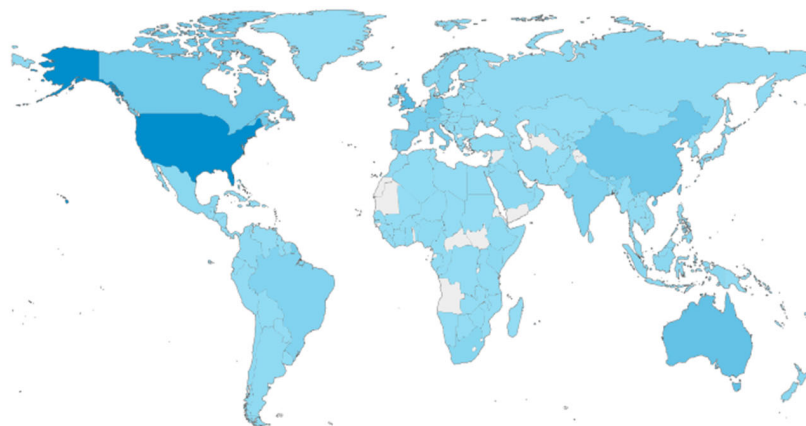


Figure 1. Geography of research in the field of ecological resilience.

Research Focus



Figure 2. Cloud of keywords in publications on ecological resilience.

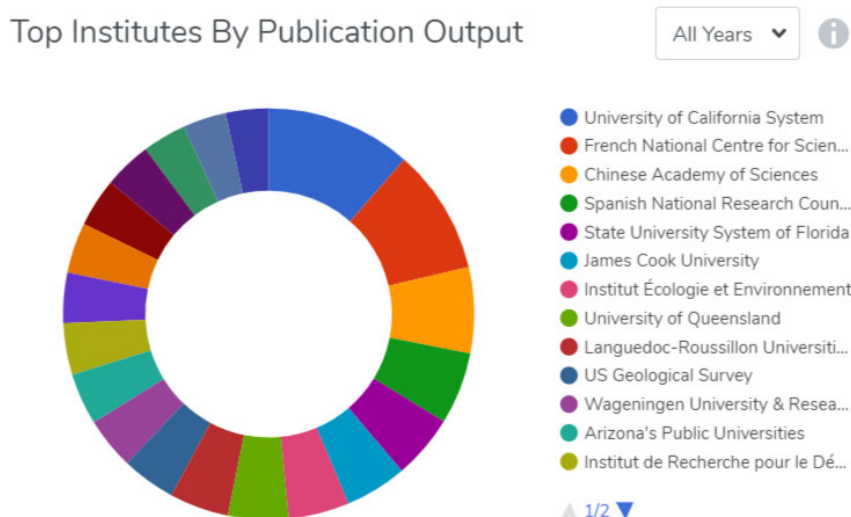


Figure 3. Top organizations in the field of ecological resilience research.

However, the use of this tool is greatly limited by the difficulty in selecting the most relevant topic for the search query. In particular, under the topic of “ecological resilience”, the resilience of regional economic systems to shocks is examined exclusively from an environmental perspective. On the one hand, this may reflect the insufficient interest of the world scientific community in the problems of regional resilience as compared, for example, to the problems of ecological resilience. On the other hand, this can be attributed to the shortcomings of this tool. Therefore, taking into account that the topic of “ecological resilience” is not sufficiently relevant to the objectives set for studying modern trends in the field of regional resilience, we can conclude that Wizdom.ai offers limited capabilities for solving problems in the development of rather narrow subject areas.

4.3. The Lens

The search in this scientometric database yielded 5100 scientific publications with the keyword “regional resilience” in the subject area of economics. The first publications date back to the second half of the 20th century, with an increase in publication activity observed after the global financial crisis of 2008–2009. It is noteworthy that 83% of the publications are articles in scientific journals; monographs, preprints, and dissertations account for 1% each; and about 6% are conference materials.

The Lens provides a means to visualize the geographic distribution of researchers, as well as publications by leading organizations, presenting information in various graphical forms: geographic maps, bar charts, heat maps, etc. It is also possible to create a custom

grouping by combining the values of several facets for visualization, grouping them in a diagram. As an example, Figures 4 and 5 present information about the geography of researchers and leading organizations in this subject area.

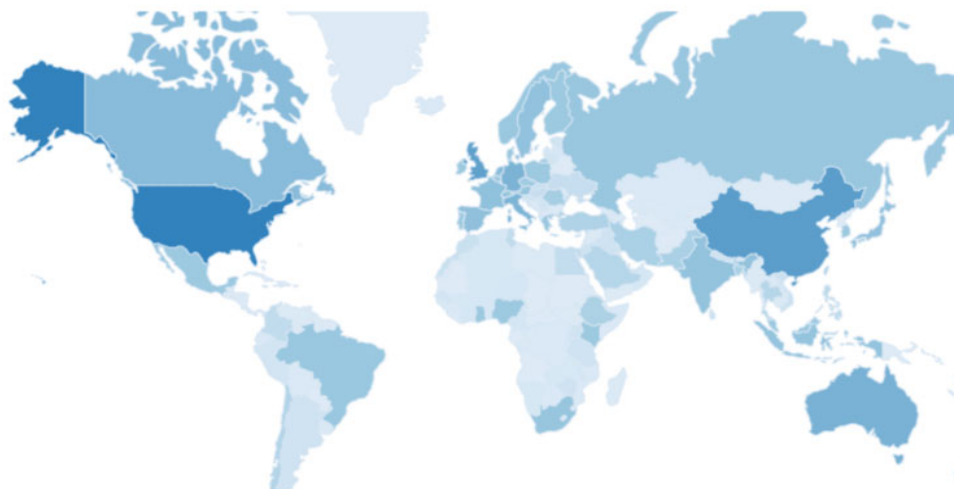


Figure 4. Geography of researchers in the field of regional resilience.

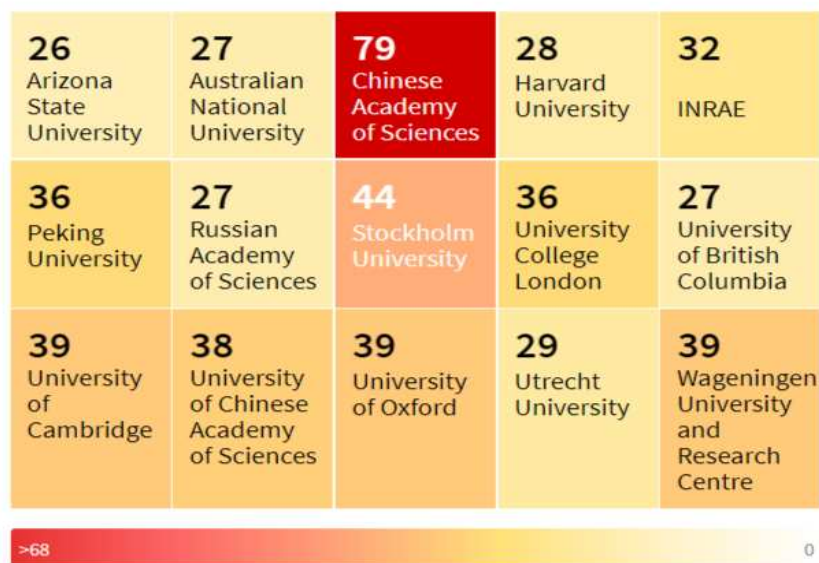


Figure 5. Leading universities in the field of regional resilience (number of publications).

Figure 4 shows that like Wizdom.ai, the Lens also identifies the USA, China, and Australia as countries most actively engaged in the field of regional resilience (color intensity indicates the share of scientific publications by researchers from a given country in the subject area under consideration). However, it also reveals a rather high level of involvement of scientists from several European countries and Brazil in the study of this subject area.

The ability to analyze a tag cloud, as well as the ability to identify and separately analyze scientific works with citations, is important for understanding scientific search trends. Thus, it is possible to exclude those studies that have not generated interest in the scientific community. However, in this case, a risk exists of overlooking interesting new research that is still unknown to the wider scientific community.

Data exported from the Lens can be processed in VOSviewer (version: 1.6.17) to visualize the relationships between keywords (Figure 6) and the networks of researchers (Figure 7).

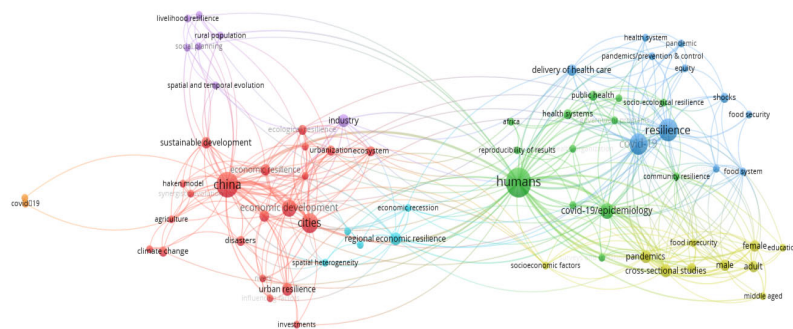


Figure 6. Analysis of keywords in publications in the field of regional resilience.

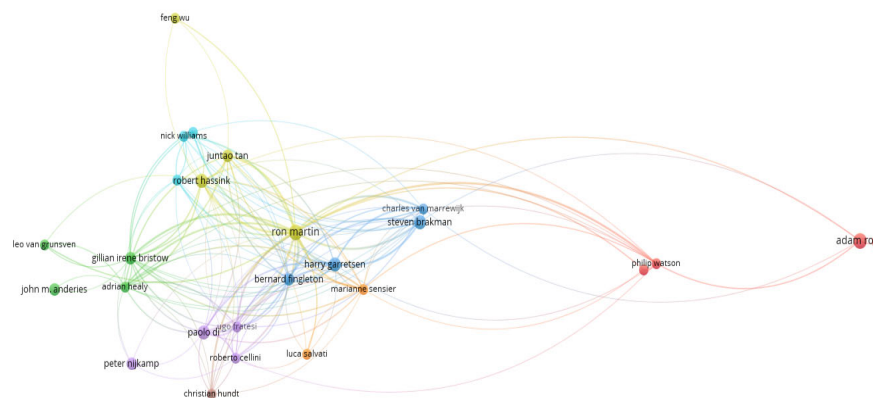


Figure 7. Analysis of the citation network of authors in the field of regional resilience.

In particular, the analysis identifies Ron Martin, Adam Rose, and Robert Hassink as the most authoritative researchers. Judging by the relationships between keywords, the main directions of research in the field of regional resilience translate into the study of urban resilience, various aspects of the human factor impact, as well as the effects of the corona crisis on regional resilience.

4.4. Dimensions

A search using the keyword “regional resilience” in economics yielded 34,680 publications, as well as 128 patents, 44 data sets, 124 grants, and 3660 policy documents. Although the first publication dates back to 1927, the interest of researchers in the problem manifested itself in a modest, though steadily growing, number of publications until the early 90s of the last century. Active interest in this subject area arose in 2011.

Dimensions does not provide information about the centers of scientific knowledge or the characteristics of the scientific community. However, it provides a means for sorting authors by the number of publications (indicating the affiliations of the top three leaders), and journals by the number of articles. In addition, it is possible to sort the generated list of publications by the number of citations and altmetrics, which allows the top topics to be identified.

In particular, the obtained data indicate that with over 40 scientific papers in this subject area, Peter Nijkamp (Netherlands) and Dong Hyun Park (Philippines) exhibit the highest publication activity. Robert Costanza, Stephen A Polasky, and Johan Rockström have the greatest number of citations.

Among scientific journals, the undisputed leader is *SSRN Electronic Journal*, which has over 3800 publications on the issues of regional resilience. Also, a significant number of studies on this issue are published in the journals *Sustainability* (920) and *Ecological Economics* (834).

In terms of the most significant areas of research covered in the journal *Ecological Economics*, we can note publications analyzing the impact of the COVID-19 crisis on regional

sustainability, as well as the sustainable development of individual economic sectors and areas of economic activity. Also, much attention is paid to the issue of modeling supply chains and risk management in logistics in terms of enhancing the sustainable development potential of a socioeconomic system.

Unfortunately, Dimensions does not enable analytical data visualization directly on the website, with the exception of a graph showing the dynamics of the number of publications. However, it is possible to process the exported information in VOSviewer or CiteSpace, creating bibliometric networks to analyze collaborations, as well as to identify topics. The system enables the downloading of no more than 2500 articles, which certainly reduces its capabilities. Nevertheless, by selecting the most cited articles or those from recent years, it is possible to gain a more accurate insight into the centers of scientific knowledge.

For example, Figures 8 and 9 visualize the results of analyzing connections between organizations and countries conducting research in the field of regional resilience using VOSviewer.

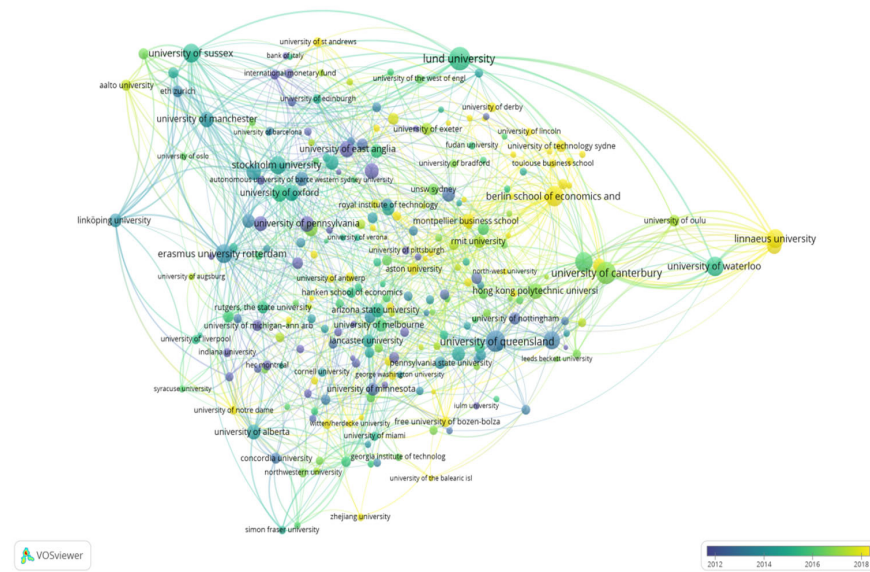


Figure 8. Visualization of the interaction networks between organizations in the field of regional resilience.

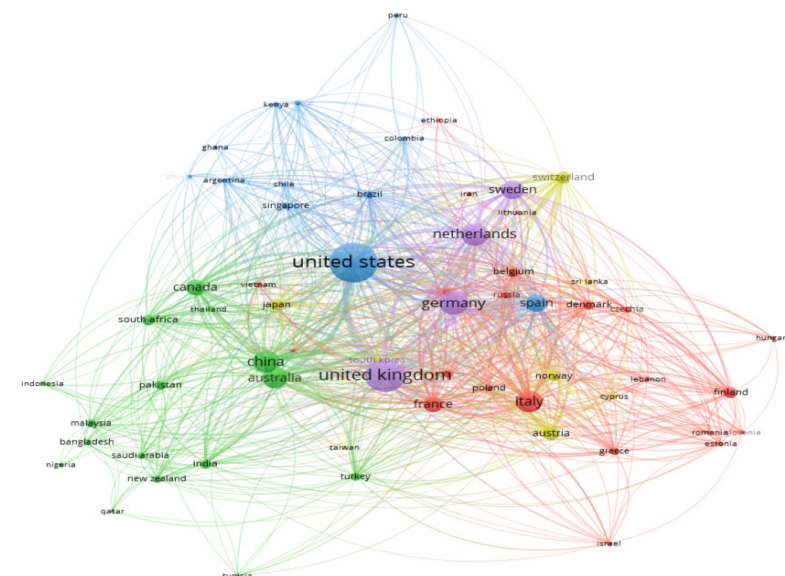


Figure 9. Visualization of interaction networks between countries in the field of regional resilience.

As can be seen, the centers of knowledge in the field of regional resilience emerged in the USA, Great Britain, the Netherlands, and Germany. Researchers from China, Australia, Italy, and Canada are also represented. Of note is that VOSviewer does not provide a means of analyzing relationships between keywords, which significantly limits the possibilities of scientometric analysis.

4.5. OpenAlex

For the keyword “regional resilience”, OpenAlex yields 131,400 search results, including 113,400 articles, 10,760 book chapters, and the rest from other sources.

The first publication dates back to 1829. This is an article by Don Guillermo Bowles “On making saltpetre France, and in Spain”. In total, only three publications on regional resilience were published in the 19th century. A gradual increase in the number of studies in the field of regional resilience was observed in the second half of the 20th century, and by 2000, the annual number of publications reached 1000. In common with other databases, OpenAlex shows that the upheavals of the 21st century have significantly intensified interest in the problems of regional resilience, reaching a peak of over 11,000 by 2019 due to reflection on the impact of the COVID-19 crisis. However, starting from 2020, the annual number of publications in this subject area is within the range of 3000–3500. Of note is that 42.5% of publications are publicly available.

According to OpenAlex, centers of knowledge generation in this subject area include the University of California, the University of London, the French Center for Scientific Research, the University of Arizona, the University of Queensland, Oxford University, and the Chinese Academy of Sciences, with the total number of publications in these institutions exceeding 1000 a. Other leading universities in various countries, including Australia, also have a fairly large number of publications. However, the lack of data visualization makes it difficult to determine the knowledge centers.

In common with Dimensions, OpenAlex provides a means of sorting the generated list of publications by the number of citations and citation percentile. According to the performed sorting, the most cited publications are those focusing on the environmental issues of regional sustainability associated with the risks of climate change.

A more detailed analysis with the construction of network maps and various graphs reflecting scientometric indicators is possible with the use of application programming interfaces (APIs), which require certain programming competencies. Therefore, OpenAlex cannot be used by a wide range of researchers. However, this database can provide important information for the development of a scientific and educational strategy at the national level and can be used with the assistance of experts qualified to carry out such an analysis.

5. Discussion

Let us consider to what extent data obtained from various scientometric databases provide insights into modern trends in scientific research in the field of regional resilience. A comparison of the obtained research landscape characteristics in the subject area of regional resilience using various scientometric databases is presented in Table 2.

Table 2. Characteristics of the research landscape in the field of regional resilience obtained using various scientometric databases.

Scientific Database	Coverage of Scientific Publications	The Most Authoritative Representatives of the Scientific Community	Scientific Knowledge Centers	Top Five Scientific Journals in This Subject Area
Scopus	3708 publications from 2000 to present	R. Martin, A. Rose, R. Hassink, and R. Boschma	Universities in Italy, the USA, the UK, and China	<i>Sustainability;</i> <i>European Planning Studies;</i> <i>Regional Studies;</i> <i>Advances in Spatial Science;</i> <i>Regional Science</i>

Table 2. Cont.

Scientific Database	Coverage of Scientific Publications	The Most Authoritative Representatives of the Scientific Community	Scientific Knowledge Centers	Top Five Scientific Journals in This Subject Area
AMiner, total	2589 publications from 1925 to present	A. Rose, R. Hassink, and B. Fingleton	Primarily universities in the USA, China, Australia, Great Britain, and the Netherlands; Centers for producing new knowledge: Stockholm University, University of California, Wageningen University	<i>Ecological Economics;</i> <i>Energy Policy;</i> <i>World Development;</i> <i>Regional Studies;</i> <i>Forest Policy and Economics</i>
Wizdom.ai	the topic of “regional resilience” was identified; the topic of “ecological resilience”, which is the closest in content, covers publications from various subject areas with a focus on the environmental aspect			
The Lens	5100 publications from 1943 to present	R. Martin, A. Rose, and R. Hassink	Chinese Academy of Sciences and University of the Chinese Academy of Sciences; Cambridge University; Wageningen University; Oxford University; Stockholm University	<i>Environmental Science and Pollution Research International;</i> <i>Sustainability;</i> <i>Research Papers in Economics;</i> <i>Environment, Development and Sustainability;</i> <i>Regional Environmental Change</i>
Dimensions	34,680 publications from 1927 to present	P. Nijkamp, D. Kogler, and A. Rose	Open University in the Netherlands; University College Dublin; University of Southern California	<i>SSRN Electronic Journal;</i> <i>Sustainability;</i> <i>Regional Studies;</i> <i>Resources Policy;</i> <i>World Development</i>
OpenAlex	131,400 publications from 1445 to present	R. Hassink, R. Boschma, and R. Martin	University of California; University of London; French Center for Scientific Research; University of Arizona; University of Queensland; Oxford University; Chinese Academy of Sciences	Not identified

The performed analysis shows that Scopus, the Lens, and Dimensions offer a clear advantage in terms of the ability to identify priority research areas. Data obtained from these databases can be exported and processed in VOSviewer. The results of processing data obtained from the Scopus database indicate that the research focus is primarily on identifying resilience factors associated with urbanization processes, as well as environmental and climate changes. It is noteworthy that theoretical research is gradually being replaced by applied research focused on improving the sustainable development of individual industries, areas of activity, and regions, as well as determining the potential for managing the processes of adaptation to new challenges. The highest priority in recent years has been given to studying the role of agent-related factors in the emergence of resilience.

An analysis of data obtained from the Lens and Dimensions yields similar results. However, conclusions made using the Lens data are closer to those made using the SciVal tool. It is noteworthy that as priority topics, the Lens and Dimensions, unlike Scopus, also identify those dealing with the applied problems of optimizing business models in various sectors of the economy, which can be attributed to the presence of patents, dissertation research materials, etc., in these databases, along with academic publications.

A comparison of the analytical and demonstration capabilities of different scientometric databases suggests that they largely replicate provided data, complementing and expanding them by including various types of data sources.

In generalized form, Table 3 compares the characteristics of scientometric databases in terms of the completeness of data provided on scientific research trends. The high, average, or low level of capabilities of the considered scientometric databases was determined by comparing them with similar capabilities of Scopus and WoS.

Table 3. Comparison of scientometric databases in terms of their capability to provide data about scientific research trends.

Scientific Database	Sample Size	Capabilities to Characterize the Scientific Community	Capabilities to Characterize Scientific Knowledge Centers	Capabilities to Characterize Scientific Journals (Source of Publications)	Capabilities of Data Visualization
AMiner	Average.	No data are available for a number of countries, including Russia. Research by Chinese scientists is predominant.			No
Wizdom.ai	Average	Low. The proposed topics do not comply with the Scopus classification. The subject area of research is difficult to identify.			High
The Lens	Quite high.	However, publications by Russian researchers and from Russian journals are poorly represented.			Average. Capabilities of data visualization in VOSviewer
Dimensions	Average.	No data are available for a number of countries, including Russia.			
OpenAlex	High	Low. Possible only for those proficient in the R and Python programming languages (using APIs)			

In spite of their limited (compared to Scopus and WoS) capabilities, open scientometric databases clearly provide data that are relevant to the acquisition of new scientific knowledge. First, this fact can be attributed to the greater number of different types of data sources that they cover (patents, open datasets, grants, etc.). In particular, Dimensions contains data on 7 million grants, 159 million patents, 1.8 million policy documents, and 814,000 clinical trials; the Lens, on over 152 million patents. Second, this is due to the provision of additional author filters. For example, by providing data on the gender of researchers, publication activity, and their academic status, AMiner helps to create a social profile of researchers. The Lens provides a means to filter out past scientific publications without citations in order to focus on publications with the greatest scientific impact. OpenAlex, as well as Dimensions, offers a similar feature, enabling the identification of publications with the highest citation percentile.

Due to the structural and functional heterogeneity of scientometric databases resulting from the different contexts in which they were created and the coverage of sources, such databases yield different content. However, we do not consider this to be a significant problem since economics is constantly evolving, becoming interdisciplinary, and incorporating new fields of knowledge. Conversely, such heterogeneity helps to develop the most complete and comprehensive picture of the scientific landscape by complementing information from different sources. Therefore, the comprehensive use of various databases seems to be appropriate in conducting scientometric studies, which will provide a means of identifying new trends and filling the gaps existing due to the limitations of each source.

6. Conclusions

In spite of the popularity of Scopus and WoS in the modern scientific world, they have been largely criticized in recent years for being “structurally biased against research produced in non-Western countries, non-English language research, and research from the arts, humanities, and social sciences” [46]. In addition, the scientific policy focus on Scopus and WoS, with scientific results and university rankings directly related to the scientometric indicators of these databases, creates real threats to academic freedom. The real possibilities of choice and goal setting for an individual researcher and research teams are limited since decisions on the allocation of financial resources and hiring of new researchers are made by the state and universities in line with the objectives of the scientific and educational policy, determined by Scopus and WoS.

The conducted study showed that despite the debatable issues about the role and significance of open science in promoting innovation, open policy is already becoming an

irreversible trend for most leading universities. Open scientometric databases provide a means of obtaining important information about trends in the development of science, no less significant in content than that provided by Scopus and WoS, offering new tools to search for publications and conduct scientometric analysis. By providing broader coverage of different types of research, as well as including scientific publications from Eastern and Southern Europe and the Global South, open scientometric databases make data retrieval more informative for scientific fields with a distinct national focus and focus on local audiences. It is difficult to say which database can yield the most reliable and complete data to characterize scientific research trends since each of the databases has certain advantages.

Nevertheless, open scientometric databases are currently incapable of serving as an alternative to Scopus and WoS due to the rather low entry barriers, which do not allow them to guarantee the high scientific level of materials available in the database. The quality of metadata in open databases is not high. In addition, such databases exhibit a relatively low level of provided services and tools for obtaining and processing scientometric data. Furthermore, scientometric databases have different citation models, as well as different coverage of sources, which complicates their comparative analysis. All these factors constitute a limitation of the obtained findings and determine directions for further research related to the study of alternative sources for outlining research frontiers, specifically, AI-assisted tools (SCISPACE, Petal, ChatGPT, etc.), and comparison of results with this study.

Unlike open databases, Scopus and WoS have very high requirements for journals to be included in their databases, ensuring that they represent the world's highest quality research. In addition, no open database can currently surpass the set of powerful analytical tools offered by Scopus and WoS, which is constantly expanding. The unique statistical data available in these databases promote the development of open bibliometric systems, as well as allowing scientists to conduct research in various scientific areas. Therefore, it seems premature to completely abandon the use of resources provided by Scopus and WoS. A rational research strategy implies the need to adopt a selective approach to using existing databases, taking into account their individual capabilities and limitations, as well as the specifics of research. In particular, with financial and other restrictions on access to commercial platforms, scientists can use databases alternative to Scopus and WoS. Also, open databases are preferred for research on the scientific potential of the Global South countries that are underrepresented in Scopus and WoS. It is noteworthy that science primarily aims to add to the knowledge about the world. That is why its openness contributes to the impartiality of making high-quality decisions in the assessment of scientific results.

The novelty of this study lies in demonstrating the possibility of using open scientometric databases to establish a methodological framework for exploring research frontiers. Unlike existing studies where scientometric databases are considered primarily as a tool for assessing the scientific impact of individual researchers and organizations, in this study, their potential as a tool for the production of scientific knowledge is demonstrated.

In spite of certain limitations, the present study yielded several important conclusions regarding the capabilities of open science. However, a large number of aspects require further, more detailed study. It seems promising to expand the number of open scientometric databases and the types of open access resources for analysis. Such resources include academic search engines, professional networks (Research Gate, Academia.Edu, etc.), as well as specialized and less popular scientometric databases.

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