

# Economic research output among the Shanghai Cooperation Organizations (SCO) countries - a scientometric analysis

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**Abstract:** The Shanghai Cooperation Organization (SCO), the political and economic alliance of countries in the Eurasian region, has a significant role in the economic development of its member nations. This study examines the research performance of the Shanghai Cooperation Organization, which was assessed using the cite space software, with all data retrieved from the Web of Science (WoS) database. A Total of 810 publications were taken from the Web of Science database for analysis. The study analysed the broad features of economic research output, focusing on Top cited institutions, different subject areas, top country-wise contributors, top authors, journals, etc. The study found that being an economic cooperation treaty like the Shanghai organization, the economic cooperation and economic research output were revealed and discussed for the first time in worldwide references. The analysis of citation counts highlights the dominance of Chinese institutions in terms of research impact. The Chinese Academy of Sciences stands out as the most cited institution, indicating its significant contribution to the economic research output among the SCO countries. The areas of interest within the economic research output of the SCO countries are environmental sciences and studies, followed by green and sustainable science and technology, public and occupational health, economics, and interdisciplinary mathematics applications.

**Keywords:** Scientometric; Shanghai Cooperation Organizations; SCO Countries; Economic research output.

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## *Resultados de la investigación económica entre los países de la Organización de Cooperación de Shanghai (OCS): un análisis cientométrico*

**Resumen:** Este estudio proporciona un análisis cientométrico de los resultados de la investigación económica entre los países de la Organización de Cooperación de Shanghai (OCS), utilizando datos de la base de datos Web of Science. El análisis incluye 810 publicaciones que destacan las tendencias en el impacto de la investigación, las áreas temáticas y los contribuyentes clave. Las instituciones chinas, especialmente la Academia China de Ciencias, dominan el recuento de citas, lo que resalta el papel importante de China en la investigación económica dentro de la OCS. Las principales áreas de investigación son las ciencias ambientales, la tecnología sostenible, la salud pública, la economía y las matemáticas interdisciplinarias. El estudio también identifica los principales autores, revistas y palabras clave, enfatizando el enfoque en el desarrollo económico y la cooperación. A pesar de limitaciones como el posible sesgo de publicación y la dependencia de indicadores bibliométricos, el estudio revela el creciente énfasis en el desarrollo sostenible y los enfoques interdisciplinarios en la investigación económica dentro de la región de la OCS.

**Palabras clave:** cientometría, Organización de Cooperación de Shanghai; países de la OCS; tendencias de la investigación económica.

## 1. Introduction

One important and exciting aspect of the modern world is that countries and nations are working together to improve international and regional order and cooperation. This collaboration fosters peace, security, prosperity, poverty reduction, equality between nations, trade, commerce, and other essential needs as the global population grows. As states' needs increase, they require more resources to sustain themselves, making international cooperation essential to meet their economic demands (Mustafa et al.,2021).

Central Asia offers a potential opportunity for regional integration; however, the region's autonomous administrations, impoverished economy, and ongoing hostilities render it challenging to achieve. Integration endeavors are further exacerbated by political instability and external interference, as evidenced by the Shanghai Cooperation Organization (Lynch & helms, 2024). The Shanghai Cooperation Organization (SCO) has evolved from its original focus on resolving border disputes into a new model of international cooperation that spans the political, economic, cultural, and educational spheres (Xue & Makengo,2021).

The SCO's policies are decided upon by reaching a consensus and operating within the parameters of the Shanghai spirit, representing a shared regional policy. Under the direction of the United States of America, the Shanghai Cooperation Organization can develop a policy that strikes a balance with the Western world. Additionally, it established a regional system to maintain a balance between Russia and China (Papageorgiou & Vieira, 2022). Finally, in 2017, India and Pakistan became members of the organization, which resulted in the organization gaining a more substantial structure in terms of population, territory, and economy. India and Pakistan have membership status in the organization, allowing them to work together on a shared platform to find solutions to long-standing regional issues that date back to the post-colonial era and continue into the present day. The group, which can alter regional and global balances, has set its sights on enhancing the members' economic well-being and sense of personal safety (Alimov, 2018).

China's objective in the Shanghai Cooperation Organization is to advance polycentrism, foster interstate partnerships, and promote state-regulated

economic globalization, all while respecting member states' sovereignty and noninterference principles (Perskaya et al.,2023). The SCO is a political and economic alliance of countries in the Eurasian region, founded in 2001. Its members include China, Russia, Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan, India and Pakistan.

Despite its promise, the SCO has yet to establish a meaningful multilateral framework, with results primarily derived from bilateral contracts rather than collective efforts (Allison, 2019). Today, the SCO is a matured, comprehensive, and inclusive intergovernmental regional organization (Cabestan, 2013). Its regional integration is state-led, with no involvement of NGOs, media, or public opinion. Mutual suspicion among members and differing priorities between Russia and China hinder the development of a collective identity (Gupta, 2016).

The SCO prioritizes peace and stability through socioeconomic integration, cultural connectivity, and geopolitical collaboration, leveraging member countries economic, military, and resource strengths for enhanced cooperation (Kundu, 2009). The Shanghai Cooperation Organization (SCO) was initially formed to address the border security interests of its founding members. Despite Russia's perceived leadership, China drives the organization, with Central Asian members offering strategic value. Expansion faces challenges due to internal conflicts. The Regional Anti-Terrorist Structure (RATS) remains its most effective component, especially in the post-2014 NATO drawdown in Afghanistan. However, the SCO is unlikely to become a military alliance (Plater et al.,2014).

The SCO aims to foster sustainable, multidimensional cooperation based on mutual respect and interest, addressing critical issues like terrorism, drug trafficking, and regional stability through a balanced, inclusive approach (Rahman, 2007). The organization aims to promote economic cooperation and development among its member states and enhance security and stability in the region. The SCO has implemented several initiatives to support economic development, such as creating a free trade area, establishing an investment fund, and developing cross-border infrastructure projects (Leeves & Poon, 2015). The organization also provides a platform for its members to dialogue on economic issues and exchange information and best practices. Overall, the SCO plays a vital role in promoting economic cooperation and

development in the Eurasian region, contributing to the growth and stability of the economies of its member countries.

This study aims to explore several objectives related to economic research output within the SCO framework. These objectives include the individual share of economic research output from different countries, identifying institutions contributing to the economic research, and identifying top-ranked journals from SCO member states. Also, the current study seeks to determine the top contributing influential authors, domain areas of interest, and commonly used keywords in economic research within the SCO. The research aims to provide valuable insights into the economic landscape and scholarly discourse within the SCO region by addressing these objectives.

The study analyses the SCO countries' research output up to 2023 using Web of Science research papers/articles. The study used cite space software for this innovative scientometric study to examine 947 Web of Science Core Collection publications, focusing on 266 publications in International Relations and Area Studies. We identify the key patterns in the annual distribution of papers, document formats, dominating journals, collaboration networks between nations, and the most productive authors while mapping research on China and Russia over the last three decades (1990-2019). The study also highlighted promising future research directions while demonstrating how the bibliometric approach can advance advancements in studies in China and Russia.

Pylypenko (2024) employs various scientific methods to analyze the SCO's economic cooperation, focusing on trade, investment, infrastructure, and energy. It highlights the organization's goals of enhancing regional trade and market access but acknowledges challenges like unresolved territorial disputes. Additionally, it identifies new opportunities with Iran's accession and emphasizes the importance of addressing internal tensions to realize the SCO's economic potential. Zhou (2024) explores the challenges hindering East Asian regional economic cooperation and proposes measures such as leveraging ASEAN, enhancing trade ties, and promoting cultural exchanges to foster development in the context of global economic integration.

Choudhari (2024) investigates the evolution of international norms through the lens of the Shanghai Cooperation Organization (SCO), illuminating its role in shaping regional dynamics and normative preferences in Central

Asia. Shahmoradi & Ellili (2024) aims to provide a comprehensive bibliometric analysis of 272 documents on economic complexity since 2007, revealing key trends, influential authors, and future research directions. Sharma (2024) identifies predominant themes, key journals, leading authors, top countries, and organizations in the economic freedom literature, offering valuable directions for future research.

Vásquez Coronado et al. (2024) underscores the need for sustainable resource management to mitigate the environmental impacts of economic growth, emphasizing the role of renewable energy sources and the need for policy interventions. Khayrullayevich (2024) explores the significant historical formation and current importance of socio-economic cooperation among Shanghai Cooperation Organization countries, highlighting key contributing factors. Aggarwal & Karwasra (2024) highlight the significant correlation between trade openness and economic growth, identifying key research trends, influential countries, and future research directions, particularly involving variables like technology and sustainable development.

Rafie & Hosseini (2024) identifies as the Economic Cooperation Organization (ECO) should foster a cultural identity similar to that of the European Union, promoting unity and progress within regional unions and aligning with constructivist identity formation theories. Afifi (2024) pointed out that fostering economic cooperation among Red Sea countries is paramount in light of increasing interconnectedness. This collaboration boosts individual economies and promotes regional stability, sustainable development, and mutual prosperity (Singh & Hasan, 2015).

Hettne & Söderbaum (2006) aims to shed light on its nuanced impacts on more robust and weaker economies, emphasizing the importance of balancing national interests with global cooperation for sustainable development. Nazzal et al. (2023) identify key contributors, journals, and research themes in FDI by MNCs in emerging economies, offering valuable insights for future studies and highlighting the field's conceptual and intellectual structures.

Khayrullayevich (2023) explored SCO's educational cooperation, initiated in 2006, which emphasizes joint efforts among member states, including information exchange, student and staff exchanges, and mutual recognition of educational documents. Gafurov, S. (2023) evaluates the evolving

geopolitical landscape, highlighting the resilience of Uzbekistan-EU cooperation amidst external challenges. It also underscores the potential for further collaboration, emphasizing mutual growth and stability.

Kirillov and Tolga (2023) analyzed that, despite their historical differences, Russia and Turkey's growing economic collaboration is a significant bilateral partnership responding to global economic uncertainty, potentially influencing regional and global dynamics. Azizi (2024). A dynamic framework emerges by synergizing the Belt and Road Initiative with the Shanghai Cooperation Organization, fostering economic integration, security collaboration, and socio-political cohesion across vast regions.

Golub (2024) explores different approaches to enhance consensus decision-making in international and regional organizations reveals challenges in achieving efficiency. Strategies include fostering shared values and creating inclusive mechanisms for collective decision-making to balance sovereignty and unity. Xin & Xin (2021) examines two decades of SCO economic cooperation in trade, investment, and finance, analyzing successes and challenges and exploring the integration of 'One Belt and One Road' and the 'Greater Eurasian Partnership'.

Sang (2021) offers a comprehensive analysis of 5,389 publications on business and economics in Vietnam, highlighting trends, influential works, author productivity, journal impact, and international research collaboration. Reisnezhad & Berenji (2022) explores the Shanghai Cooperation Organization's regionalism model, the transition from "guided" to "pervasive" regionalism, interactive patterns, convergence mechanisms, challenges, and perspectives, highlighting the evolving cooperation and mutual trust among its diverse member states. Htun & Fernandes (2023) examine the Shanghai Cooperation Organization (SCO) and its impacts on the Indian economy, highlighting prospects and challenges. The findings reveal that India's SCO membership offers more positive than negative impacts. Key prospects include energy cooperation, economic ties, and regional security, while the India-Pakistan rivalry poses a significant challenge. Strategic policy planning in trade, tourism, and energy is essential for maximizing benefits.

Wang et al. (2020) analyze the bibliometric data of the Economic Research-Ekonomiska Istra Zivanja journal from 2007 to 2019, revealing 831

publications. Hatemi-J et al. (2015) study examines G7 countries, while the second study evaluates the economic research output among the Shanghai Cooperation Organization (SCO) countries. Solarin (2016) investigated the relationship between research output and economic growth through a global analysis of 169 countries. Wei (2017) provides valuable insights into the contributions of different countries to the economic landscape and scholarly discourse within the SCO region. The study's results inform efforts to enhance the research capacities of developing countries and promote more significant equity and inclusiveness in economics.

Grammes et al. (2020) explored publications connected to the COVID-19 pandemic were obtained from the Web of Science and examined using the SciPE (science performance evaluation) web program, which allows for massive data scientometric assessments of the global geographical distribution of scientific output. According to the findings, the COVID-19 research landscape is fast evolving. It is driven by countries with a generally pre-pandemic solid research output but is also considerably influenced by countries with a high prevalence of COVID-19 cases. The study concluded with an observation that the United States is leading international collaboration initiatives.

Fang et al. (2018) revealed that academic publications and multidisciplinary collaboration have grown dramatically during the past 25 years. Australia, the US, Canada, New Zealand, and Europe have this discipline's most productive authors and institutions. The study identified the field's most critical research concerns, including climate change's effects on tourism, necessary adaptations, tourism industry susceptibility, tourist behaviour and demand in reaction to climate change, and tourism sector emission reductions. *Tourism Management*, *Climatic Change*, and *Environmental Impact Assessment Review* were the study's most referenced journals, keywords, and authors. The report emphasizes the need for ongoing research and collaboration to promote sustainable tourism and mitigate climate change's effects on the business.

Elam (2022) analyzed that the SCO has struggled to establish itself as a solid regional organization due to the power projection of its two prominent members, Russia and China, and the limitations of using a single-theoretical approach to understanding the organization. A multi-faceted critical approach incorporating both classical and new regionalist theories is necessary to fully understand the dynamics of the SCO and its role as a regional organization.



Gupta & Chauhan (2021) used bibliometric analysis to empirically assess current sharing economy (SE) research published between January 2015 and February 2020. To investigate the intellectual structure of 425 articles comprising 20,322 cited references, HistCite software was used to perform co-citation analysis, cluster analysis, and content analysis. The authors recognized the most influential and cited recent works and their role in developing the current SE literature. The chronological distribution of current SE papers, commonly used terms, and the most prominent authors was shown using data statistics. Six significant clusters of contemporary SE research were established regarding intellectual organization that represented core study concerns in this subject.

SCO (Xue, 2021) provides valuable insights into the organization's development and its economic research landscape. The findings from the economic research analysis highlight the significant growth in research output within the SCO countries, particularly in areas such as environmental sciences, economics, and interdisciplinary mathematics applications.

The study conducted by Tunga (2022), which applies Bradford's Law of Scattering to the Economics literature, reveals that journal articles (64.795%) are the predominant form of literature in the field, followed by books (22.011%) and working papers (5.972%). This suggests that scholarly journals are the primary channel for disseminating economic research. Chao (2022) focuses on China's involvement in the SCO's political economy, highlighting China's objectives, challenges, and strategies.

In the study conducted by Azmeh (2022), the MENA countries should prioritize enhancing the quality of research output, particularly in the identified research areas, to achieve the desired economic growth. In contrast, the SCO countries study underscores the significance of economic research in promoting economic cooperation within the organization. These findings suggest that fostering research output can positively impact economic growth and integration, providing valuable insights for policymakers in both regions. Capannelli et al. (2009) study highlights economic integration and cooperation in East Asian economies, comparing progress to the EU, but notes modest official cooperation due to political interests and cultural disparities.

Tripathi (2023) explores the academic literature on economic value added (EVA), examining its function, structure, calculation, and weaknesses. It identifies three main themes: residual income and valuation, financial performance, and performance management. Pourghaz (2023), in their study, investigates the simultaneous effect of research outputs on economic indicators such as inflation rate, unemployment rate, and GDP. It emphasizes the significance of considering a joint model that captures the interdependence between these variables. This study explores the trends and patterns in economic research output among the SCO countries. It identifies key contributors, institutions, subject areas, and journals in the field.

The main objective of this study is to evaluate the economic research output trends of Shanghai Cooperation countries.

- To find the country-wise individual share of economic research output from Shanghai Countries
- To identify the prolific institutions from Shanghai countries in terms of their economic research
- To identify top-ranked journals from Shanghai countries
- To find the top contributing countries to the economic research output from Shanghai countries
- To identify top authors from the Shanghai countries to the economic research output
- To identify the domain areas of interest for the economic research output
- To identify top keywords which are used for the economic research

The Shanghai Cooperation Organization (SCO) is a political and economic alliance of countries in the Eurasian region, founded in 2001. It comprises eight-member states: China, Russia, Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan, India, and Pakistan.

Here is a brief overview of the member countries:

1. China - The largest country in population and one of the world's largest economies. It is a major global power and significantly influences the region.

2. Russia - The world's largest country by land area, with a strong economy and a history of political and military power.
3. Kazakhstan - A country with a rapidly developing economy, rich in natural resources, particularly oil and gas.
4. Kyrgyzstan - A mountainous country with a largely agrarian economy and a strong tradition of nomadic culture.
5. Tajikistan - A country with a predominantly agricultural economy and a history of political instability.
6. Uzbekistan - A country with a rich cultural heritage and a rapidly developing economy, particularly in textiles and gold mining.
7. India - The world's largest democracy and one of the fastest-growing major economies, with a rapidly expanding middle class.
8. Pakistan - A country with a diverse economy, including agriculture, textiles, and a rapidly growing IT sector.

The SCO focuses on regional cooperation in areas such as security, trade, and cultural exchange and works towards promoting stability and development in the region (<https://dppa.un.org/en/shanghai-cooperation-organization>).

This type of scientometric analysis can provide valuable insights into the economic research output of the Shanghai Cooperation countries. By analyzing the top cited institutions, subject areas of research, cited references, top contributing countries, top cited authors, top cited journals, and top keywords used, it is possible to understand better the strengths and weaknesses of the economic research produced by these countries (Ketzler & Zimmermann, 2013). Additionally, analyzing the most frequent terms used in the abstracts of these research studies can provide further insights into the dominant themes and ideas being explored in economics (Vásquez Coronado et al., 2024). The results of this study could be beneficial not only to the Shanghai Cooperation countries themselves but also to the broader international community for further analysis and research. It could provide a benchmark for the quality and impact of economic research in these countries and help inform future research efforts and collaborations. Overall, a scientometric analysis of the economic research output of the Shanghai Cooperation countries can provide valuable insights into the field's current state and help identify areas for future growth and development.

## 2. Methodology

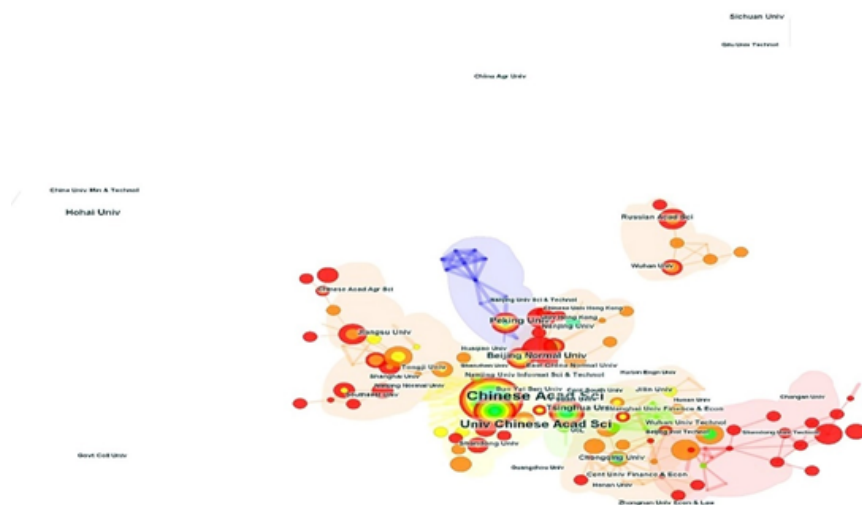
This study is a scientometric analysis of economic research output among the SCO countries. The data for the study was collected from the Web of Science database using Cite Space software. The search used the following keywords: economic, economic cooperation, and economic development. Only open-access publications were included in the study, and we limited our search to publications written in English. The SCO countries of Russia, Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan, India, Pakistan, and China were included in the study. We used bibliometric indicators to analyze the data, including the number of publications, citations, and co-citations. These indicators were used to identify patterns and trends in economic research output among the SCO countries, the most prevalent research areas, and the most influential authors, journals, and institutions in this field. We conducted our analysis using Cite Space software, allowing us to visualize the bibliometric data. These visualizations were used to identify clusters of related publications and the most influential publications in economic research among the SCO countries.

## 3. Results

The top ranked item by citation counts is The Chinese Academy of Sciences (2003) in Cluster #0, with citation counts of 67. The second one is The University of the Chinese Academy of Sciences (2017) in Cluster #0, with citation counts of 34. The third is Peking University (2007) in Cluster #6, with citation counts of 13. The 4th is Beijing Normal University (2012) in Cluster #4, with citation counts of 13. The 5th is Hohai University (2016) in Cluster #11, with citation counts of 13. The 6th is Tsinghua University (2017) in Cluster #5, with citation counts of 11. The 7th is Fudan University (2008) in Cluster #5, with citation counts of 8. The 8th is Jiangsu University (2021) in Cluster #2, with citation counts of 8. The 9th is Sichuan University (2021) in Cluster #12, with citation counts of 8. The 10th is Chongqing University (2014) in Cluster #1, with citation counts of 7.

**Table 1.** Top cited institutions

Citation Counts	Institutions
67	The Chinese Academy of Sciences, 2003
34	The University of the Chinese Academy of Sciences, 2017
13	Peking University, 2007
13	Beijing Normal University, 2012
13	Hohai University, 2016,
11	Tsinghua University, 2017
8	Fudan University, 2008
8	Jiangsu University, 2021
8	Sichuan University, 2021
7	Chongqing University, 2014



**Figure 1.** Top cited institutions

*Source:* Web of Science database

The top ranked item by citation counts is ENVIRONMENTAL SCIENCES (2007) in Cluster #0, with citation counts of 234. The second one is ENVIRONMENTAL STUDIES (2003) in Cluster #3, with citation counts of 156. The third is GREEN & SUSTAINABLE SCIENCE & TECHNOLOGY (2015) in Cluster #0, with citation counts of 132. The 4th is PUBLIC, ENVIRONMENTAL & OCCUPATIONAL HEALTH (2011) in Cluster #5, with citation counts of 54. The 5th is ENERGY & FUELS (2008) in Cluster #0,

with citation counts of 48. The 6th is MULTIDISCIPLINARY SCIENCES (2013) in Cluster #4, with citation counts of 41. The 7th is ECONOMICS (2008) in Cluster #2, with citation counts of 29. The 8th is MATHEMATICS, INTERDISCIPLINARY APPLICATIONS (2020) in Cluster #4, with citation counts of 26. The 9th is COMPUTER SCIENCE, INFORMATION SYSTEMS (2019) in Cluster #1, with citation counts of 24. The 10th is TELECOMMUNICATIONS (2019) in Cluster #1, with citation counts of 22.

**Table 2.** Subject areas of research

Total No. of citations	Subject area	No. of articles
234	Environmental sciences	16
156	Environmental studies	11
132	Green & sustainable science & technology	6
54	Public, environmental & occupational health	6
48	Energy & fuels	8
41	Multidisciplinary sciences	3
29	Economics	14
26	Mathematics, interdisciplinary applications	2
24	Computer science, information systems	9
22	Telecommunications	4



**Figure 2.** Subject areas of research

The top ranked research article by cited references is “Measuring the efficiency of decision-making units” with citation counts of 13. The second one is “Understanding China’s Belt & Road Initiative: Motivation, framework and assessment” with citation counts of 8. The third is “General diagnostic tests for cross-sectional dependence in panels” with citation counts of 8. The 4th is “Introduction to Spatial Econometrics” with citation counts of 8. The 5th is “A simple panel unit root test in the presence of cross-section dependence” with citation counts of 7.

**Table 3.** Based on cited references in the specific Domain

Citations	Title of the article	Author	Year	Source	DOI
13	Measuring the efficiency of decision-making units	Charnes A	1978	Eur J Oper Res	10.1016/0377-2217(78)90138-8
8	Understanding China’s Belt & Road Initiative: Motivation, framework and assessment	Huang YP	2016	China Econ Rev	10.1016/j.chieco.2016.07.007
8	General diagnostic tests for cross-sectional dependence in panels	Pesaran MH	2021	Empir Econ	10.1007/s00181-020-01875-7
8	Introduction to Spatial Econometrics	LeSage J	2009	Stat Text Monogr	
7	A simple panel unit root test in the presence of cross-section dependence	Pesaran MH	2007	J Appl Economet	10.1002/jae.951
7	Toward a New Conception of the Environment-Competitiveness Relationship	Porter Me	1995	J Econ Perspect	10.1257/jep.9.4.97
7	Environmental challenges for the Belt and Road Initiative	Ascensao F	2018	Nat Sustain	10.1038/s41893-018-0059-3
7	Economic Growth and the Environment	Grossman GM	1995	Q J Econ	10.2307/2118443
7	Science Mapping: A Systematic Review of the Literature	Chen CM	2017	J Data Info Sci	10.1515/jdis-2017-0006
6	Productivity and Undesirable Outputs: A Directional Distance Function Approach	Chung YH	1997	J Environ Manage	10.1006/jema.1997.0146



**Figure 3.** Based on cited references in the specific Domain

The top ranked country based on citation is Peoples R China having citation counts of 530 with 42 research articles. The second one is USA having citation counts of 66 with 35 research articles. The third is England having citation counts of 47 with 37 research articles. The 4th is Pakistan having citation counts of 34 with 23 research articles. The 5th is England having citation counts of 47 with 37 research articles. The 4th is India having citation counts of 32 with 42 research articles.

**Table 4.** Top countries

Citations	Countries	No. of articles
530	Peoples R China	42
66	USA	35
47	England	37
34	Pakistan	23
32	India	42
27	Russia	16
18	South Korea	24
18	Australia	15
11	Japan	13
10	Canada	12





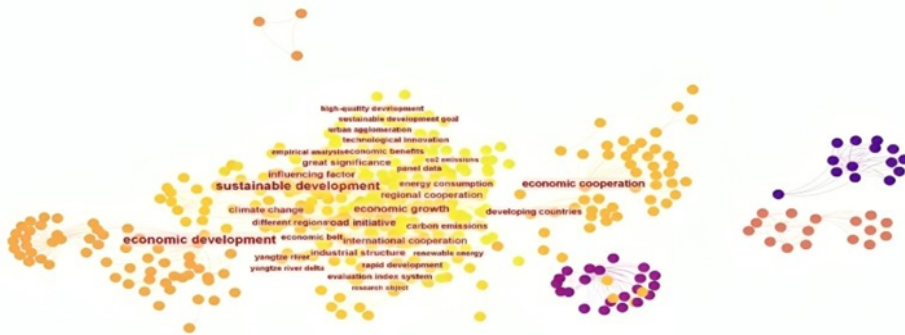


Figure 5. Most frequent used term in abstracts

The most frequent used concept of research in the field, based on timeline started with the concept economic development in 2003. At the end of 2022 major concepts for research in the field are technological innovation, sustainable development, renewable energy, carbon emissions etc.

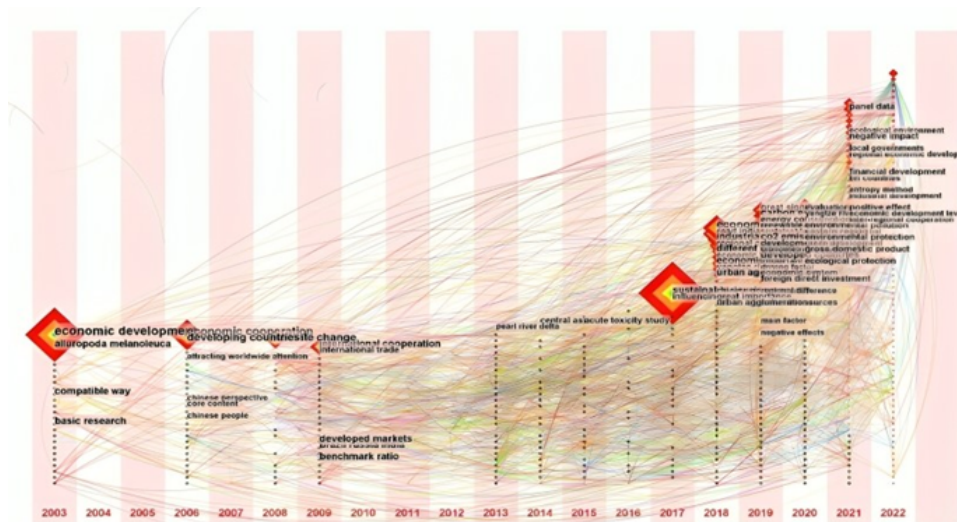
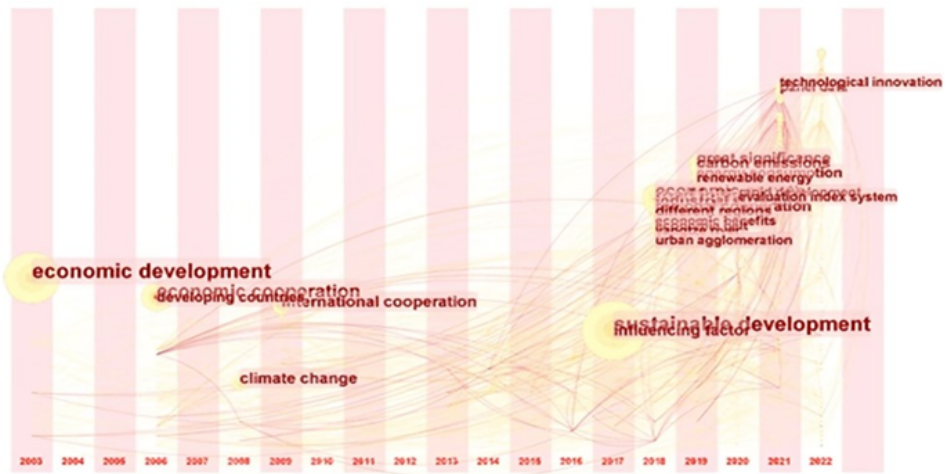


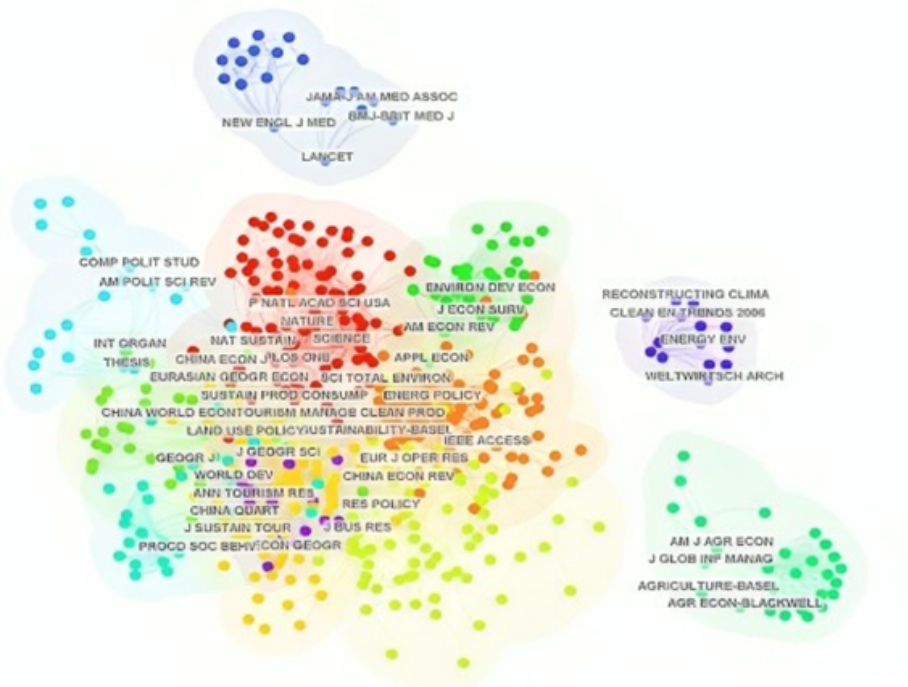
Figure 6. Timeline based on use



**Figure 7.** Timeline based on citation

**Table 6.** Top Cited journals

Citations	Journal titled
247	Sustainability Basel journal
227	The Journal of Cleaner Production
151	Energy policy journal
131	Science of the Total Environment journal
115	Renewable and Sustainable Energy Reviews
114	Environmental Science and Pollution Research
111	The Journal of Environmental Management
107	Ecological economics
98	ENERGY
90	SCIENCE
86	Ecological Indicators
85	Energy Economics
85	Applied Energy
85	International Journal of Environmental Research and Public Health
83	Technological Forecasting and Social Change
81	PLOS ONE
80	NATURE
73	Proceedings of the National Academy of Sciences of the USA
64	The American Economic Review
62	Journal of Geographical Sciences



**Figure 8.** Top Cited journals

The top cited journals by cited references is ‘Sustainability Basel journal’ with citation counts of 247. The second one is ‘The Journal of Cleaner Production’ with citation counts of 227. The third is ‘Energy policy journal’ with citation counts of 151. The 4th is ‘Science of the Total Environment journal’ with citation counts of 131. The 5th is ‘Renewable and Sustainable Energy Reviews’ with citation counts of 115.

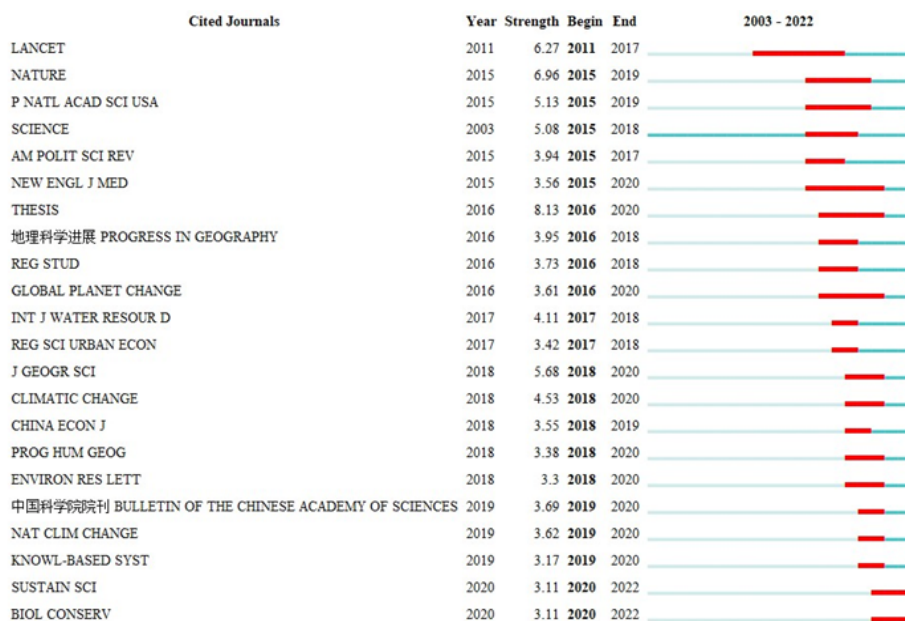


Figure 9. Top 22 journals with the strongest citation bursts

Based on the Top 22 journals with the strongest citation bursts, The Lancet has the highest citation burst strength from 2011 to 2017, with a strength of 6.27. Nature has the second-highest citation burst strength from 2015 to 2019, with a strength of 6.96. PNAS (Proceedings of the National Academy of Sciences of the United States of America) has the third-highest citation burst strength from 2015 to 2019, with a strength of 3.13. Science has the fourth-highest citation burst strength from 2003 to 2022, with a strength of 5.08. The American Political Science Review has a strong citation burst from 2015 to 2018, with a strength of 3.94. The New England Journal of Medicine has a strong citation burst in 2015. Thesis has a strong citation burst in 2016. Progress in Human Geography has a strong citation burst in 2018. Environmental Research Letters has a strong citation burst in 2018. The China Economic Journal has a strong citation burst in 2018. Global Planet Change has a strong citation burst in 2016. The International Journal of Water Resources Development has a strong citation burst in 2017. Regional Science and Urban Economics has a strong citation burst in 2017. The Journal of Geographical Sciences has a strong citation burst in 2018. Climatic Change has a strong citation burst in 2018. The Bulletin of the Chinese Academy of

Sciences has a strong citation burst in 2019. Knowledge-Based Systems has a strong citation burst in 2019-2020. Nature Climate Change has a strong citation burst in 2019-2020. Sustain Science has a strong citation burst in 2020. Biological Conservation has a strong citation burst in 2022.

## 4. Discussion

The findings of this study reveal several important insights into the economic research output among the Shanghai Cooperation Organization (SCO) countries. Firstly, it is evident that there has been significant growth in economic research output over the years. This growth can be attributed to the contributions of various institutions and authors within the SCO countries. This suggests a growing interest and emphasis on economic research and cooperation within the region.

The analysis of citation counts highlights the dominance of Chinese institutions in terms of research impact. The Chinese Academy of Sciences stands out as the most cited institution, indicating its significant contribution to the economic research output among the SCO countries. This suggests that China has established a strong research infrastructure and expertise in the field of economics within the SCO region. The most researched areas of interest within the economic research output of the SCO countries are environmental sciences and studies, followed by green and sustainable science and technology, public and occupational health, economics, and interdisciplinary mathematics applications. This reflects the growing importance of sustainable development, environmental considerations, and interdisciplinary approaches in the economic research conducted by the SCO countries. It indicates a shift towards a more holistic and multidimensional understanding of economic development.

The frequent usage of terms such as economic development and cooperation in the abstracts of economic research output from the SCO countries further emphasizes the focus on enhancing economic cooperation and integration within the region. This aligns with the goals and objectives of the SCO in promoting economic collaboration among its member states. The top cited journals in the economic research output of the SCO countries include Sustainability Basel journal, The Journal of Cleaner Production, Energy policy journal, Science of the Total Environment journal,

and Renewable and Sustainable Energy Reviews journal. These journals specialize in areas such as sustainability, cleaner production, energy policy, and environmental science. The presence of these journals indicates the relevance of these subject areas in the economic research conducted by the SCO countries.

The concepts of research within the field have evolved over time, starting with a focus on economic development and expanding to include technological innovation, sustainable development, renewable energy, and carbon emissions, among others. This demonstrates a shift towards addressing contemporary issues and challenges in economic development and cooperation among the SCO countries. It indicates a growing recognition of the importance of incorporating technological advancements and sustainability considerations in economic research. China emerges as the top contributing country to the economic research output of the SCO countries, followed by Russia and Kazakhstan. This highlights the significant role played by China in driving economic research and cooperation within the SCO region. However, it is worth noting that countries like the USA, England, Pakistan, and India also contribute substantially to the economic research output, showcasing the diverse participation and collaboration among countries beyond the SCO.

While the findings provide valuable insights, it is important to acknowledge the limitations of this study. The use of the Web of Science database may result in the exclusion of relevant economic research publications not indexed in this database. Additionally, the restriction to open access publications written in English may introduce language and publication bias, limiting the generalizability of the results to the entire SCO region. Future research could consider using multiple databases and search strategies, including publications in multiple languages, to overcome these limitations. The use of bibliometric indicators, while useful for identifying patterns and trends, may not capture the full scope of economic research within the SCO countries. The exclusion of unpublished works, research reports, and grey literature may limit the comprehensiveness of the analysis. Moreover, the potential for self-citation bias should be acknowledged, as it may overestimate the influence of certain institutions or authors within the field of economic research in the SCO countries. Despite these limitations, this study provides valuable insights into the economic research output among the SCO countries and emphasizes the importance of

economic cooperation and development in the region. The findings contribute to the existing body of knowledge on economic research within the SCO countries and can serve as a basis for future research

Shanghai Cooperation countries have shown significant growth in economic research output over the years, with several institutions and authors contributing to this growth. The top-ranked institutions by citation counts are from China, with The Chinese Academy of Sciences being the most cited. Environmental sciences and studies are the most researched areas of interest, followed by green and sustainable science and technology, public and occupational health, economics, and interdisciplinary mathematics applications. Economic development and cooperation are the most frequently used terms in abstracts related to economic research output from Shanghai Cooperation countries. The top cited journals are Sustainability Basel journal, The Journal of Cleaner Production, Energy policy journal, Science of the Total Environment journal, and Renewable and Sustainable Energy Reviews journal. The most frequently used concepts of research in the field began with economic development in 2003 and have since evolved to include technological innovation, sustainable development, renewable energy, and carbon emissions, among others.

China has been the top contributing country to the economic research output from Shanghai Cooperation countries, followed by the USA, England, Pakistan, and India. The study revealed that the top cited institutions in the economic research output of the Shanghai Cooperation countries were from universities and research institutions in China, Russia, and Kazakhstan. The analysis also found that the most popular subject areas in the economic research output were related to economics and trade, followed by finance and investment, and then energy and resources. Furthermore, the study revealed that China was the top country-wise contributor to the economic research output of the Shanghai Cooperation countries, followed by Russia and Kazakhstan. The top authors in the field were also predominantly from China and Russia, with a small number of authors from other Shanghai Cooperation countries.

The study also found that the most frequently published journals in the economic research output of the Shanghai Cooperation countries were those that specialize in economics, trade, and finance. The authors concluded that the economic research output of the Shanghai Cooperation countries showed a strong focus on economic cooperation and trade, which is in line



with the organization's aim to promote economic cooperation and integration among its member states. Overall, the use of cite space software to analyze the economic research and publication output of the Shanghai Cooperation countries provides valuable insights into the current state and future directions of economic research and cooperation in the region.

## 5. Conclusions

The findings from the analysis of economic research output among Shanghai Cooperation countries suggest a growing interest in environmental sciences, green and sustainable science and technology, public and occupational health, and interdisciplinary mathematics applications. The top-ranked institutions by citation counts are from China, and economic development and cooperation are the most frequently used terms in abstracts related to economic research output from the region. While the study provides valuable insights into the economic research output of the SCO countries, it is important to note the limitations of the study, including the use of the Web of Science database and the potential for language and publication bias. Despite these limitations, the study highlights the importance of economic cooperation and development among the SCO countries and offers potential directions for future research.

Overall, the analysis demonstrates the growing importance of economic research and cooperation among Shanghai Cooperation countries and suggests opportunities for collaboration in areas such as environmental science, sustainable technology, and public health. As the region continues to evolve and develop, further research can help inform policies and initiatives to promote economic integration and cooperation among member states. In the study conducted by Azmeh (2022), the MENA countries should prioritize enhancing the quality of research output, particularly in the identified research areas, to achieve the desired economic growth, whereas the SCO countries study underscores the significance of economic research in promoting economic cooperation within the organization. Together, these findings suggest that fostering research output can positively impact economic growth and integration, providing valuable insights for policymakers in both regions. While the study provides valuable insights into the economic research output of the Shanghai Cooperation Organization (SCO) countries, there are several

limitations to consider. One limitation is the use of the Web of Science (WoS) database, which may not include all relevant economic research publications. Additionally, limiting the study to publications written in English may have resulted in language and publication bias, potentially leading to the exclusion of valuable economic research published in other languages and making the results less generalizable to the entire SCO region.

Moreover, the use of bibliometric indicators, while useful for identifying patterns and trends, may not capture the full scope of economic research within the SCO countries. Another limitation to consider is the potential for self-citation bias, as authors from the same institutions may cite each other's work more frequently than the work of authors from other institutions. This could lead to an overestimation of the influence of certain institutions or authors within the field of economic research in the SCO countries. Despite these limitations, the study provides valuable insights into the economic research output among the SCO countries and highlights the importance of economic cooperation and development in the region. Future research could address these limitations by using multiple databases and search strategies, including publications in multiple languages, and exploring additional indicators of research impact beyond bibliometrics.

### **Authors' contributions**

Vijesh P V: Conceptualization and drafting the original manuscript. Varghese Joy: methodology and formal data analysis. Jobin Jose: validation and drafting-revising and editing the manuscript. Saran Murali: drafting-revising and editing the manuscript.

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### **Data Availability Statement**

The data supporting the findings of this study were obtained from the Web of Science database, which requires a subscription. Access to the data is available through institutional subscription to the Web of Science database. The authors used this database for data retrieval and analysis in the development of this manuscript.

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## Conflicts of Interest

The authors declare that they have no conflicts of interest.

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