



Bibliometric Analysis of Farmers' Rural-Urban Migration Based on the Scopus Platform

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Cities and metropolitan regions provide economic and social opportunities for individuals in today's globalized and rapid urbanization period. However, urbanization has led to unequal economic growth between rural and urban regions, promoting urban migration. Migration is a cross-cutting problem on the SDG 2030 agenda, presenting fresh difficulties at national and international levels. Rural-urban migration is a common phenomenon in developing countries. In many cases, rural farmers migrated and left their existing farming profession. Many people believe there are some positive effects, like improving food supply, schooling for kids, etc., and some adverse effects, like

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poor housing and unhygienic living environments in cities for the migrants. However, very few studies have been conducted in this aspect. Considering these, the present study showed a bibliometric study of farmers' rural-urban migration based on the Scopus platform. The study used both Biblioshiny and VOSviewer software. The bibliometric analysis of scholarly articles from 2013 to 2023 is presented in the article, including the analysis of 1,549 journals, books, and other publications, with 3,892 documents from the Scopus platform. Influential journals, such as "SUSTAINABILITY", "INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH", and "PLOS ONE". Leading research countries are China and the USA. Active institutions in rural-urban migration include the University of Amsterdam, Beijing Normal University, Peking University, etc. Future research should consider data from different sources and integrate cross-border populations, as conceptual analysis based on keywords may provide a superficial interpretation.

Keywords: Agricultural extension; rural-urban migration; bibliometric analysis; rural development.

1. INTRODUCTION

Cities and metropolitan regions offer opportunities for individuals to succeed economically and socially in this rising globalization and rapid urbanization period. Urbanized areas have difficulties satisfying the increasing demand for public services while preserving a sustainable environment for current and future generations, with a projected 68 per cent share of the world's population in 2050 Almihat et al. [1]; Al-Maruf et al. [2]. However, enormous capital inflows and preferential policies have led to unequal economic growth between rural and urban regions, which has promoted urban migration [3]. As stated in the Sustainable Development Goals (SDG) 2030 agenda of the United Nations, sustainable cities "without leaving anybody behind" should take into account immigrant groups [4]. Migration is garnering the attention of academics from various fields as a cross-cutting problem on the SDG 2030 agenda, and it presents fresh difficulties at the national and international levels [5]. Immigrant communities have received more attention because of COVID-19 and their health issues [6].

A mix of push-pull variables often influences the preference for migration. People moved to cities and towns because there were more prospects for employment there. According to migration studies, there is a direct correlation between a region's degree of infrastructure development and the volume of out-migration Rustam et al. [7]. The migratory people may find a variety of livelihood chances with different earnings in the towns and cities, regardless of competence. Therefore, migration is seen as a livelihood coping mechanism for impoverished rural people. However, a significant portion of the population leaves rural regions for metropolitan centres in

search of higher-quality education, jobs, and investment possibilities. These wealthy immigrants sometimes help the poorer immigrants find work in urban areas, usually as wage labourers. Nevertheless, economic factors dominate in each of these groups. Communication and information also affect migration choices.

There is a relationship between migration and agricultural productivity. First, the loss of labour due to migration might tighten the labour constraint for agricultural output, and second, the money received as remittances from migrants could ease credit restrictions and aid in investments in agricultural production. These two factors might positively, negatively, or equalize influence on agricultural revenue. A positive effect would show that migration complements agricultural output, whereas a negative impact would imply that the loss of labour induced by migration diminishes agrarian productivity. Migration is not a new phenomenon, as shown by the supply and demand theories of Harris and Todaro (1970) and the individual rationality theories of Todaro and Maruszko (1987) (cited in Yonemoto, 2021), which included it as a component of the economy. Agriculture families who have lost workers to migration should be able to adjust to a labour shortage. Mechanization and switching to less labour-intensive agricultural practices, such as fewer labour-intensive crops, are examples of existing adaptation strategies.

Previous research on migrant populations in urban wards has covered a variety of themes, but it is an incomplete portrait of this population King et al. [8]. Analyse intellectual structures of rural-to-urban migrants using VOSviewer and R-based software Biblioshiny as bibliometric approaches in migration research are relatively

new. Although many studies have been published on rural-urban migration, no meta-research has examined patterns and conclusions across all of these articles. By identifying the gaps in what is already accessible, this kind of research is required to discover new study topics and to direct future research and policy agendas. Using the quantitative technique known as bibliometric analysis (Glänzel & Moed, 2002), the most notable authors, institutions, and countries will be discovered, as well as patterns and trends in research subjects and methods. Additionally, we thoroughly examined the ten most popular articles on rural-urban migrations, where current knowledge on the subject comes from. The following research questions served as our guidance for gathering and analyzing data:

- RQ1: How has the significant area of study in the rural-urban migration literature changed over time?
- RQ2: How are the many players (writers, institutions, and countries) connected within this broad research area?
- RQ3: What is the distribution of the essential themes in terms of centrality and density?
- RQ4: How are the centrality and density of crucial keywords utilized to spark rural-urban migration literature?

RQ5: Which knowledge gaps in rural-urban migration might indicate the need for more study?

2. METHODOLOGY

Researchers have used comprehensive scientific mapping techniques in many research areas [9]. Various statistical and graphical approaches are available; Biblioshiny is a unique open-source R package with user-friendly online applications. The Bibliometrix package, included with R, is used for the bibliometric analysis used in this study. A sophisticated visualization tool for creating and visualizing bibliometric networks called VOSviewer is also used. VOSviewer uses built-in R methods when creating a "net" object in the R Programming Environment. We have used the Scopus database for this study and the period covered from 2013 to 2023. The Scopus is a source of bibliographic information and is widely accepted by scientists. We collected 3905 publications in the first stage using the subject keyword "rural", AND "urban" AND "migration". Each paper's complete record and referenced references are exported for the bibliometric analysis, leaving 3892 articles after duplicates were eliminated. The search was conducted on June 26, 2023. The Detailed research procedure with five steps is presented in Fig. 1.

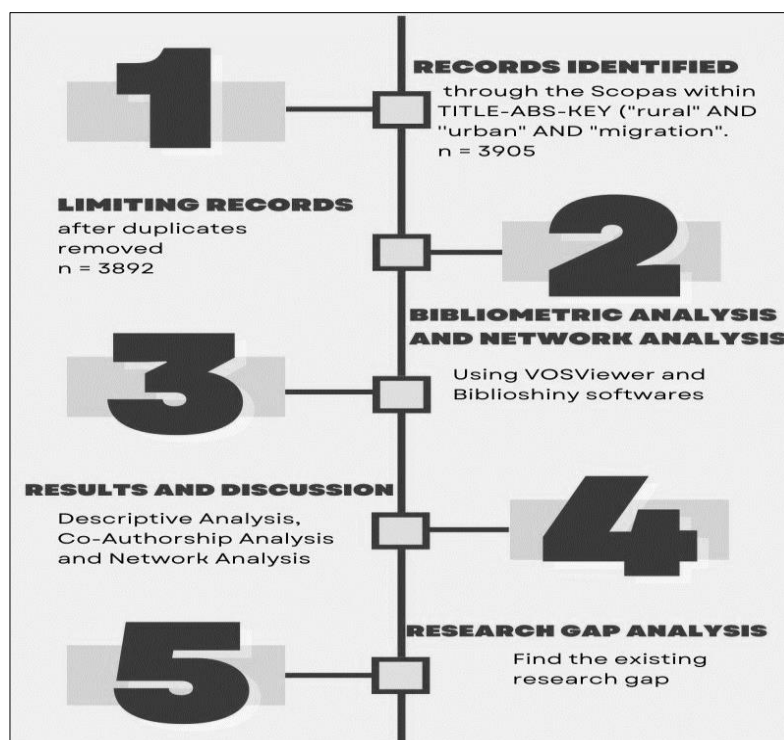


Fig. 1. The steps in research methodologies

Source: Original material of the study

3. RESULTS AND DISCUSSION

3.1 Description of the Data

Table 1 provides key information for conducting a bibliometric analysis of scholarly articles from 2013 to 2023. It includes data on the timespan, sources, and documents used in the study.

The timespan covered in the analysis is from 2013 to 2023, indicating the range of years from which the articles were selected. The sources used for the study include 1,549 journals, books, and other publications that contributed to the dataset. In total, 3,892 documents were included in the analysis.

The average number of citations per document is 14.3, highlighting scholarly impact and referencing within the dataset. The dataset contains a total of 181,840 references.

The table also provides information about the contents of the documents. It includes 8,461 keywords plus (ID), which may refer to additional keywords or descriptors associated with the articles. Furthermore, there are 9,273 author keywords (DE), which likely represent specific keywords chosen by the authors to describe their research.

The analysis involves 9,177 authors who contributed to the documents in the dataset. Of

these authors, 741 were single authors who authored their respective articles without collaboration.

There were 823 single-authored documents in the dataset. On average, each record had 3.54 co-authors, demonstrating the level of collaboration among researchers. Additionally, 33.2% of the co-authorships were international, implying an association between authors from different countries.

Finally, all 3,892 documents in the dataset are categorized as articles, representing the primary type of scholarly publication included in the analysis.

3.2 Publication Progression

In 2013, 239 articles were published, which increased to 281 in 2014. The number of articles slightly decreased to 266 in 2015 but rebounded in 2016 with 304 articles. The trend continued upward in the following years, with 321 articles in 2017, 349 in 2018, and 396 in 2019.

The year 2020 saw a significant increase in articles, with 483 publications. This indicates a substantial growth in research output during that year. In 2021, the number of articles decreased slightly to 443, followed by a significant increase to 575 pieces in 2022 (Fig. 2).

Table 1. Descriptive statistics for the data

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	2013:2023
Sources (Journals, Books, etc.)	1549
Documents	3892
Annual Growth Rate %	-0.17
Document Average Age	4.46
Average citations per doc	14.3
References	181840
DOCUMENT CONTENTS	
Keywords Plus (ID)	8461
Author's Keywords (DE)	9273
AUTHORS	
Authors	9177
Authors of single-authored docs	741
AUTHORS COLLABORATION	
Single-authored docs	823
Co-Authors per Doc	3.54
International co-authorships %	33.2
DOCUMENT TYPES	
article	3892

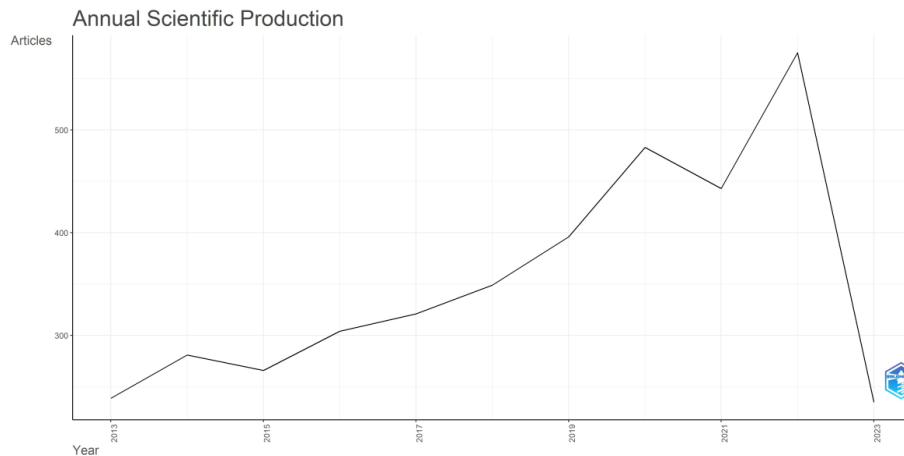


Fig. 2. Annual progression of publications (2013-2023)

3.3 Influential Journals

The journal "SUSTAINABILITY (SWITZERLAND)" has 137 associated articles, indicating that a significant number of scholarly articles in the analyzed dataset were published in this journal. Similarly, the "INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH" has 87 pieces, and "PLOS ONE" has 74 articles.

Researchers can identify the key journals where articles related to their research interests are published. It also allows for assessing the impact and reach of specific journals within the field. The top most relevant journals with their publications in the area are presented in Fig. 3.

3.4 Author's Outputs

Table 2 provides information about the authors of scholarly articles and their respective publication records. It includes data on the authors' names,

the number of articles they have published, and the fractionalized representation of their articles within the dataset. For example, Liu Y has published 52 articles, while Wang Y has published 51 papers.

Articles fractionalized provides the fractionalized representation of each author's articles within the dataset. This metric is calculated by dividing the number of articles published by an author by the total number of articles in the dataset and expressing it as a percentage. For instance, Liu Y's articles account for 12.13% of the total articles, while Wang Y's articles represent 12.97%.

The table allows researchers to identify the most prolific authors within the analyzed dataset. It provides insights into the distribution of publication output among different authors and their relative contributions to the scholarly literature in the field of study.

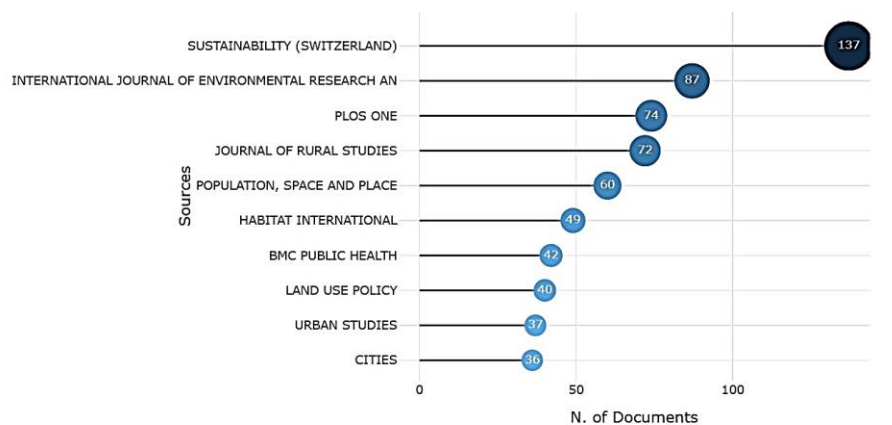


Fig. 3. Influential journals in rural-urban migrations

Table 2. Top authors, their number of publications and article fractionalized in rural-urban research

Authors	Articles	Articles Fractionalized
LIU Y	52	12.13
WANG Y	51	12.97
LI X	44	12.10
WANG X	41	11.21
LI Y	39	10.29
SMEETH L	39	3.64
AGYEMANG C	37	2.99
ZHANG Y	37	9.49
CHEN Y	35	9.17
LIU J	35	9.77

3.5 Author Productivity through Lotka's Law

An analysis of the statistical distribution of writers' production based on Journal *Chemical Abstracts* was published in 1926 by A. J. Lotka. He discovered a rough mathematical formula that states that a relatively small number of writers produce a significant portion of the overall creation of documents. At the same time, the majority of authors (60 per cent) only contribute one document.

The formula is: The proportion of writers to articles is $1/n^2$, where each author contributes n articles. If 100 writers each generate one paper within a specific time frame, then 25 authors produce two pieces, 11 authors have three articles, etc.

The ratio of writers who make n contributions to those who make one is around $1/na$, where a is often close to 2.

This rule, along with Bradford's law of scattering and Zip's law, is considered one of the three traditional bibliometric laws and is sometimes called "the inverse square law of scientific production."

Documents with a single author (7733) account for 84.3% (0.843) of the total documents in the dataset. On the other hand, documents with two authors (766) represent 8.3% (0.083) of the total.

3.6 Corresponding Author's Countries

Based on the dataset, the distribution of scholarly articles across different countries is presented in Fig. 5. It includes data on the countries, the number of articles published by each country, the number of articles in the single-country

publication (SCP) category, the number of articles in the multi-country publication (MCP) category, the frequency of articles for each country, and the MCP ratio.

Based on total publications, China has 887 articles, while the USA has 484 articles with its correspondence. China has 571 articles classified as SCP and 316 articles classified as MCP.

3.7 Scientific Production by Countries

Fig. 6 provides information about the distribution of scholarly articles across different regions or countries in the analyzed dataset. It includes data on countries and the frequency of articles associated with each country. China, the USA, the UK (United Kingdom), India, Germany, the Netherlands, Australia, Canada, South Africa, and Japan are the key countries that published papers in this area. 3,762 articles in the dataset are attributed to China, while the USA has 1,993 pieces.

3.8 Country Collaboration

Fig. 7. provides information about the frequency of collaborations between different countries in the analyzed dataset. It includes data on the source country, target country, and the frequency of partnerships between them. Netherlands, USA, Belgium, Brazil, France, Germany, Kenya, Mexico, Pakistan, Poland, South Africa, Spain, Thailand, United Kingdom, China, India, and Ethiopia are mentioned in the figure with the highest collaboration.

3.9 Active Institutions

Table 3 provides information about authors' affiliation in scholarly articles within the analyzed dataset. University of Amsterdam, Beijing Normal

University, Peking University, Sun Yat-Sen University, and London School of Hygiene are the key institutions in rural-urban migration. 173 articles are associated with the University of Amsterdam, 147 are associated with Beijing Normal University, and so on.

3.10 Network Analysis and Trend Word Analysis

3.10.1 Cluster analysis

Fig. 8. resents a network analysis of nodes and their corresponding attributes in a scholarly article on migration and urbanization. The nodes represent various concepts or topics, while the features include the cluster to which each node

belongs, as well as measurements of betweenness centrality and closeness centrality.

The first cluster of nodes revolves around urbanization and migration. Urbanization-related nodes, such as urbanization and urban-rural migration, have relatively high betweenness centrality values, indicating their significance as bridges between other nodes in the network. These nodes also have low closeness centrality values, suggesting they are not as closely connected to other nodes in the network. Regarding PageRank, urbanization and urban-rural migration have relatively low values, implying that they are not highly influential within the network.

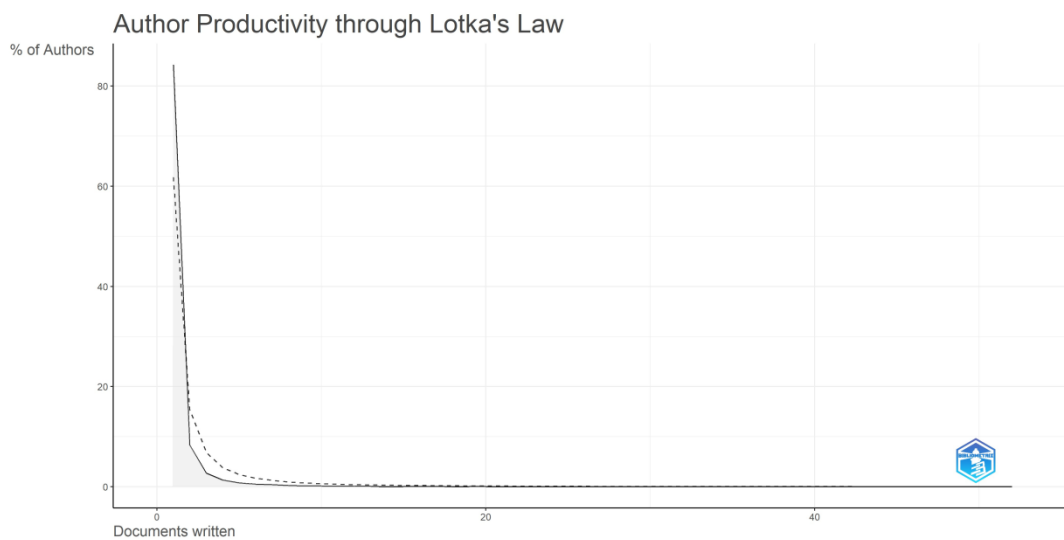


Fig. 4. Author productivity through lotka's law

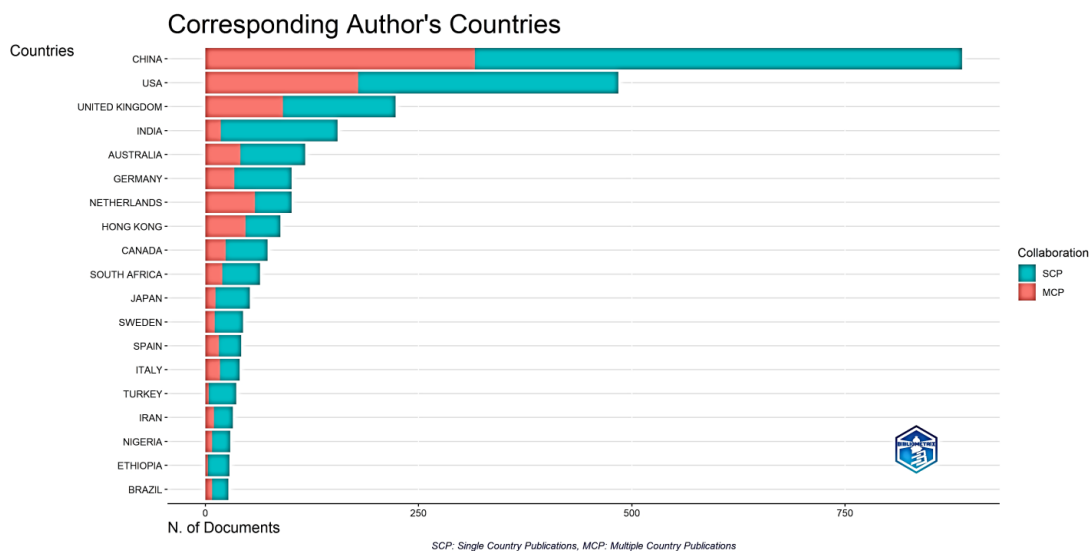


Fig. 5. Corresponding 'authors' countries

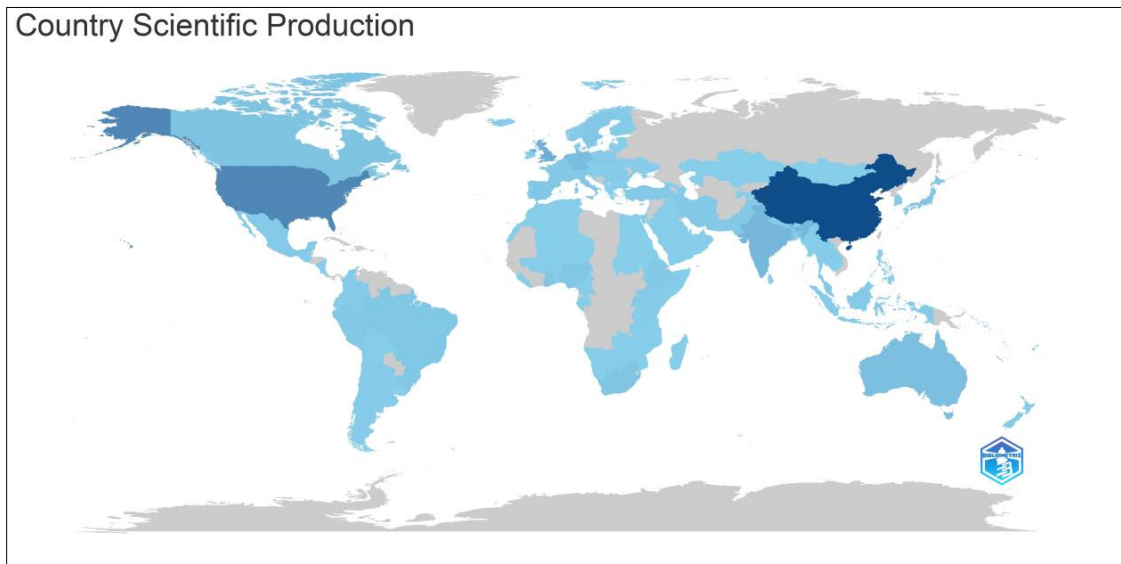


Fig. 6. The countries and their production

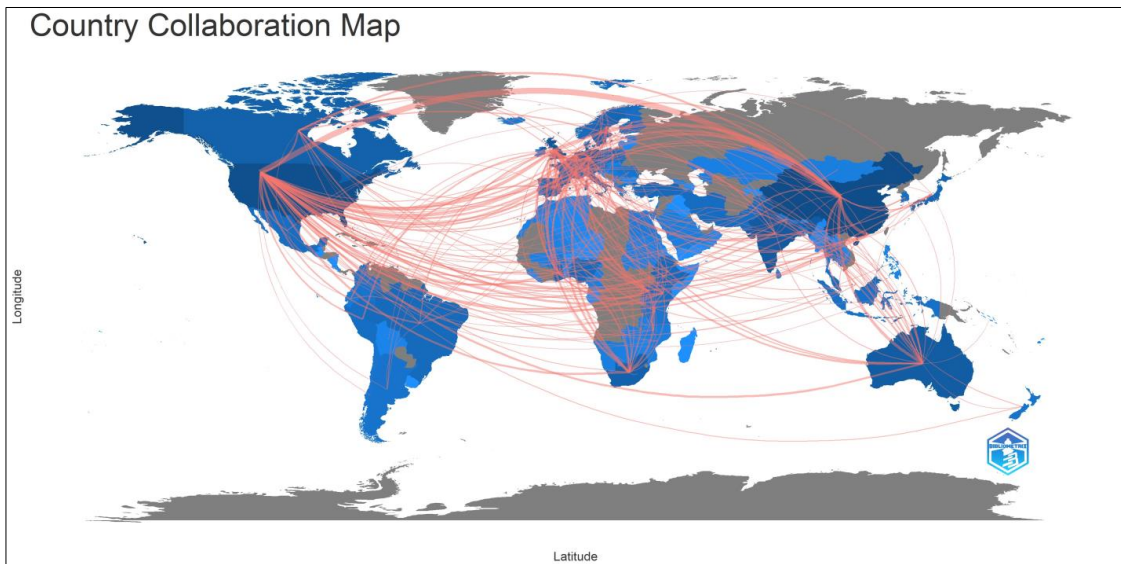


Fig. 7. Collaboration among the countries

Table 3. Key Institutions and their productions

Affiliation	Articles
University Of Amsterdam	173
Beijing Normal University	147
Peking University	140
Sun Yat-Sen University	135
London School Of Hygiene And Tropical Medicine	128
Zhejiang University	98
Fudan University	84
Nanjing University	77
Universidad Peruana Cayetano Heredia	75
Renmin University Of China	67

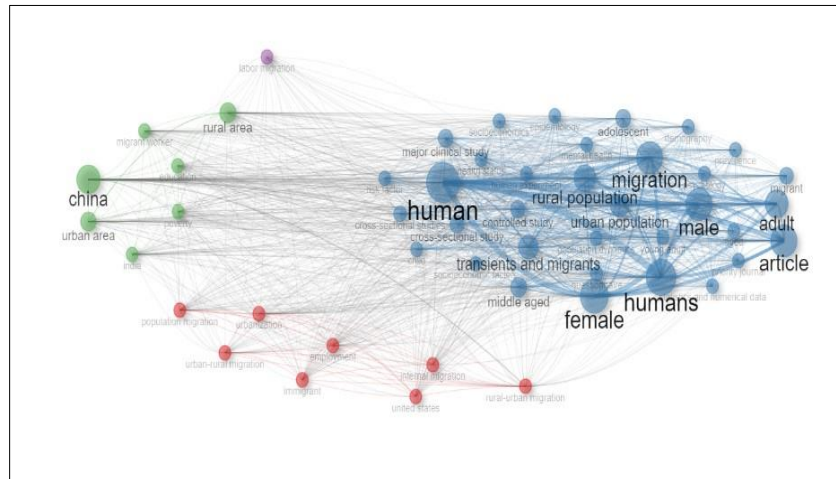


Fig. 8. The clusters in rural-urban migration research

The second cluster of nodes pertains to migration and population dynamics. Nodes like population migration, rural-urban migration, and internal migration have moderate betweenness centrality values, indicating their importance in connecting different network parts. However, their closeness centrality values are also relatively low, suggesting they are not tightly bound to other nodes. Their PageRank values are also relatively low, indicating moderate influence within the network.

The remaining nodes in the network include employment, United States, and immigrants. These nodes have lower betweenness centrality values, indicating a lesser role in connecting other nodes. Their closeness centrality values are also moderate, suggesting a moderate level of connectivity. In terms of PageRank, these nodes have relatively low values, indicating a lower level of influence compared to other nodes in the network.

Furthermore, Fig. 8 reveals that the nodes related to gender, namely female and male, form a separate cluster. Both nodes have high betweenness centrality values, indicating their importance as bridges within the network. They also have low closeness centrality values, suggesting they are not as closely connected to other nodes.

3.10.2 Co-occurrence network of the keywords

Interestingly, the prominence of "rural-urban migration" as one of the top keywords in both

occurrences and link strength suggests a deliberate exploration of this migration pattern's implications. This choice may indicate the author's intent to shed light on the socio-economic factors driving such migrations and the resulting shifts in urbanization dynamics.

Including "female" and "male" as keywords could suggest an investigation into the gender dimensions of migration, which is a commendable endeavor given the importance of gender analysis in migration studies. The concept of "urbanization" and its relatively high total link strength may imply that the article substantially emphasizes transforming rural areas into urban landscapes due to migration. It raises questions about how the article explores the socio-cultural, economic, and infrastructural implications of urbanization driven by migration.

3.10.3 Trend topics

Fig.10. presents a collection of keywords or topics along with their respective frequencies and temporal distributions. These keywords represent various subjects that are relevant to a scholarly article. The frequencies indicate how frequently these keywords appear in the academic literature, reflecting their relative importance or popularity in research. The temporal distributions, represented by the year_q1, year_med, and year_q3 columns, provide insights into the periods during which these keywords gained prominence.

Furthermore, keywords like rural population and urban-rural migration indicate an exploration of urbanization and its impact on population dynamics. Including terms like human, human experiment, and cognition suggests a broader interest in human behaviour and cognitive processes.

4. CONCLUSIONS

These findings provide a wealth of knowledge on the intellectual framework of migration from rural to urban areas. Our bibliometric analysis findings enabled network analysis, document coupling analysis, reference co-citation analysis, co-occurrence network analysis, theme analysis, and conceptual structure analysis based on keyword interactions using the bibliometric R-package and VOSviewer. Cross-disciplinary investigations on the knowledge and understanding of the migrant population against the backdrop of rapidly expanding urbanization have been encouraged. Migrant studies have grown to various topics as China's distinctive Hukou system underlines the disparity between rural migrants and urban residents. We highlighted the most influential writers and sources in this field and identified international cooperation networks among them.

The study explores the literature on migrants using keyword-based analytic tools, focusing on various aspects such as illness prevalence, labour market dynamics, settlement intention, and social integration. Four cross-disciplinary clusters provide a comprehensive overview of this group while examining specific study issues. Like the Hukou system in China, population registration systems play a crucial role in migrant decisions, creating a dynamic environment for families and communities. Policymakers should acknowledge the importance of family support systems, affordable health insurance, occupation-specific medical policies, and awareness of the digital divide. To combat systematic prejudice and violence against immigrant groups, institutional effects must be evaluated. However, future research should consider data from different sources and integrate cross-border populations, as

conceptual analysis based on keywords may provide a superficial interpretation.

COMPETING INTERESTS

The authors have declared that no competing interests exist.

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