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THE CHINESE SOCIAL CREDIT SYSTEM: A BIBLIOMETRIC STUDY IN SCOPUS WITH BIBLIOMETRIX AND ON THE LATTES PLATFORM WITH SCRIPTLATTES AND VOSVIEWER

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ABSTRACT

The exploratory and descriptive research aimed to identify the areas of knowledge, authors, institutions, scientific production, co-authorship networks and themes that involve the Chinese social credit system. The methodology used was Bibliometrics, using Scopus and the Lattes Platform as sources of information, as well as digital tools for data collection, analysis, and visualization: Bibliometrix, scriptLattes and VOSviewer.

The results revealed that this topic is relatively new and emerging. The area of Social Sciences stood out in terms of volume of scientific production. The converging themes between the samples of the two databases were ethics, governance, and big data.

Keywords: Social Credit System. Scopus. Bibliometrix. Lattes Platform. scriptLattes.

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INTRODUCTION

The China's social credit system (社会信用体系 *shehui xinyong tixi*) was launched in 2014 with the intention of evaluating and qualifying the reliability of citizens and businesses in relation to their ability to repay bank loans, in addition to a set of activities that include, for example, respect for laws, policies, and moral conduct in the face of certain situations. The proposed classification of the system covers four areas: administrative, business, social behavior, and law enforcement (Cabestan, 2020).

The subprime mortgage crisis in the United States in 2008 was one of the factors that contributed to the implementation of a credit information system in China, aimed at expanding the scope of credit risk analysis. According to the Chinese government, American banks had a limited range of information and therefore did not adequately assess the risk associated with loans. In view of this, the Chinese system needed to address the level of trust granted to everyone, making it important to increase the level of morality among citizens as a precaution (Prisque, 2020).

The social credit system plan pointed to socioeconomic problems in China, from food quality and safety to academic dishonesty. Some of these problems may be the result of a lack of strict regulation for people who break social trust (信用– *xìnyòng*). To solve some of these problems, a system capable of collecting data on the credibility and trustworthiness of all people and institutions would be necessary, as well as serving as a benchmark for creating a reward mechanism, called a redlist, and a punishment mechanism, called a blacklist (Liu, 2019).

The proposed Chinese model for a credit information system can be considered a mass social experiment seeking to change the relationship between the moral and economic domains in an era of digital platforms. Technology would be the basis for transforming the human behavior of social actors who act as a test subject in service of state objectives to modify the social environment (Bach, 2020).

It is worth considering that the credit system has apparently converged with the informatization plan in China, since in 2015 an action plan was published to promote the development of big data with the intention of strengthening the service and supervision of market entities (State Council, 2015; Creemers, 2018). In practical terms, this plan envisioned the use of big data to monitor behavior in different market segments, prioritizing areas such as food safety, pharmaceuticals, and production in general.

OBJECTIVES

Face of contradictions and challenges surrounding this vast information system, Bibliometric research aims to explore the Scopus and Lattes Platform databases to map the authors, areas of knowledge, institutions, co-authorship networks, and themes related to the China's social credit system that can be identified in the analysis of scientific production data. In this way, it would be possible to point out the interest in this issue from academic community internationally, based on data from Scopus, and in Brazil, derive data from the Lattes Platform.

LITERATURE REVIEW

In China, there are countless stories about filing systems involving public employees and citizens. The filing system called *dăng'àn* (檔案館) was introduced during the Mao Zedong era (1949-1976) to continue the personal filing procedures of the Chinese imperial period, expanding its scope to include files from government bureaucrats to documents from ordinary citizens (Yang, 2011; Liang et al., 2018).

Dăng'àn system can be considered a basic socialist database model, authorized by the Chinese Communist Party (CCP) to examine and contextualize the daily lives of Chinese people. The filing system could reveal the internal bureaucratic workings of the state on individuals during Maoist socialism. The personal dossier consisted of records for each employee regarding their academic background (teacher reports), professional history (employer reports), ancestry (family reports), achievements, awards, mistakes, self-criticism, among other things (Yang, 2011; Liang et al., 2018; Jiang, 2020).

For Chinese Communist Party employees, the filing system was crucial for career advancement, whereas for the average citizen, files could pose a risk to their professional life. Therefore, the *dăng'àn* became a powerful information archive as it allowed state policy to penetrate the intimate aspects of each person's life (Yang, 2011).

Another important filing system for social management was the called *hùkŏu* (户口), which was initiated in 1958 and used for migration control. This system consisted of two types of records about the population's residence: 1) place of residence, based on the individual's place of birth; and 2) rural or non-rural classification status. Both classifications served the purpose of managing and redistributing resources, but they were also symbolic, as they aimed to sustain a social order and legitimize state governance (Liang et al., 2018).

Apparently, the China's social credit system is connected to the *dăng'àn* filing system, in the sense that it is an extension of this information system, encompassing records of public employees, individuals, and legal entities, with the purpose of monitoring and evaluating the behavior of these groups of social actors (Creemers, 2018; Liang et al., 2018).

Although there is a history of filing and classification systems, which in a way demonstrates the use of social management procedures by the Chinese state, the construction of a credit information system stems from economic reforms and China's negotiations with the international community to join the World Trade Organization in 2001. Because of the interaction between Americans and Chinese, Washington requested Beijing to develop a credit information system that would allow American companies to know their Chinese counterparts (Prisque, 2020).

Amid the advance of globalization and the demand for deregulation in the early 2000s, the credit information system was introduced to support economic reforms, with the intention of reducing loan defaults and improving the credit rating mechanism. The credit system was initially conceived as a project focused on facilitating financial exchanges and transactions between China and the outside world, and subsequently, the system transformed into a broad social management project encompassing government, judicial, commercial, and social matters (Liang et al., 2018; Prisque, 2020).

Between the 12th Five-Year Plan (2011-2015) and the 13th Five-Year Plan (2016-2020), the Chinese government launched the outline of the social credit system plan (2014-2020), based on the premise that good credit requires the development of a healthy socio-economic environment, and also pointed out that a lack of integrity and trust hinders market development, disrupts social order, and impairs national progress (State Council, 2014).

The social credit system is technically complex due to the variety of data and fragmentation of initiatives at the local and regional levels, increasing the difficulty of national integration. In addition to these challenges, there is the added difficulty of expanding digitization, computerization, and data standardization at the local level (Drinhausen; Brussee, 2021).

Although the deadline for implementing the social credit system ended in 2020, the information system did not achieve full digitization and integration. Therefore, the government indicated the continuation of the system's implementation in the 14th five-year plan (2021–2025), and also demonstrated interest in structuring a national data-sharing platform covering the areas of taxation, justice, water, electricity, gas, social security, as well as information capable of extending access to credit for small, medium, and micro-enterprises.

It is worth highlighting that at the end of 2022, the Chinese government launched the Data Twenty initiative, which presents twenty important points for the development of a data- driven information system with the intention of enabling the growth of a digital economy. Beijing has embraced the idea that data is the new oil, in addition to the fact that China possesses the advantage of a vast amount of data and know-how to build an environment that allows the use of data in such a way as to provide a great advance for the country (State Council, 2022).

METHODOLOGY

This exploratory and descriptive research aims to clarify the issue of the China's social credit system by detailing information identified in the mapping of scientific production in the Scopus and Lattes Platform databases, used in the development of the study (Gil, 2002). Figure 1 shows the investigation process to answer the research questions, carried out in Draw.io, a Diagram and flowchart editor.

The questions used as parameters for conducting the research were five: 1) What areas of knowledge have researched the social credit system? 2) Where are the researchers from the main institutions located (country, region, and state)? 3) What is the volume of scientific production (quantity, titles, etc.) on the subject? 4) Is there any co-authorship network among researchers? 5) What are the frequent terms related to the China's social credit system?

The chosen methodology was Bibliometrics because it studies the quantitative aspects of the production, dissemination, and use of scientific information (Macias-Chapula, 1998). This method aims to examine the relationships between different variables, such as human resources, articles, journals, and book chapters, as well as the production, consumption, and distribution of documents, with regard to, for example, citations and the number of authors per article (Braga, 1974).

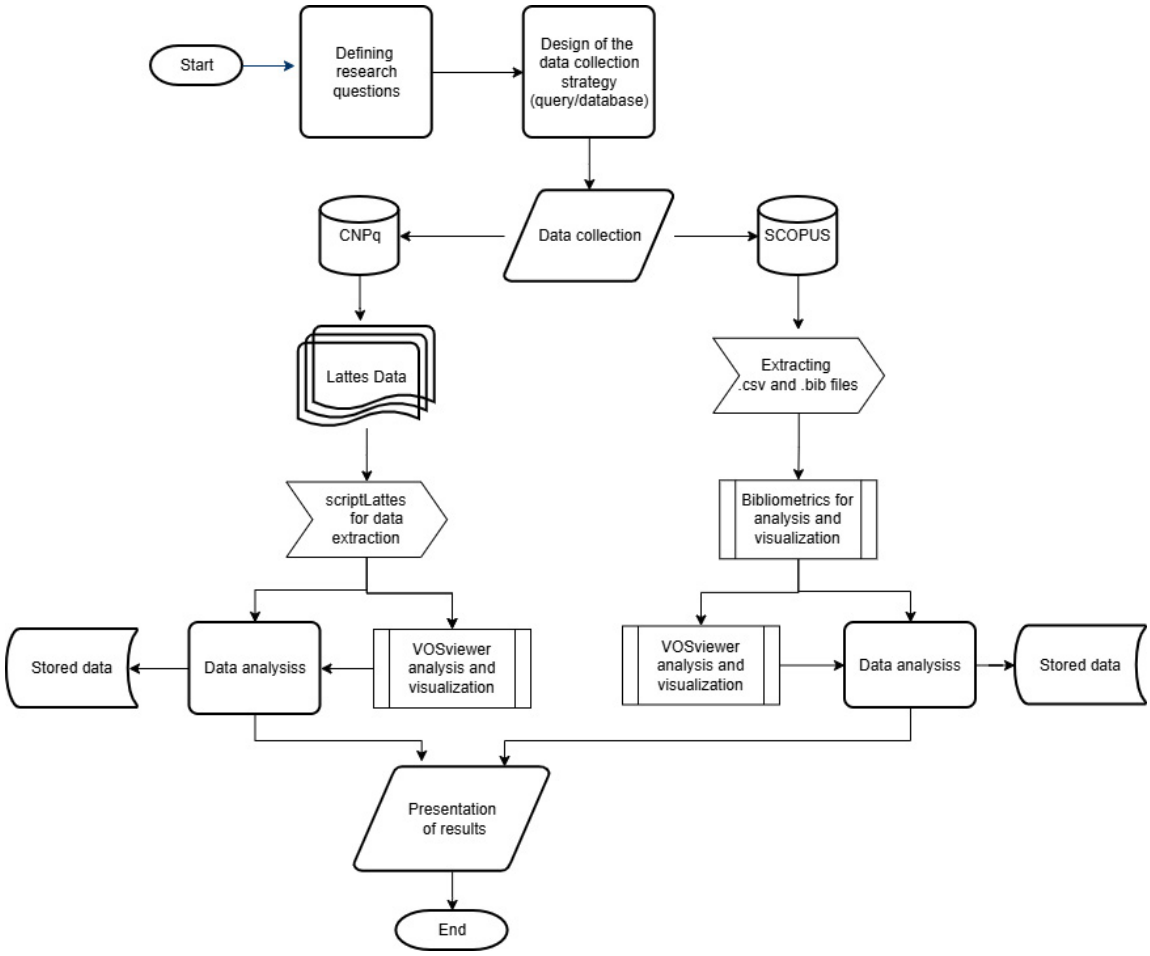


Figure 1. Research development diagram

Source: The Authors. Created in Draw.io (2023).

The sources of information explored in the study were two: 1) Scopus, an international database from Elsevier that covers abstracts and citations organized by experts with enriched data associated with academic literature in a variety of disciplines, such as: Social Sciences, Arts, Humanities, Public Health, Engineering, and others. 2) Lattes Platform, a database developed and maintained by the Brazilian Council for Scientific and Technological Development (acronym in Portuguese CNPq), consisting of data on the scientific and academic achievements of students, professors, researchers, and professionals, as well as institutions and research groups involved with the areas of Science and Technology in Brazil.

For data analysis, three digital tools were chosen: 1) Bibliometrix [1], an open-source software written in the R statistical language with libraries that provide a set of quantitative analyses based on Bibliometric methods (Aria; Cuccurullo, 2017; Dervis, 2019). 2) scriptLattes [2], an open-source

1 Bibliometrix. https://www.bibliometrix.org/home/

2 scriptLattes. https://scriptlattes.sourceforge.net/

software developed in Python that allows the download of Lattes curricula (in HTML format), data extraction, and generation of reports that can be used to understand patterns of academic activities (Mena-Chalco; Cesar Junior, 2009). 3) VOSviewer [3]version 1.6.19, a digital tool for building and visualizing Bibliometric networks. These networks are composed of nodes and edges, where nodes can be publications, journals, researchers, or terms. While edges indicate the relationships between pairs of nodes, as well as the intensity of the relationship (Van Eck; Waltman, 2007).

The first part of the investigation involved six steps: 1) Data collection in Scopus [4]using the English search term "*china social credit system*" (without quotation marks), indefinite period, and restricted to title, abstract, and keyword. 2) Downloading the data in .bib format. 3) Downloading and installing the R Studio program and the R Bibliometrix package. 4) Opening the analysis environment using Biblioshiny. 5) Uploading the dataset in .bib format for data analysis in Bibliometrix. 6) Downloading the results from the author collaboration network for application of VOSviewer for co-authorship analysis and visualization.

Bibliometrix analyses encompass three data options: 1) Information sources: most relevant sources, most cited local sources, Bradford's Law, and source impact. 2) Authors: authors' output over time, most relevant authors, Lotka's Law, author impact, most relevant affiliations, corresponding author's country, scientific output by country, and most cited countries. 3) Documents: most cited references, most cited documents, reference spectroscopy, most frequent words, word cloud, treemap, word dynamics, and topic trends (Abbas et al., 2022). The Reference Publication Year Spectroscopy (RPYS) technique is based on analyzing the frequency with which references are cited in publications within a specific research field (Rhaiem; Bornmann, 2018).

The second part of the study was divided into three phases: 1) Data collection on the Lattes Platform using the Portuguese search term "*sistema de crédito social chinês*" and the English search term "*china social credit system*", without quotation marks, indefinite duration, restricted by subject, database of PhDs and other researchers with Brazilian nationality. 2) Download, installation of the Linux virtual machine and testing of scriptLattes. 3) Extraction of Lattes curricula, analysis and generation of reports in scriptLattes.

The scriptLattes was designed to compile data and generate reports such as, for example, a list of bibliographic, technical and artistic productions; academic supervisions organized by type and in chronological order; a list of research projects, awards and titles; the creation of co-authorship graphs (networks) among the members of a specific group and a geolocation map of researchers which are registered on the Lattes Platform (Mena-Chalco; Cesar Junior, 2013).

3 VOSviewer. https://www.vosviewer.com/

4 Both data collections were carried out on October 5, 2022.

SCOPUS RESULTS WITH BIBLIOMETRIX

The result of retrieving information using the search term "*china social credit system*" was 299 documents in Scopus. After processing the data in a Google Sheets spreadsheet, 13 items were excluded due to lack of title and author, resulting in a final total of 286 documents for analysis.

The first analysis of Scopus data focused on the authors' areas of knowledge, affiliations, countries, and number of documents, as exhibited in Table 1 below.

Table 1. Main authors, areas of knowledge, institutions, countries, and number of documents.

Authors	Area of Knowledge	Affiliation	Country	Number of Documents
Grossklags, Jens	Computer Science	Technical University of Munich	Germany	5
Chen, Mo	Social Sciences/ Political Economy	Technical University of Munich	Germany	5
Kostka, Genia	Social Sciences/ Chinese Politics	Free University of Berlin	Germany	4
Engelmann, Severin	Computer Science	Technical University of Munich	Germany	3
Kerremans, Bart	Social Sciences/ Political Science	KU Leuven	Belgium	2
Belis, David	Social Sciences/ Political Science	KU Leuven	Belgium	2
Chen, Qingyi	Computer Science	Renmin Business School	China	2
Cui, Caiyun	Computer Science	North China Institute of Science and Technology	China	2
Liu, Yong	Computer Science	Zhejiang University of Science and Technology	China	2
Tan, Rong	Computer Science	Shanghai Business School	China	2
Zhang, Jing	Computer Science	Shanghai Business School	China	**2**
Liang, Fan	Social Sciences/ Digital Media	Duke Kunshan University	China	**2**
Zhang, Qi	Social Sciences/ Economy	China Petroleum University - Beijing	China	**2**
Zhou, Li	Mathematics	Minzu University of China	China	**2**
Jiang, Min	Social Sciences/ Social Communication	University of North Carolina at Charlotte	United States	**2**
Rajan, Raghuram G.	Social Sciences/ Economy	University of Chicago	United States	**2**
Raghunath, Nilanjan	Social Sciences/ Sociology	Singapore University of Technology and Design	Singapore	**2**
Creamers, Rogier	Social Sciences/ Right	Leiden University	Netherlands	**1**
de Prisque, Emmanuel D.	Social Sciences/ Business and Management	Thomas More Institute	France	**1**
Cabestan, Jean P.	Social Sciences/ Political Science	Hong Kong Baptist University	Hong Kong	**1**

Source: Scopus sample (2022).

It was noted that the authors' areas of expertise were divided into two major areas: Social Sciences (Political Science, Communication, Law, Economics, Management, and Sociology), and Exact and Earth Sciences (Computer Science and Mathematics). It should be added that the most relevant areas of expertise by quantity in the overall sample were the following: Social Sciences (120), Computer Science (77), Engineering (64), Business, Management and Accounting (54), Economics (41), Environmental Science (39), Energy (25), Mathematics (19), Decision Sciences (17), and Arts and Humanities (16).

It was observed that among the countries related to the authors' affiliations, China and Germany had the highest volume, followed by Belgium and the United States, demonstrating the interest in the issue on the part of Western countries. Regarding the overall production by country in the sample, the ten countries with the highest number of documents were: China (277), United States (56), United Kingdom (21), Germany (17), Australia (12), Netherlands (10), Japan (7), France (5), Singapore (5), and Turkey (5). The production on the topic in other countries was surprising, in consequence of the object of study was Chinese, with the order shown by volume of records indexed in the database.

The second analysis of Scopus data focused on scientific output, the 20 most cited documents, authors, and scientific journals are demonstrated in Table 2 below.

Table 2. Most cited documents, authors and journals.

Title	Author	Periodical	Year	Total Citations	Average Citations/Year
Globalization of the Amazon soy and beef industries: opportunities for conservation.	Daniel C Nepstad, Claudia M Stickler, Oriana T Almeida	Conservation Biology	2006	366	21.53
Constructing a Data-Driven Society: China's social credit system as a State Surveillance Infrastructure.	Fan Liang, Vishnupriya Das, Nadiya Kostyuk, Muzammil M. Hussain	Policy & Internet	2018	121	24.20
A comparative review of environmental concern prioritization: LEED vs other major certification systems.	Ozge Suzer	Journal of Environmental Management	2015	93	11.63
China's social credit systems and public opinion: Explaining high levels of approval.	Genia Kostka	New Media & Society	2019	88	22.00
Chinese social media and Big Data: Big Data, Big Brother, Big Profit?	Min Jiang, King- Wa Fu	Policy & Internet	2018	38	7.60
The time-varying impacts of government incentives on innovation.	JingJing Zhanga, Jiancheng Guan	Technological Forecasting and Social Change	2018	38	7.60
Stock market volatility and bank performance in China.	Yong Tan, Christos Floros	Studies in Economics and Finance	2012	33	3.00
Comprehensive Approach to Open Access Publishing: Platforms and Tools.	Armen Yuri Gasparyan, Marlen Yessirkepov, Alexander A. Voronov, Anna M. Koroleva, George D. Kitas	Journal of Korean Medical Science	2019	27	6.75
Dynamic optimization management of the dual-credit policy for passenger vehicles.	Yaoming Li, Qi Zhang, YanyanTang, Benjamin Mclellan, Huiying Ye, Hiroshi Shimoda, Keiichi Ishihara	Journal of Cleaner Production	2020	26	8.67

Table 2. Cont.

Title	Author	Periodical	Year	Total Citations	Average Citations/Year
The gamification of trust: the case of China's "social credit".	Zahy Ramadan	Marketing Intelligence & Planning	2018	26	5.20
China's food security: past success and future challenges.	Gregory Veeck	Eurasian Geography and Economics	2013	25	2.50
Not Just Another Shadow Bank: Chinese Authoritarian Capitalism and the 'Developmental' Promise of Digital Financial Innovation.	Julian Gruin, Peter Knaack	New Political Economy	2020	24	8.00
Clear Sanctions, Vague Rewards: How China's social credit system Currently Defines "Good" and "Bad" Behavior.	Severin Engelmann, Mo Chen, Felix Fischer, Ching -yu Kao, and Jens Grossklags	Proceedings of the Conference on Fairness, Accountability, and Transparency	2019	24	6.00
Cashless China: Securitization of everyday life through Alipay's social credit system - Sesame Credit.	Gladys Pak Lei Chong	Chinese Journal of Communication	2019	23	5.75
The 7 Cs of rural credit in China.	Calum G. Turvey, Guangwen He, Rong Kong, Jiujie Ma, Patrick Meagher	Journal of Agribusiness in Developing and Emerging Economies	2011	23	1.92
How private enterprises establish organizational legitimacy in China's transitional economy.	Tianli Feng, Guofeng Wang	Journal of Management Development	2010	23	1.77
Datafication, dataveillance, and the social credit system as China's new normal.	Claire Seungeun Lee	Online Information Review	2019	22	5.50
Controlling GHG emissions from the transportation sector through an ETS: institutional arrangements in Shenzhen, China.	Jingjing Jiang, Bin Ye, Xiaoming Ma, Lixin Miao	Climate Policy	2016	21	3.00
Beyond surveillance capitalism: Privacy, regulation and big data in Europe and China.	Brett Aho, Roberta Duffield	Economy and Society	2020	20	6.67
We're just data: Exploring China's social credit system in relation to digital platform ratings cultures in Westernized democracies.	Karen Li Xan Wong, Amy Shields Dobson	Global Media and China	2019	20	5.00

Source: Scopus sample (2022)

Among the 20 most cited documents, 7 titles are directly related to the China's social credit system and five academics were identified - Genia Kostka (Free University of Berlin, Germany), Severin Engelmann (University of Munich, Germany), Mo Chen (University of Munich, Germany), Jens Grossklags (University of Munich, Germany), and Fan Liang (Duke Kunshan University, China) - who can be considered the main authors in relation to academic production on the subject in this Scopus sample, this production being relatively recent (2018 and 2019).

Regarding scientific journals, it was possible to recognize that most are related to the areas of Social Sciences such as Economics, Political Science, Management and Communication (Media, Information, Marketing).

The third data analysis from Scopus was on the collaboration network between authors carried out in VOSviewer and the graph presented in Figure 2.

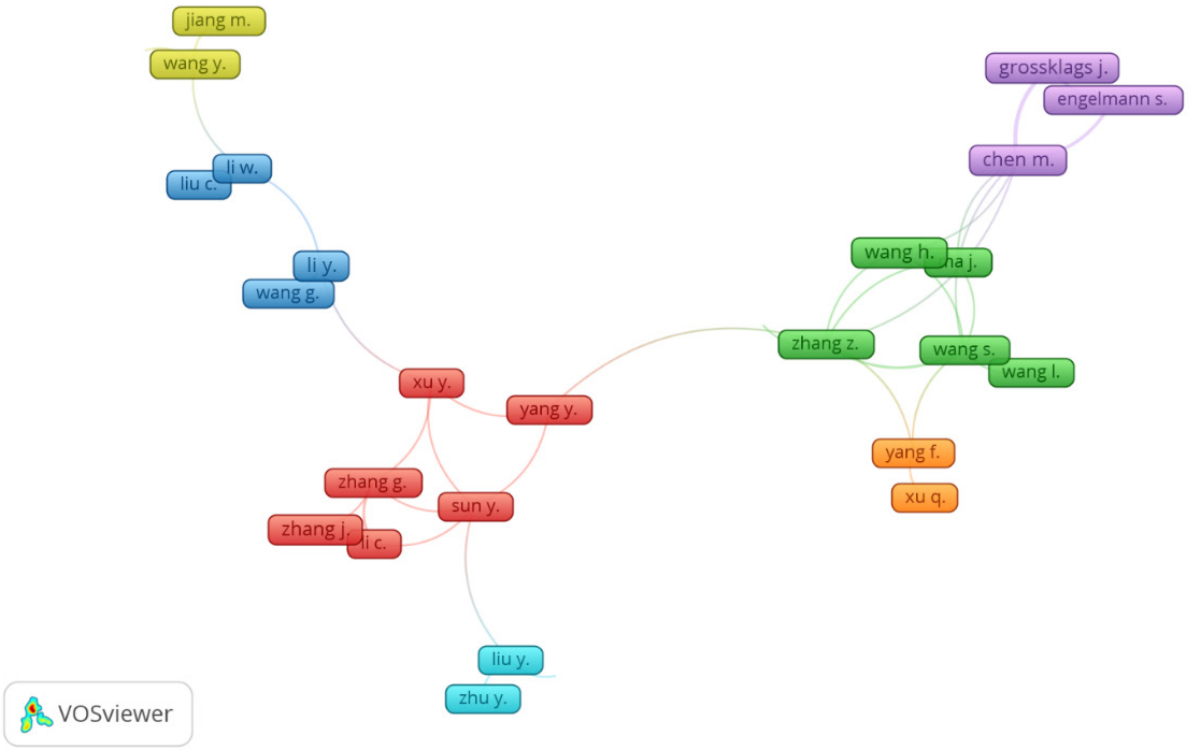


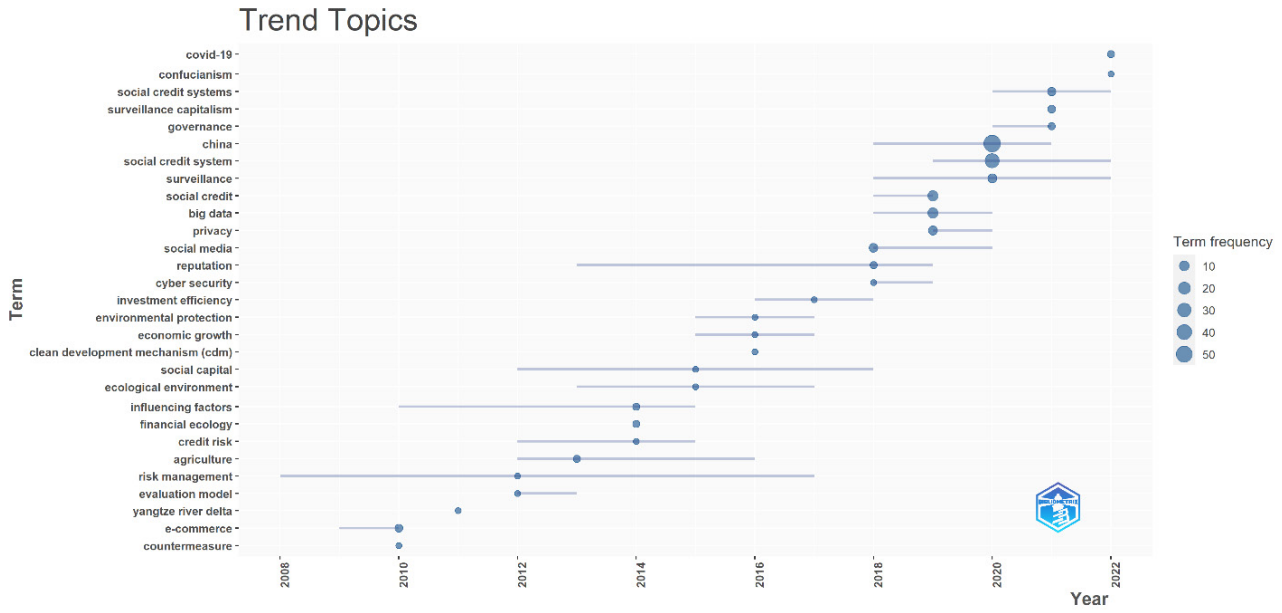
Figure 2. Network of co-authors of researchers on the China's social credit system.
Source: Scopus sample (2022)

A scientific collaboration network is composed of nodes that represent the authors and links established through co-authorship. Network analysis is used to identify scientific collaborations (Glänzel; Schubert, 2004).

Figure 2 shows the author collaboration network graph with 7 clusters, which may be related to the articles in the sample: 1) Lilac cluster refers to the article "Ordinary people as moral heroes and foes: Digital role model narratives propagate social norms in China's social credit system" (Chen; Engelmann; Grossklags, 2022), and these authors are from the Technical University of Munich, Germany. 2) Green cluster points to the article "Analysis of Needs and Construction of Coordinated Multi-Governance System for Pollution Reduction and Carbon Reduction" (Wang et al., 2022), and these authors are from Chinese Research Academy of Environmental Sciences, Institute of Public and Environment, and Renmin University of China. 3) Orange cluster indicates the article "The inhibition effect of bank credits on PM2.5 concentrations: Spatial evidence from high-polluting firms in China" (Yang et al., 2022), and these authors are from Central South University of Hunan and Agriculture and Forestry University of Fujian, China, as also Nanyang Technological University of Singapore and University of Tasmania, Australia. 4) Red cluster is linked to the article "A Novel Big-Data-Driven Credit Reporting Framework for SMEs in China" (Sun et al., 2016), and the authors are from Beijing Normal University, National Computer Network Center of China, State Key Lab of Networking & Switching Tech., Beijing University of Posts &Telecommunications, China. 5)

Indigo blue cluster indicated to the article "Social insurance law and corporate financing decisions in China" (Liu et al., 2021), and the authors are affiliated with Lingnan College, Sun Yat-sen University of Guangzhou, Guangdong University of Foreign Studies, Renmin University of China, as well as New York University, United States. 6) Dark blue cluster is associated with the article "PEST (political, environmental, social and technical) development of the anaerobic waste-to-energy digestion industry in China as a representative of developing countries" (Khalid et al., 2020), and these authors are affiliated with Beijing University of Chemical Technology and CPCEP Bio-energy LLC., China, as well as the University of the Punjab, Pakistan. 7) Yellow cluster is related to the article "Confucianism and auditor changes: evidence from China" (Ye et al., 2022), and these authors are from Beijing University of International Business and Economics, Qingdao University of Science and Technology, Xijing University, China, and the University of Central Oklahoma, United States.

The fourth Scopus data analysis focused on the themes identified based on the keywords of the sample authors. The chosen option in Bibliometrix was topic trend analysis, as it allows for the observation of themes over time. The result of the analysis of the minimum frequency of words, starting with every three options per year, and this is reflected in the size of the circles along the axes: terms on the vertical axis versus time on the horizontal axis, as shown in Graph 1 below.



Graph 1. Trend of topics in Bibliometrix
Source: Scopus sample (2022).

The terms in the graph above are related to the keywords most frequently used by the authors, highlighting those most relevant to the topic: 1º) China (58), 2ª) social credit system (35), and 3º) big data (11).

The term COVID-19 was identified among the authors' keywords regarding the China's social credit system, suggesting a consequence of the large volume of academic production on the pandemic, a global public health emergency, as well as the fact that the SARS-CoV-2 virus was first reported in China.

Among the terms shown in Graph 1, it is worth highlighting that some may be related to ethical, financial, governmental, and information security issues, such as: privacy (7), surveillance (7), social media (6), surveillance capitalism (4), financial ecology (3), reputation (3), governance (3), Confucianism (2), and cyber security (2).

RESULTS FROM THE PLATFORM WITH SCRIPTLATES

The result of data collection using the English search term "*china social credit system*" was 88 Lattes curricula, and using the Portuguese term "*sistema de crédito social chinês*" was 232 curricula on the Lattes Platform. After processing and consolidating the data using a spreadsheet, the total was approximately 303 Lattes curricula for analysis.

The first data analysis of the Lattes Platform was on the areas of knowledge of professionals and academics researching the topic. Twenty-five specific areas of knowledge were detected, and the top 10 in terms of volume are the following areas: Economics (120), Administration (84), Law (37), Political Science (14), Communication (7), Production Engineering (6), Computer Science (5), Education (4), Sociology (3), and Psychology (3).

The major areas of knowledge identified in the sample according to CNPq were the following: Applied Social Sciences (250), Humanities (30), Exact and Earth Sciences (8), Engineering (8), Agricultural Sciences (4), Linguistics, Literature and Arts (2), and Biological Sciences (1).

The second data analysis from the Lattes Platform was about the institutions, states, and regions where the researchers are located. The result regarding the Brazilian regions showed: 1º) Southeast (181), 2º) South (64), 3º) Midwest (26), 4º) Northeast (24), and 5º) North (8).

The analysis of the Brazilian states showed São Paulo in first place (121), followed by Rio Grande do Sul (40) in second, and Rio de Janeiro (33) in third. These results reflect the location of the 20 main academic institutions where the researchers in the sample are located, as exhibited in Table 3 below.

Table 3. Institutions, states, regions, and number of researchers on social credit systems.

Institutions	State	Region	Number of researchers
University of São Paulo	São Paulo	Southeast	37
Getúlio Vargas Foundation	São Paulo	Southeast	28
State University of Campinas	São Paulo	Southeast	20
Federal University of Rio Grande do Sul	Rio Grande do Sul	South	11
Federal University of Santa Catarina	Santa Catarina	South	8
Pontifical Catholic University of São Paulo	São Paulo	Southeast	8
University of Brasília	Federal District	Central-West	7
Fluminense Federal University	Rio de Janeiro	Southeast	7
Federal University of Rio de Janeiro	Rio de Janeiro	Southeast	6
Federal University of Paraná	Paraná	South	4

Table 3. Cont.

Institutions	State	Region	Number of researchers
University of Pernambuco	Pernambuco	Northeast	4
Federal Rural University of Rio de Janeiro	Rio de Janeiro	Southeast	3
Federal University of Ceará	Ceará	Northeast	3
Federal University of Goiás	Goiás	Central-West	3
Federal University of Minas Gerais	Minas Gerais	Southeast	3
Federal University of Mato Grosso do Sul	Mato Grosso do Sul	Central-West	3
Mackenzie Presbyterian University	São Paulo	Southeast	3
Federal University of Bahia	Bahia	Northeast	2
Pontifical Catholic University of Minas Gerais	Minas Gerais	Southeast	2
Federal University of Amazonas	Amazon	North	1

Source: Sample from the Lattes Platform (2022).

The sample results demonstrated other types of public institutions, such as the Court of Auditors of the State of Amazonas, the Central Bank, and the National Bank for Economic and Social Development, as well as private entities, such as: Medeiros & Sahid Advogados (law firm), Ernst & Young (financial consulting), and Pluralis Assessoria em Gestão Social (consulting).).

It is worth mentioning that the second place ranking of the Getúlio Vargas Foundation among academic institutions in general is consistent with the results of the most representative areas of knowledge (Economics, Administration, and Law) observed in the sample.

The third data analysis from the Lattes Platform was on scientific production and specific production on the authors, identified only in the titles of the academic production, as exposed in Table 4 below.

Table 4. General and specific scientific production on the social credit system.

Description	Total Quantity	Specific Quantity
Full articles published in journals	13,737	1
Published/organized books or editions	2.083	0
Published book chapters	4,961	0
Texts in newspapers/magazines	19,492	1
Full papers published in conference proceedings	11,607	0
Extended abstracts published in conference proceedings	1.095	0
Abstracts published in conference proceedings	2,738	2
Articles accepted for publication	266	0
Presentation of papers	11,847	1
Other types of bibliographic production	15.044	1
Total bibliographic production	82,870	6

Source: Sample from the Lattes Platform (2022).

The limited amount of research specifically on the topic showed that the China's social credit system can be considered new to Brazilians. Regarding the main themes detected in the academic productions, these were ethics, governance, and big data.

The areas of knowledge and institutions of the authors related to the verified scientific productions were as follows: Law (University of Vale do Rio dos Sinos, University of Fortaleza and State University of Rio de Janeiro), Administration (State University of Minas Gerais), and Journalism (Pontifical Catholic University of São Paulo).

The fourth data analysis from the Lattes Platform was on the co-authorship network collected by scriptLattes and processed in the VOSviewer tool for data visualization and interpretation, resulting in the network graph shown in Figure 3.

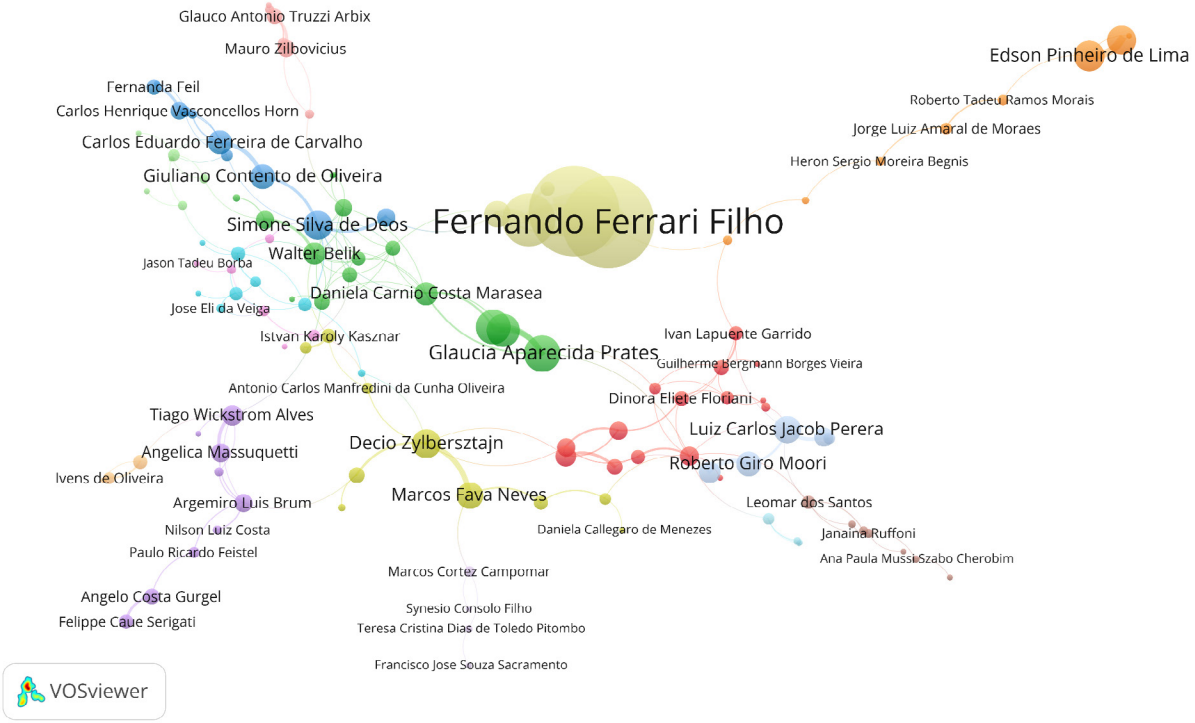


Figure 3. Network of co-authors of researchers on the social credit system.
Source: Sample from the Lattes Platform (2022).

Social Network Analysis (SNA) was used to evaluate the co-authorship network, which is an undirected network, meaning there is no direction in the relationships between the nodes. The network consists of 303 nodes representing the researchers and 216 edges depicting the connections among them, of which 130, or 42.90%, have no connection with any other node (degree = 0). Therefore, we chose to focus the analysis on the giant component of the network, which represented about 40% of the nodes (authors) and 84% of the edges (co-authorships). This percentage is high considering that ⅖ (40%) of the authors in the sample had collaborative publications with others belonging to a large continuum of interconnected authors. The giant component network consists of 122 nodes, representing the researchers, and 182 edges, depicting the connections among them.

The network diameter represents the greatest distance from one node to reach another node (highest eccentricity = 15). The network radius represents the shortest distance from one node to reach another node (lowest eccentricity = 8). The network density is 0.025, that is, close to 0 (zero), indicating that not everyone in the network communicates with everyone else in the network, even though this is the cut-off point by the giant component.

According to SNA centrality metrics, the degree is a measure of the links or connections that a given node possesses. The highest degree was 12, held by Simone Silva de Deos, a professor at the Institute of Economics at the State University of Campinas (acronym in Portuguese UNICAMP), the author with the highest number of connections in the network, located in the blue cluster on the left. The advantage of discovering the degree of the components of a network would be to infer how people behave within this network based on the observation of the number of connections (Pinheiro, 2011).

The degree of closeness represents the average of the geodesic distances (shortest path from the perspective of the social network) among a given node and all other nodes connected to it. It can be understood as the time it takes for information to spread within the network from a specific node. The closeness measure is calculated based on undirected graphs (Pinheiro, 2011). The lowest closeness is 0.09431 from Jose Marcelo Almeida Prado Cestari (Computer Science) and Miguel Afonso Sellittode (Production Engineering), whose labels are hidden in the graph by Edson Pinheiro de Lima, located in the upper right part of the graph.

The distance of relationships can reveal some relevant characteristics about the network structure. The strength of connections contributes to establishing the relationship between nodes. A specific link between two nodes can be central to the entire network. Therefore, not only can nodes be evaluated in terms of proximity, but also links can be measured in terms of how they connect nodes in the network (Pinheiro, 2011).

Betweenness represents the measure of how frequently a node appears in the shortest paths between nodes. Nodes that occur in many short paths between other nodes have greater betweenness than those that do not. Betweenness can be understood as how central a node is, considering the entire network and all connections. The betweenness measure is calculated based on undirected graphs (Pinheiro, 2011). The node with high betweenness is called the "gatekeeper or gossip of the network", with the highest betweenness being 2058.95 for Raquel da Silva Pereira (Administration), located in the red cluster, whose label is hidden in the graph by the label of Roberto Giro Moori, located in the center-right part of the graph.

To explore and visualize the co-authorship network, access the interactive graph via the link:

https://app.vosviewer.com/?json=https://drive.google.com/uc?id=1Ht7rrCGc5RndHIA47MYFuchfHY2zuSGO

CONCLUSION

Bibliometric analysis helped reveal that China's social credit system can be considered a new topic, due to the volume of data collected in both Scopus and the Lattes Platform. However, the increase in scientific production in recent years, particularly in terms of volume in the United States, the United Kingdom, and Germany, may indicate a growing trend of interest in the issue.

The Social Sciences area had the highest scientific output in both databases. However, the results regarding specific areas showed differences in interest in the topic, with Computer Science being relevant in volume in Scopus, that is, on a global scale, and the areas of Economics and Administration standing out in the Lattes Platform, in the Brazilian context. Finally, we highlight the convergence of themes surrounding the China's social credit system identified in the scientific output in both databases: ethics, governance, and big data.

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