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Bibliometric Analysis of Bioscience Trends Journal (2007-2017): Knowledge dynamics and visualization

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Abstract

BioScience Trends (BST) is a peer-reviewed journal belongs to the International Research and Cooperation Association for Bio & Socio-Sciences Advancement (IRCA-BSSA) Group of Japan. Despite a decade of existence, no study was performed to measure the bibliometric profile of the journal. The objective of this study was to investigate the bibliometric characteristic of BST. A bibliometric analysis will specifically measure: 1) growth rate of the scientific publications, 2) dynamics of authorship and collaboration pattern; 3) core research themes of articles that have been published, and 4) citation pattern of BST. Bibliographical archives of BST were obtained from the Core Collection database of the Web of Science (WoS). We divided the dataset into three interval periods, 2007-2010, 2011-2014 and 2015-2017 respectively. Data processing and analysis was performed using Bibliometrix, a bibliometric analysis package in R software, VOSViewer 1.66, Orange 3.15 and CitNetExplorer. Within one decade of scientific production, BST continues to attract global researchers in life sciences. However, it is still dominated by authors from China and Japan. Annual journal growth of BST is 12.83 %. Reaching the end of the first decade, number of first author and the country origin multiplied, 20 and 5 times respectively, compared to the first-year. Research themes are consistent with the Aims and Scope of the Journal with strong emphasizes on molecular biology, biochemistry, and clinical research. Entering the second decade, strategies to promote and enlarge authors participation from countries that are not in the current list are encouraged.

Keywords: bibliometrics, knowledge visualization, journal, life sciences

5 figures and 3 tables

Key messages:

- This single bibliometric study has portrayed the growth and stand of Bioscience Trends (BST), an emerging Asian journal on life science based in Japan.

- In one decade, number of first author and the country origin multiplied, 20 and 5 times respectively.
- BST has attracted global researchers in life sciences, although still dominated by authors from Japan and China.
- Research themes are consistent with the Aims and Scope of the Journal with strong emphasizes on molecular biology, biochemistry, and clinical research
- Based on this study, strategies to promote and enlarge authors participation from countries that are not in the current list are encouraged.

Conflict of Interest

Authors of this article have no conflict of interest

Funding statement

This research has received no funding.

1. Introduction

BioScience Trends (BST) is a peer-reviewed journal belongs to the International Research and Cooperation Association for Bio & Socio-Sciences Advancement (IRCA-BSSA) Group of Japan. BST covers life sciences including biochemistry, molecular biology, clinical research, public health, medical care system, and social science. The journal was aimed to support international cooperation and exchange among scientists and clinical researchers including those from Asia and the West (1).

Over the years, life sciences continue to evolve and grow. As a scientific journal, BST plays an important role to collect and accumulate the science evidence. Since the inauguration in 2007, BST has attracted international researchers to submit research papers. Nowadays, all papers are indexed in the reputable bibliographical database, such as Web of Science (WoS), Scopus, and Pubmed. According to the Journal Citation Reports, Impact Factor of BST has significantly increased from 0.392 in 2010 to 1.844 in 2017. Based on the Impact Factor, this journal is ranked 35 in the category of Biology from out of 85 journals.

After one decade of scientific production, no bibliometric study was performed to measure the progress and achievement of BST. Bibliometric study is the use of quantitative and statistical methods applied in bibliographical data to produce an insightful pattern of a knowledge dynamics (2). Thanks to the highly available of electronic bibliographical data and various tools, bibliometric research has multiplied recently. It is also driven by the increased motivation of the scientific community to discover a new understanding of the stockpiled pieces of literature (3, 4).

A single journal study is one sort of bibliometric study. This endeavor aims to provide an intuitive portrait of a journal beyond the existing metrics. This analysis could discover productivity and maturity of the journal in a certain scientific discipline (3). Beside that, meaningful information regarding the core research themes, authorship pattern, and scientific collaboration could illustrate the journal popularity or standing within the global scientific community (5). Some examples of single journal bibliometric study have been published in healthcare domain (6-8).

The aim of this study was to investigate the bibliometric profile of BST. This research could deliver: 1) growth rate of the scientific publications, 2) dynamics of authorship and collaboration pattern, 3) core research themes of published articles, and 4) citation pattern of BST.

2. Materials and Methods

2.1. Materials

Bibliographical archives of Bioscience Trends were obtained from the Core Collection database of the Web of Science (WoS). We searched publications using the search string “Bioscience Trends” in the Publication Name field started from the period 2007 till 2017. We excluded biographical item, retracted publication, retraction, and news. Data were then downloaded in a plain text format. Variables in the dataset include publication ID, publication title, date of publication, author name, affiliations, keywords, and citation records.

2.2. Methods

Until 2017, BST published 596 documents consisting of 467 articles (78.4%), 85 reviews (14.2%), 22 editorials (3.7%), 6 letters (1.0%), and 16 others (2.7%). We excluded 1 biographical item, 1 retracted publication, 1 retraction, 13 news items producing 580 records in the final dataset for analysis.

Dataset from the WoS was processed using R statistical program version 3.4.3. Bibliometrix, an R package for bibliometric analysis, was utilized to generate the bibliometric indices including publication growth, number of authors, number of citations and others (9, 10). More detailed explorations were performed using VOSViewer 1.66 to visualize the co-occurrences of words, authors, organizational affiliations, and countries in an intuitive way (11). Data from the WoS was also analyzed using CitNetExplorer to create the citation pattern of the journal (12, 13).

Bibliographic dataset was divided into 3 periods, namely period 1 (2007-2010), period 2 (2011-2014) and period 3 (2015-2017). Scientific productivity of BST was measured by the

number of documents published annually and cumulatively. Productivity of contributing countries were measured, examined and compared among periods. Latest version of Bibliometrix provides shiny app subroutine to perform this analysis (10).

We performed topical analysis to discover leading topics of the research articles. Using VOSViewer, we measured co-occurrences of words in title, abstract and author keywords. VOSViewer could produce a visual representation of the research topics using a clustering algorithm. We also analyzed the dynamics of Medical Subject Heading (MeSH) qualifiers from the WoS by periods and visualized in heatmap using Orange 3.15 (14). MeSH is a well-known and the most complete health sciences vocabulary developed by the National Library of Medicine since 1960. It consists of more than 680 thousand entry terms including MeSH terms, qualifiers, check tags, geographical characteristics, publication type and others that will be useful to categorize bibliographic data (15, 16). In this study we prefer to choose MeSH qualifier to complement the author keyword analysis

3. Results

We organized the following sections to provide the details picture of one-decade scientific production of BST.

3.1. General bibliometric indices

Out of the 580 articles, there are 467 original articles (78.4%), 85 reviews (14.2%), 22 editorials (3.7%), and 6 letters (1.0%). In the first year, BST published 29 articles started from August 2007. Number of documents that have been published per year increased throughout the decade, reaching double in 2017 (**Figure 1**).

INSERT Figure 1. Annual scientific production and the cumulative number of BST (2007-2017).

Table 1 presents the general bibliometric indicators of the journal. In a decade, annual growth of BST is 12.83%. The highest growth occurred in the first period (25.26%). In the 2nd

period, annual growth was slowing down, but then revived in the period 3. Number of authors increased from 560 authors in the 1st period to 944 authors in the 3rd period. Total number of authors in a decade were 2007 persons or on average 3.46 authors per article. Collaboration index of the journal that was measured by number of authors in joint articles divided by number of joint papers remains stable. This figure shows a positive picture of the journal indicating a continuous progress over the time to attract authors to submit the manuscripts.

INSERT Table 1. Bibliometric indicators of Bioscience Trends (2007-2017)

3.2. Authors profile and collaboration network

In one decade, BST accepted papers from 471 first authors who are originating from 31 countries. Asian countries (90.86%) are predominant, followed by the North America (3.45%), Europe (3.28%), Australia (0.86%), South America (0.86%) and Africa (0.69%). This record shows that BST achieved a certain level objective as a medium for global scientific exchanges in the domain of life sciences. In the first year, 29 first authors of BST were originated from the 6 countries, namely Japan (22), USA (4), China (1), Indonesia (1), Thailand (1) and South Africa (1). Reaching the end of the first decade, total number of first authors multiplied 20 times while the origin countries of the first author increased 5 times compared to the first year.

Figure 2 depicts authors' collaboration network in BST. In Figure 2A, a big picture network was visualized at country level. While China and Japan were the most important contributors, however more meticulous patterns were exposed in Figure 2 B, 2C and 2D. VOSViewer could generate this network based on the co-authorship pattern. Authors who appeared as co-authors in a paper have been considered as part of the network. The thicker the edge indicates more connection between the nodes or indicating more collaboration on co-authoring together. The bigger the nodes indicates the higher the number of documents. In terms of organizational collaboration, the main nodes are University of Tokyo (blue), followed by Shandong University (blue), Fudan University (red) and Tokai University (blue).

INSERT Figure 2. Authors' collaboration network. A) Country level. B) Institutional level. C) University of Tokyo's collaboration network. D) Fudan University's collaboration network.

To explore the dynamic contribution of respected countries we present the Table 2. In this table, the 5-most active countries were selected. Amounts of publication by period were counted and ranked. China and Japan were the consistently active contributors to the journals. In the first period, Japanese first authors ranked 1st with the total contribution of 53.89% of the publication. This situation changed since the second period, as China took lead with 46.67% of articles. This continues until the 3rd period with even higher contribution. Compared to the first period, contribution of Japanese first authors in the third period decreased more than half. Within the top five, there are two non-Asian countries, namely the USA and Australia. It is worth to recognize the rising role of Australia. This country was ranked 8th in the first period, then increased to 7th in the second period and finally appeared in the 5th at the last period of the first decade. On the other hand, ranking of USA were getting down over the period. India also showed decreased productivity, although in all period this country is still located in the 3rd rank of the most productive countries.

INSERT Table 2. Top 5 most-productive countries by period

3.3. Knowledge domain dynamics

Figure 3 presents the research themes in BST. Figure 3a visualizes the most common words appear in the title and abstract of article. Based on the clustering algorithms, VOSViewer produces 3 clusters: red, green and blue. The red cluster relates to the topic of clinical research on the individual patient. The green cluster includes research related to the mechanism and regulation at the cellular level, while the third cluster was about hepatocellular carcinoma (blue cluster).

Using the author keywords, as shown in Figure 3b, the research themes become more detailed. There are 8 main clusters of research topics published in BST. Each cluster represents particular themes in different color, for example 1)hepatocellular carcinoma, 2)biomarker for cancer, 3)apoptosis and breast cancer, 4)inflammation, 5)traditional Chinese medicine, 6)topics related to China, 7)medical humanities and 8)infectious diseases such as tuberculosis and avian influenza.

INSERT Figure 3. Co-occurrences word analysis. A) In title and abstract B)In author keywords

Figure 4 illustrates the temporal trends of research topics. Data of MeSH qualifier was processed and visualized with heatmap. The first cluster is related to metabolism. This keyword was consistently the highest rank in each period compared to other keywords MeSH qualifiers. The next cluster is research topic that was continuously stable or increasing. In this cluster, the keywords includes genetics, pharmacology, drug effects, methods, physiology, pathology, therapeutic use and drug therapy. The remaining cluster is a relatively rare research topic or even downtrend.

INSERT Figure 4. Heatmap of Medical Subject Heading qualifiers.

3.4. *Citation pattern*

Table 3 presents a list of the 10 most cited articles that were produced by three countries, namely Japan (5 documents), China (4 documents), and India (1 document). Most of them are Review paper (7) and the remaining 3 are research articles. Within this list, three of them were related to the Chinese medicine (paper number 1,3 and 4), three papers on hepatocellular carcinoma (paper number 6, 9 and 10) and the rest are related with aging, sectio cesarea, P-glycoprotein inhibitor and metabolic syndrome. Two single authors were on the list. Paper ranked no 4 on total citation is, interestingly, the 2nd ranked on times citation with 19 citation per year(17). This paper was

published in 2015 and already received 39 citations in 2016. Given that the chinese medicine is listed as the leading research topic, this paper is predicted to be cited higher in the year to come.

INSERT Table 3 Top 10 most-cited papers in Bioscience Trends (2007-2017)

Figure 5 presents the citation pattern in the BST journal. There are 3 main cluster of citation between Bioscience Trends papers. The biggest cluster (magenta) consists of 21 articles about hepatocellular carcinoma. The second citation cluster (green) is about traditional Chinese medicine consists of 21 articles. The third cluster (blue) that consists of 11 articles was related with outbreak management of avian influenza. This visualization shows continuity between one topic and another in the BST. It shows the role of BST as a dialogue medium and strengthens scientific communication to continuously update new findings that linked to the previous results.

INSERT Figure 5. Citation pattern in Bioscience Trends (2007-2017)

4. Discussion

This study is the first publication in Bioscience Trends to reveal the bibliometric profile of the journal. Results of this study showed that BST performs positive bibliometric indices. Within the first decade, this journal has attracted life sciences researchers from the five continents in the world. However, most of the papers are coming from two Asian giants, China and Japan. Not only as the top paper producers, these two countries are also the best performers on the citation. In the top-10 list of most cited articles, 90% are from these two countries. While the contribution of the existing countries is still important, however strategies to promote and enlarge participation from countries that are not in the current list are encouraged.

Variety of research themes are consistent with the Aim and Scope of the journal including biochemistry, molecular biology, clinical research, public health, medical care system, and social science with the different level of appearances. Topics related to molecular biology, biochemistry

and clinical research are more prevalent than public health, medical care system and social science. The top-10 most cited articles are mostly related to the molecular biology, biochemistry and clinical research.

This study did have some limitations. First, the thematic analysis using co-word was conducted with title and abstracts only. It is possible that the results could be different compared to the whole document analysis. Secondly, interpretation of the map and visualization was qualitative and subjective. However, we believe this study entails some strengths, particularly with regards to the dynamic profile of contributing countries and research institutions as well as citation patterns that have never been disclosed before.

Within one-decade of scientific production, Bioscience Trends continues to attract global researchers in life sciences, while so far is still dominated by authors from China and Japan. Research themes of the publications are consistent with the Aims and Scope of the Journal and with more emphasizes on molecular biology, biochemistry and clinical research. While entering the second decade, strategies to promote and enlarge participation from countries that are not in the current list are encouraged.

Abbreviation

MeSH: Medical Subject Headings

Conflict of Interest

There is no conflict to disclose.

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Table 1. Bibliometrics indicators of Bioscience Trends (2007-2016)

Criteria	P1 (2007-2010)	P2 (2011-2014)	P3 (2015-2017)	All period (2007-2017)
Number of articles	167	188	225	580
Average citations/document	9.30	8.27	2.50	6.32
Number of authors	560	798	944	2007
Authors/document	3.35	4.24	4.20	3.46
Co-authors/document	4.83	6.09	5.96	5.68
Collaboration index	3.57	4.34	4.24	3.57
Country origin of 1 st authors	18	14	20	31
Annual growth rate (%)	25.20	7.21	29.32	12.83

Table 2. Top 5 countries ranking on number of articles by period

Rank	Country	All period (2007-2017) N=580		P1 (2007-2010) N=167		P2 (2011-2014) N=188			P3 (2015-2017) N=225			
		n	%	n	%	Rank	n	%	Rank	n	%	Rank
1	China	281	48.45	33	19.76	2	100	53.19	1↑	148	65.78	1→
2	Japan	201	34.66	89	53.29	1	66	35.11	2↓	46	20.44	2→
3	India	25	4.31	16	9.58	3	8	4.26	3→	1	0.44	14↓
4	USA	17	2.93	12	7.19	4	2	1.06	6↓	3	1.33	7↓
5	Australia	5	0.86	1	0.60	8	1	0.53	7↑	3	1.33	5↑

N = total number of publications in the period

n = number of publications from related country in the period

% = percent to the total publications in the same period

Table 3. Top 10 most-cited papers in Bioscience Trends (2007-2017)

Rank	Citations	TC/year	Title (type of article)	Author (Country of the corresponding)	Year
1	162	20.25	Chinese herbal medicines as adjuvant treatment during chemo- or radiotherapy for cancer (<i>Review</i>)	Qi FH;Li AY;Inagaki Y;Gao JJ;Li JJ;Kokudo N; Li XK;Tang W (<i>China</i>)	2010
2	83	8.30	Inflammaging (inflammation plus aging): A driving force for human aging based on an evolutionarily antagonistic pleiotropy theory? (<i>Review</i>)	Goto M (<i>Japan</i>)	2008
3	67	8.38	Traditional Chinese medicine and related active compounds against hepatitis B virus infection (<i>Review</i>)	Cui XY;Wang YL;Kokudo N;Fang DZ;Tang W (<i>Japan</i>)	2010
4	57	19.00	The advantages of using traditional Chinese medicine as an adjunctive therapy in the whole course of cancer treatment instead of only terminal stage of cancer (<i>Review</i>)	Qi FH;Zhao L; Zhou AY;Zhang B;Li AY;Wang ZX; Han JQ (<i>China</i>)	2015
5	44	6.29	The increasing cesarean rate globally and what we can do about it (<i>Review</i>)	Niino Y (<i>Japan</i>)	2011
6	41	5.12	Novel aminopeptidase N (APN/CD13) inhibitor 24F can suppress invasion of hepatocellular carcinoma cells as well as angiogenesis (<i>Article</i>)	Inagaki Y;Tang W;Zhang L;Du GH;Xu WF;Kokudo N (<i>Japan</i>)	2010
7	41	4.10	Recent advances in research on P-glycoprotein inhibitors (<i>Review</i>)	Yang KH;Wu JF;Li X (<i>China</i>)	2008
8	40	5.00	Metabolic syndrome: What are the risks for humans? (<i>Review</i>)	Gupta A;Gupta V (<i>India</i>)	2010
9	38	4.75	The management of hepatocellular carcinoma in Asia: A guideline combining quantitative and qualitative evaluation (<i>Article</i>)	Song PP;Tang W;Tamura S;Hasegawa K;Sugawara Y;Dong JH;Kokudo N (<i>Japan</i>)	2010
10	31	6.20	Screening for and surveillance of high-risk patients with HBv-related chronic liver disease: promoting the early detection of hepatocellular carcinoma in China	Song PP;Feng XB;Zhang KM;Song TQ;Ma KS;Kokudo N;Dong JH;Yao LN;Tang W (<i>Japan</i>)	2013

TC=times citation

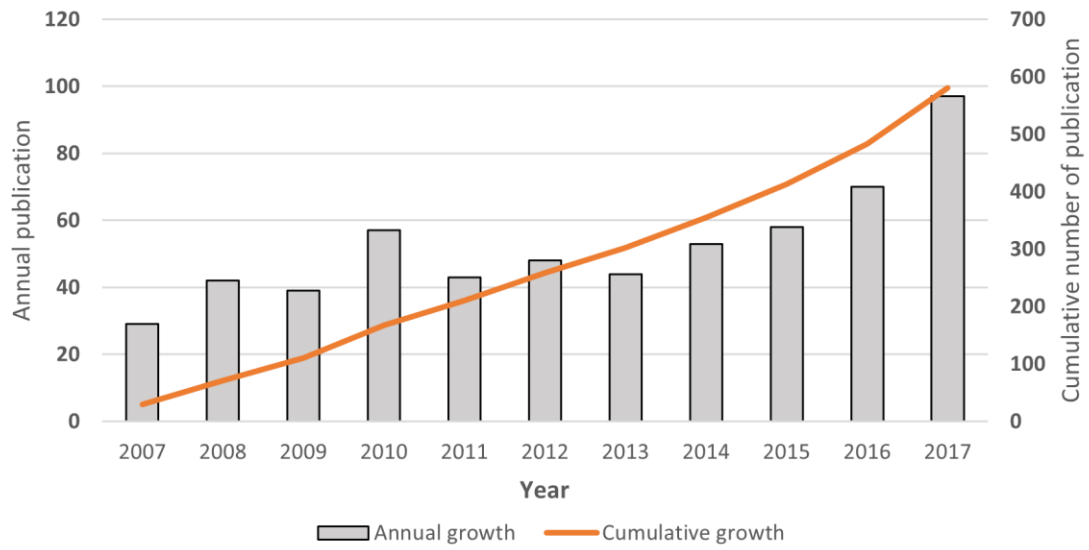


Figure 1. Annual Scientific production of BST and the cumulative number (2007-2016).

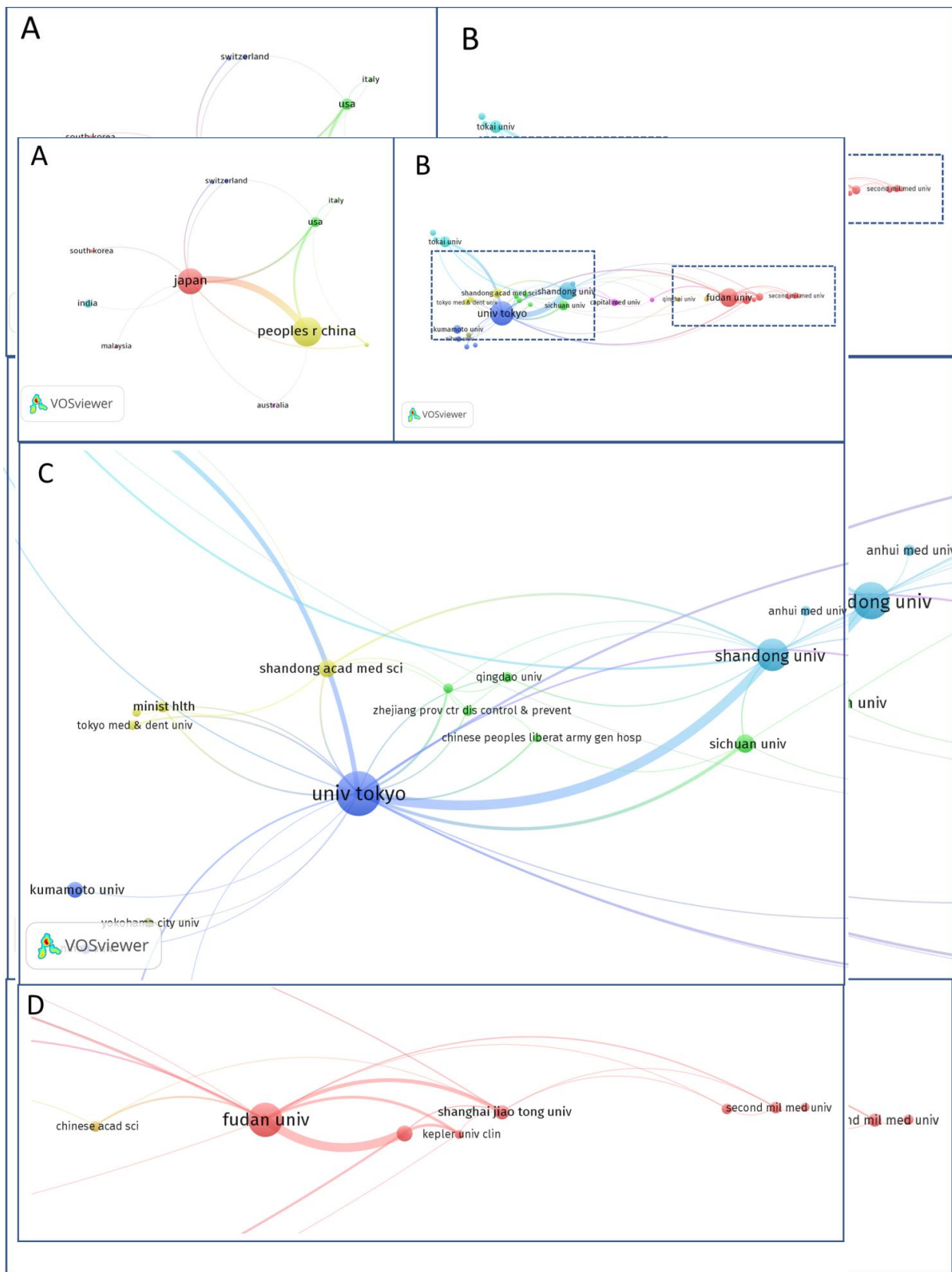


Figure 2. Authors' collaboration network. A) Country level. B) Institutional level. C) University of Tokyo's collaboration network. D) Fudan University's collaboration network.

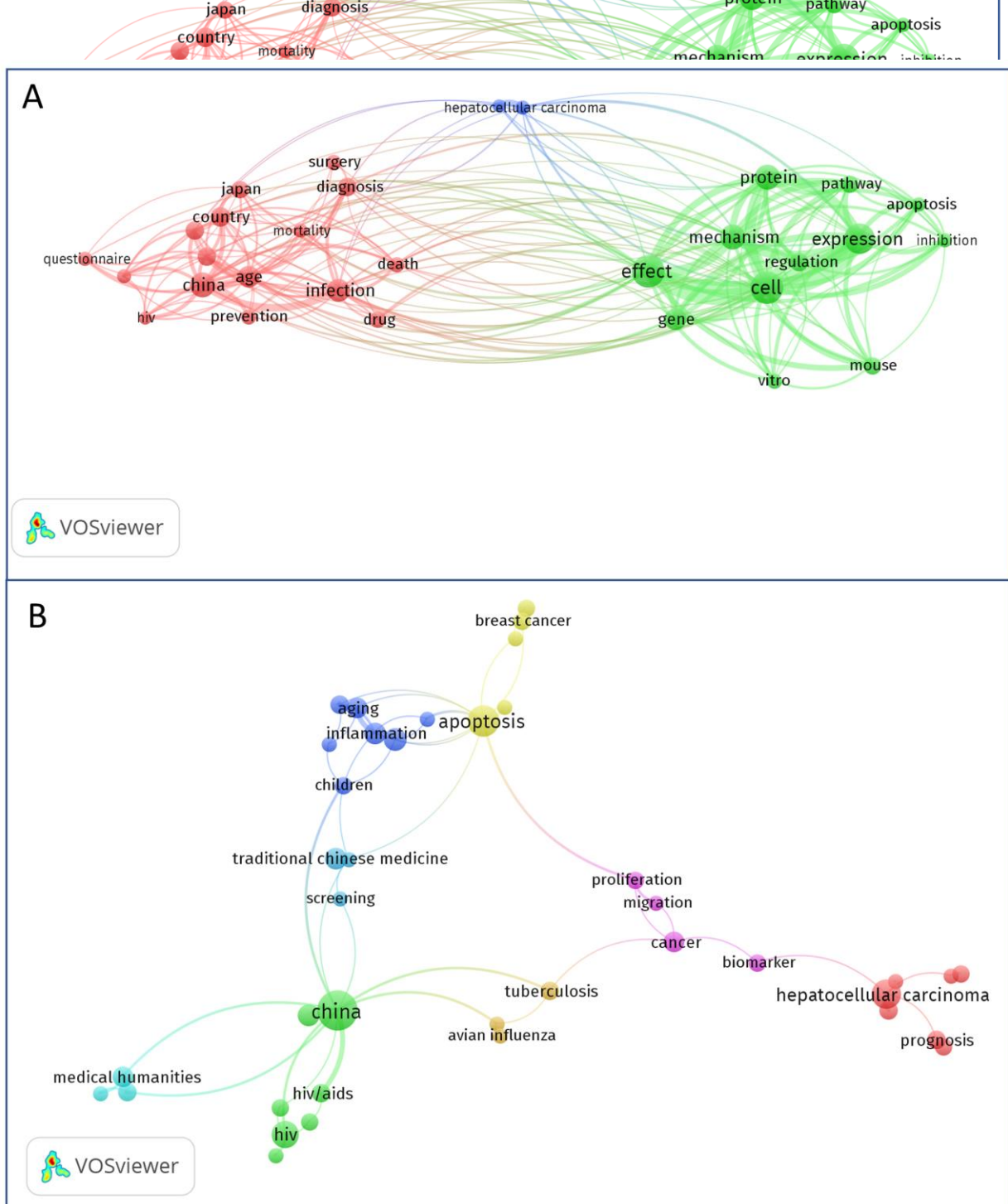


Figure 3. Co-occurrences word analysis. A) In title and abstract B)In author keywords

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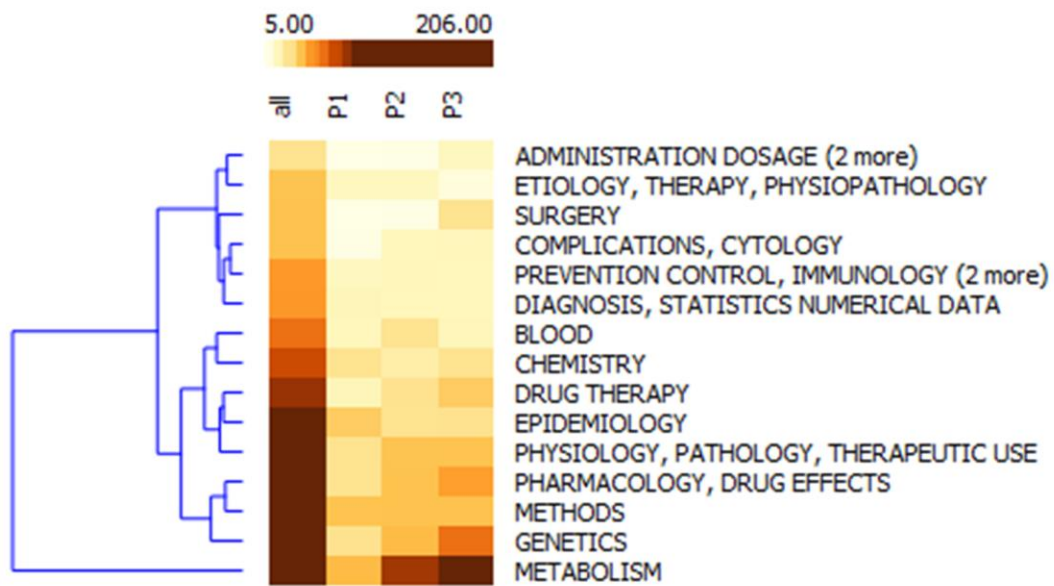


Figure 4. Heatmap of Medical Subject Heading qualifiers.

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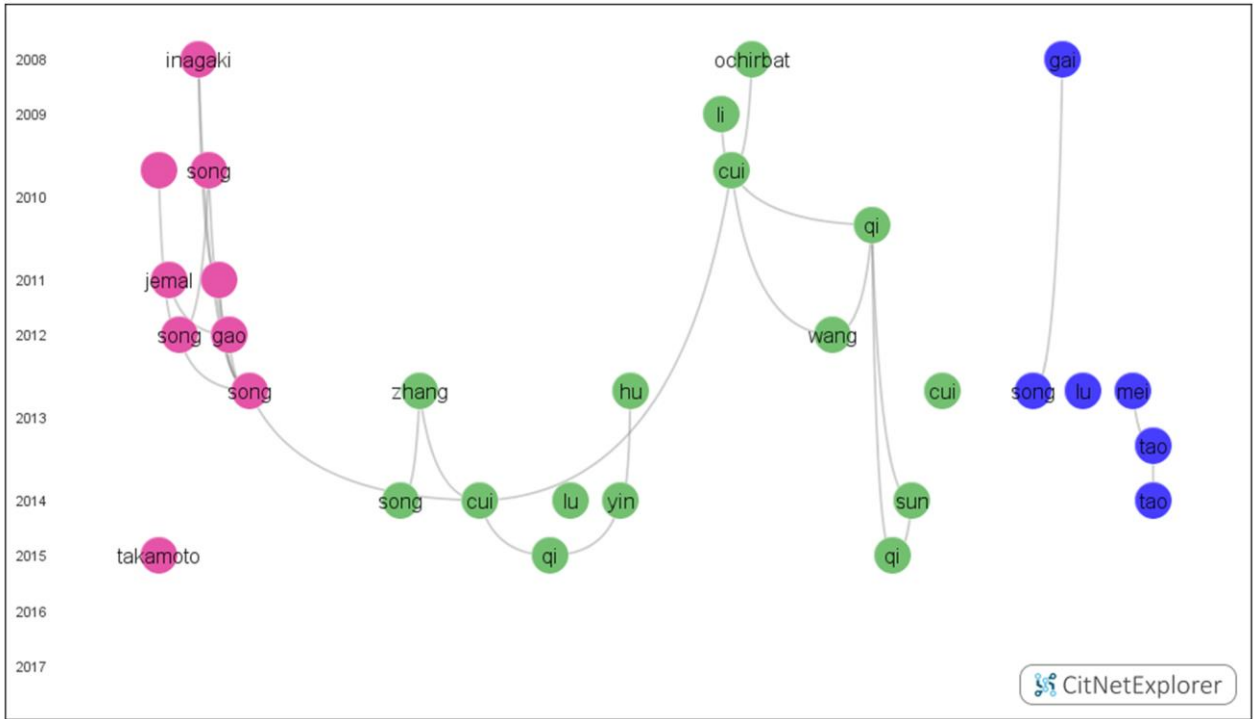


Figure 5. Citation pattern in BST (2007-2017)

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