Minimun Wage: A Bibliometric Analysis
of this Research Topic

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Abstract:

Purpose: *In this study, a bibliometric analysis of the scientific literature on the minimum wage is carried out to detect its evolution and point out future research trends.*
Approach/Methodology/Design: *The bibliometric analysis of the minimum wage based on an extensive examination of publications indexed in Web of Science (WoS) de Clarivate Analytics. was conducted. This database is one of the most complete. It supports the reliability of the bibliometric analysis. The period of the analysis covered the years 1962-2021. The analysis was carried out with the support of the VOSviewer software, version 1.6.18. The units of analysis used for the thematic areas were the keywords, KeyWords Plus (KW+); with them, bibliometric maps were created by applying a methodology based on co-word analysis, clustering techniques and visualisation techniques.*
Findings: *Two thousand eight hundred twenty-two articles in scientific journals have been detected. Groups of countries have been identified, analysing the subject matter, authors, their belonging organisations and the subject areas of the studies, and their evolution over time. In addition, it was recognised how minimum wage publications are clustered.*
Practical Implications: *The identification of the most productive publications with the highest number of citations can be used by future authors to define the most appropriate publication strategy. Likewise, the identification of the most relevant authors in the field can be helpful for decision-makers to meet potential collaborators.*
Originality/Value: *To the authors' knowledge, this is the first bibliometric analysis of the literature on minimum wages. This article provides an exhaustive and up-to-date bibliometric analysis of this subject, allowing us to establish existing patterns and trends.*

Keywords: *Minimum wage, bibliometric analysis, research trends.*

JEL classification: *J31, Z21, C88.*

Paper Type: *Research article.*

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1. Introduction

This study carries out a bibliometric analysis of the scientific literature on the minimum wage, detecting and indicating the evolution and future research trends. This work helps us to understand the academic scope of the subject of the minimum wage. Its strengths rely on the discussed contents and the identification of the countries with the highest scientific production, the most prolific authors and the leading organisations. The study is novel in that no systematic review or bibliometric analysis has been conducted.

Bibliometric research uses quantitative statistical data analysis in the published literature to study publication patterns within a scientific field (De Bellis, 2009). The bibliometric analysis involves using a set of quantitative metrics, techniques and tools to analyse references in the scientific literature (Donthu *et al.,* 2021).

Bibliometric studies are mainly based on quantitative analysis of publications about a specific phenomenon (Liu *et al.,* 2019). This method of analysis is widely recognised and used for examining scientific discourse (Ellegaard and Wallin, 2015) and is an effective procedure for understanding how a field of research emerges and develops (van Raan, 2005; Zhang *et al.,* 2016).

From a bibliometric perspective, no work has been done that can answer the following general questions: how is the conceptual and thematic structure of the minimum wage shaped; which specialisms and sub-specialisms are at the centre of gravity of the subject; how has research in this field evolved; or what are the emerging research fronts and future challenges?

2. Objectives and Research Questions

The main objective of this paper is to analyse the developments and progress of the internationally published scientific literature on minimum wage from a bibliometric perspective. Through a combination of co-citation analysis, co-word analysis and graphical representation techniques, this research has the following objectives:

O1: To identify and visualise existing academic networks in the field of minimum wage research, their potentials and possible gaps.

> O1A: To identify the most productive countries, authors and organisations.
> O1B: To know the most relevant sources and seminal works.

O2: Identify and visualise the most relevant topics and trends in minimum wage research through keyword analysis.

3. Materials and Methods

The procedure was developed in several stages: a) data collection, b) selection and processing of the study units, and c) processing, analysis and visualisation of the study units. For the clustering and visualisation of the results, the software VOSviewer, version 1.6.18, developed by van Eck and Waltman, a computer tool for the graphical visualisation of bibliometric networks, was used.

This software has been applied in this study in a similar way to other recent work (Kumar *et al.,* 2022; 2020; Hassan *et al.,* 2021; Handoko, 2020; Tang *et al.,* 2020).

The literature was identified and compiled through online searches by conducting a comprehensive scan of Clarivate Analytics' Web of Science (WoS), a very comprehensive, scientifically recognised database with global geographic scope, international distribution and high-impact quality indicators. As one of the most comprehensive, it supports the reliability of the bibliometric analysis.

The search was conducted in such a way as to be equivalent to the following logical expression in "topic" or topics including the terms in the -title, abstract, author keywords and keywords Plus- containing "minimum wage". The study period spans from 1962 to the end of 2021, where fifty-nine years are analysed. The choice of the starting date is motivated by the fact that the first article published in WoS on the minimum wage was in 1962.
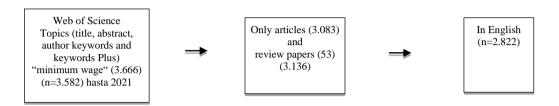
Since bibliometric analyses focus mainly on academic journals, only articles published in "journals and review" were selected, discarding other options such as editorials, books, book chapters and conference proceedings. The selected language of writing was English. The search for articles was closed on 7 June 2022. Retrieved documents were directly downloaded in plain text format to be processed and analysed. As a result of the search, a total of 2,822 documents were obtained.

A processing, analysis and visualisation of the study units have been carried out. Firstly, the evolution of the number of publications and citations per year is analysed; the number of articles by WoS categories and publishing journals. The VOSviewer software, version 1.6.18, was used to group and visualise the results.

We have identified groups of authors analysing the subject matter, the organisations to which the researchers belong, the countries and subject areas of the studies, and their evolution over time.

The units of analysis used for the thematic areas were the keywords, KeyWords Plus (KW+); with them, bibliometric maps were created by applying a methodology based on co-word analysis, clustering techniques and visualisation techniques.

Figure 1. *Diagram of study selection*

Source: *Own elaboration.*

Table 1. *Inclusion and exclusion criteria and bibliometric indicators*

Inclusion criteria	Exclusion criteria	Bibliometric indicator
Period: From the first published article until the end of December 2021	EX1: Articles published after 2021	Number of documents per year of publication
CI2: All categories in WOS	EX2: None	Number of citations per year
CI3: Type of documents: journal articles and review articles	EX3: Papers from publishers, Books, Chapters of books, Proceedings	Number of journal articles (2771) Number of review articles (51)
CI4: Language	EX4: published in non-English language.	Number of publications of journal articles and review articles in English (2822)
CI5: Topic "minimum wage	EX5: Purification of articles containing in the subject "minimum salary".	Most prolific countries Most productive organizations/institutions Most productive authors

Source: *Own elaboration based on records obtained from WoS database by VOSviewer.*

4. Results and Discussion

4.1 Descriptive Bibliometric Analysis of the Mínimum Wage

The results of the bibliometric analysis of the 2,822 scientific articles obtained from the WoS database published between 1962 and 2021 are shown below. Of the entire study period (1962 to 2021), the year 2020 reached the highest peak of scientific

production, with 261 articles. Three periods can be distinguished, the first from 1962 to 1997, with low scientific production on the subject; the second, with no production for a decade, from 1998 to 2008; and the third, from 2009 to 2021, with an upward trend in articles on the minimum wage. Since the beginning of the third period, 2009, there has been a steady increase, although with a slight decrease in 2010. In the last year of the study, 2021, a decrease is observed, perhaps as a consequence of COVID-19, although this statement should be contrasted; it coincides with other bibliometric studies (González-Limón and Rodríguez-Ramos, 2022; González-Limón *et al.,* 2022).

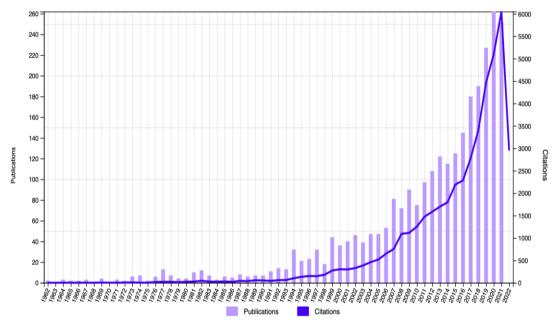***Table 2.*** *Techniques implemented in the bibliometric analysis of this study.*

Techniques	Key concepts
Analysis based on the number of publications and citations per year.	- The trend of publications from 1962 to 2021 on minimum wage shows an increase in recent years. - The years with the most studies are 2020 and 2021, with a slight decrease in research output in 2021. - The evolution of the number of citations by year of publication. Year with the highest number of citations and most cited article.
Grouping	- To extract the most outstanding topics in the field of research. - To know the authorship of articles by country. - Examine the most influential authors in the research field. - Locate the most prolific research Organizations/Centers/Universities on the topic. - Categorize the topics identified through keywords, KeyWords Plus (KW+).

Source: *Own elaboration based on records obtained from WoS database by VOSviewer.*

The articles have been published in different WoS categories. Table 3 shows the ten WoS categories where most articles on the subject are published, accounting for 89 % of the production. The first category, "Economics", accounts for 44.11 % of the publications analysed. In the second place, "Industrial Relations Labor", with 494 documents, accounts for 17.50 %, less than half as many publications as "Economics". The following two in the ranking, "Public Environmental

Occupational Health" and "Political Science", account for 5.74 % and 4.35 %, respectively, far behind the values of the first two WoS categories, "Economics" and "Industrial Relations Labor".

Figure 2. *Number of publications and citations (1962-2021).*

Source: *Own elaboration based on records obtained from WoS database by VOSviewer.*

Table 3. *The number of publications and categories from WoS database*

Web of Science Categories (10)	Number of publications (2822)
Economics	1245
Industrial Relations Labor	494
Public Environmental Occupational Health	162
Political Science	123
Law	92
Management	88
Public Administration	84
Development Studies	81
Social Sciences Mathematical Methods	77
Sociology	77

Web of Science Categories (10)	Number of publications (2822)
Total	**2523 (10 Categories)**

Source: Own elaboration based on records obtained from WoS database by VOSviewer.

Table 4 shows the titles of the ten journals that publish the most articles on the subject. They represent 11.48% of the total production analysed. The *Journal of Labor Research* is ranked number 1, with 48 papers, followed by *Labor Economics*, with 45 papers, and *Monthy Labor Review*, with 36 papers, in third place, even though the journals with the highest production on the subject are the *Journal of Labor Research*, *Labor Economics* and *Monthy Labor Review*. However, the analysis of the co-citation of sources revealed the three most relevant journals: *American Economic Review*, *Quarterly Journal of Economics* and *Industrial and Labor Relations Review*.

Table 4. *Titles of the ten journals containing the highest number of articles*

Publication Titles (10)	Number of articles
Journal of Labor Research	48
Labor Economics	45
Monthly Labor Review	36
Journal of Industrial Relations	34
Industrial Labor Relations Review	30
British Journal of Industrial Relations	29
ILR Review	27
Economics Letters	26
International Labour Review	26
Applied Economics	23
Total	**324**

Source: Own elaboration based on records obtained from WoS database by VOSviewer.

We have identified groups of authors who analyse the subject matter, the organisations to which the researchers belong, the countries and the thematic areas of the studies, and their evolution over time. We present the results obtained. Table 5 shows the number of publications of the ten most productive authors. The most prolific of all is David Neumark of the University of California, Irvine (USA), who has also collaborated with the Institute of Labor Economics (IZA) in Germany. In second place is Alan Manning, who has been attached to the Department of

Economics and Political Science at the London School of Economics from 1992 to 2022. In 2022 he is seconded to the Centre for Economic Performance, London School of Economics (LSE).

Table 5. *Top ten most prolific authors*

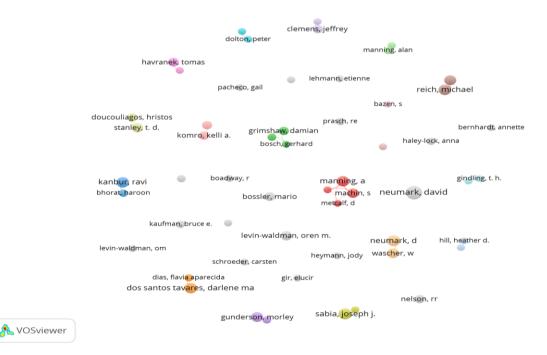| Authors(10)	Number of publications	Organisation
Neumark, David	32	University of California Irvine IRVINE, CA, USA IZA Institute Labor Economics (ALEMANIA)
Manning, Alan	17	London School Economics & Political Science Econ LONDON, ENGLAND Centre for Economic Performance (LSE)
Levin-Waldman, Oren M.	14	Demograph Specialist PoliticalVip Com Global Inst Sustainable Prosper & Labor Market BRONX, NY, USA
Machin, Stephen	14	London School Economics & Political Science LONDON, ENGLAND
Wascher, William L.	14	Federal Reserve System Board of Governors Div Res & Stat WASHINGTON, DC, USA
Gunderson, Morley	13	University of Toronto Ctr Ind Relat & Human Resources TORONTO, ON, CANADA
Sabia, Joseph J.	12	San Diego State University Ctr Hlth Econ & Policy Studies SAN DIEGO, CA, USA IZA Institute Labor Economics (desde 2017)
Kanbur, Ravi	11	Cornell University ITHACA, NY, USA IZA Institute Labor Economics (2019)
Reich, Michael	11	Dessau Community Gen Hosp Dept Internal Med DESSAU ROSSLAU, GERMANY
Tavares, Darlene Mara D.	11	Universidade Federal do Triangulo Mineiro Dept Enfermagem Educ & Saude Comunitaria UBERABA, MG, BRAZIL Conselho Nacl Desenvolvimento Cient & Tecnol CNP (desde 2022)
Total	**149**	

Source: *Own elaboration based on records obtained from WoS database by VOSviewer.*

The most cited article was published in 1996 in the journal *Econometrica*, with 1,231 citations and with an annual average of 45.59. The authors are DiNardo, J., Fortin, N.M., and Lemieux, T. (1996). Labour market institutions and the distribution of wages, 1973-1992: A semiparametric approach. Econometrica, vol 64(5). pp. 1001-1044, DOI10.2307/2171954. The co-citation analysis of papers identified the work of Dinardo, Fortin and Lemieux (1996), Card and Krueger (1994); Meyer (1995); and Dube, Lester and Reich (2010) as seminal contributions on the minimum wage. The co-citation analysis of authors revealed the different academic schools of thought on the subject, with authors such as D. Neumark, J.J. Sabia, A. Dube, W. Wascher, M. Reich and T.D. Stanley is standing out.

4.2 Network Analyses

The total number of authors publishing on minimum wages is 5,861. Figure 3 shows the 55 authors with five or more published papers. There are 36 clusters, with no significant connections between the authors. The largest cluster is formed by four connected authors: A. Manning; S. Machin; R. Dickens, and D. Metcalf. The most productive author with the highest number of citations is David Neumark, with 32 articles on the subject and 1,187 citations of these articles.
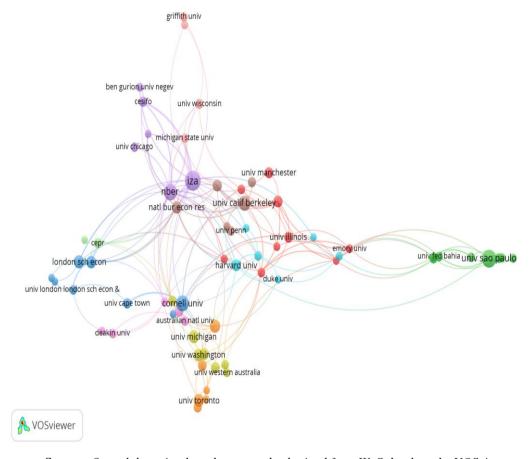
Figure 3. *Most productive authors*

Source: *Own elaboration based on records obtained from WoS database by VOSviewer.*

Organisations publishing articles on minimum wages total 2,163. Those with ten or more documents have been selected, amounting to 69 organisations. Furthermore, the 67 connected organisations forming 11 clusters are presented in figure 4. The central and most significant positions are the National Bureau of Economic Research (NBER) and the Institute of Labor Economics (IZA).

Figure 4. *Most productive organisations*

Table 6 shows the ten most productive organisations in order of link strength. In first place is the National Bureau of Economic Research, with 60 articles and 4,154 citations and a link strength of 64, in the three indicators it occupies first position; in second place is the Institute Labor Economics (IZA), with 55 documents, 675 citations and a link strength of 48, second in number of articles and link strength; in citations, it is surpassed by Harvard University, which occupies second place in citations.

Table 6. *Top ten most productive organisations*

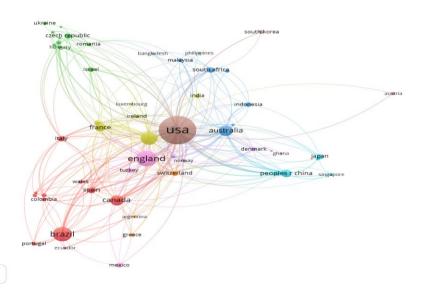| Organisation/University	No. of documents	Citation	Link strength
NATIONAL BUREAU OF ECONOMIC RESEARCH (NBER)	60	4154	64
INSTITUTE LABOR ECONOMICS (IZA)	55	675	48
UNIVERSITY OF CALIFORNIA, BERKELEY	33	1407	22
CORNELL UNIVIVERSITY	37	737	18
CESIFO. CENTER FOR ECONOMIC STUDIES	16	86	16
HARVARD UNIVERSITY	19	1855	16
UNIVERSITY OF NORTH CAROLINA	19	710	16
UNIVERSIDADE SÃO PAULO	45	478	16
COLUMBIA UNIVERSITY	14	171	15
UNIVERSITY COLLEGE LONDON (UCL)	22	600	15

Source: Own elaboration based on records obtained from WoS database by VOSviewer.

4.2.1 Mapping Scientific Collaboration
Through the co-authorship network of the countries and the source citation network, scientific collaboration was mapped

Figure 5. *Mapping Scientific Collaboration*

Source: Own elaboration based on records obtained from WoS database by VOSviewer

In total, 97 countries publish articles on minimum wages. Given the large number of countries and the long period analysed, we have considered those countries with five or more documents, leaving 55 countries represented in figure 5, which form 9 clusters. The colour of the spheres corresponds to a grouping or cluster of countries.

At the same time, the size represents the number of documents published per country. A high centrality of the USA and collaborative networks can be observed. In second place is England in the number of articles and collaborations, and Brazil in third. However, it shows less centrality and collaboration with other countries.

Table 7. *Top 10 most cooperative countries and their main partners*

Countries	No. of articles	No. of citations	No. of collaborations	Major Collaborations
USA	998	21342	270	Netherlands, Germany, Australia
England	314	6830	163	Germany, USA, Canada
Germany	204	2209	156	USA, England, Australia
Australia	150	2446	89	USA, Germany, England
Canada	133	3.067	66	Spain, England, Brazil
China	79	553	63	New Zealand, Taiwan, Singapore
France	83	1588	53	Belgium, Ireland, Italy
Brazil	260	1992	46	Ecuador, Portugal, Spain
Spain	46	369	40	Canada, Colombia, Brazil
Netherlands	40	922	36	USA, Vietnam, Thailand

Source: *Own elaboration based on records obtained from WoS database by VOSviewer.*

Table 7 shows the characteristics of the ten countries that have published the largest number of articles and the countries with which they have collaborated the most, ordered by the number of collaborations. The first in the ranking is the USA, with 998 articles and 21,342 citations, and has collaborated with 270 countries, the main collaborators being the Netherlands, Germany, and Australia.

In second place is England, with 314 articles and 6,830 citations, and has collaborated with 163 countries, mainly Germany, USA, and Canada. In third place in the ranking is Brazil, with 260 articles, 1,992 citations and 46 collaborations, mainly with Ecuador, Portugal and Spain. Despite the number of articles published in Brazil, citations and collaborations are lower than in other countries. Spain
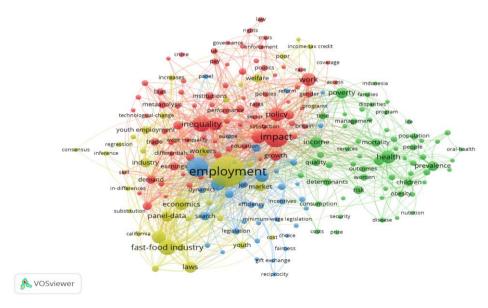
occupies ninth place in the world ranking in the subject with 46 articles, 369 citations and collaborations with 40 countries. It is, therefore, in the top ten.

4.2.2 Keyword and Co-Keyword Analyses

In the second part of this study, through the identification of clusters, the most salient issues of the scientific literature in this field have been detailed. There are controversies when it comes to implementing co-word analyses and visualisations. Different units of analysis can be used, Author KeyWords provided by the authors themselves, KeyWords plus, automatically extracted keywords, based on the frequency of occurrence of the words in the titles of the references of the cited articles. Some studies consider the KW+ as more appropriate units (Cantos-Mateos *et al.,* 2013), for others (Zhang *et al.,* 2016; Gálvez, 2019), the KeyWords plus are less specific and understandable than the key words provided by the authors.

Therefore, we have previously analysed and compared the visualisations generated by both the authors' KeyWord descriptors and the KeyWord plus descriptors, and it has been revealed that KW+ descriptors are the most suitable units in this scientific domain. As a result, the units of analysis used were the keywords, KeyWords Plus (KW+), extracted automatically by WoS. With the KW+ obtained, bibliometric maps were created by applying a methodology based on co-word analysis, clustering techniques and visualisation techniques. The co-word analysis reflects the semantic structure of the research field being addressed.

Figure 6. *Bibliometric map, showing 214 KW+ with a frequency ≥8 of the 2859 KW+ analysed*

Source: *Own elaboration based on records obtained from WoS database by VOSviewer.*

Keyword co-occurrence analysis produces a network of themes and their relationships that represent the conceptual space of a field. In the graphical visualisation, the size of a circle denotes the relevance of an element and network connections identify the most closely linked elements. The placement of circles, colours and delimitation is used to group elements. The distance between two nodes is proportional to the number of matches between keywords. Therefore, shorter distances suggest a higher match between keywords.

From the total of 2822 documents corresponding to the entire period 1962- 20212 (Table 3), 2859 KW+ are obtained, with an occurrence ≥8, 218 words were obtained, from which "minimum wage", "minimum wages", "wage" and "wages" were eliminated leaving 214 words. After applying the clustering algorithm, with a minimum value of 30 words, 4 clusters or thematic groupings were generated, reflecting the degree of similarity of the KW+.

The resulting maps showed, in synthesised form, the following five thematic clusters or main research fronts: a) evaluation of employment-related effects, the central term; b) themes organised around the impacts generated by the minimum wage; c) studies related to the generation of unemployment; and fourthly, d) the research front analysing health-related issues (Figure 6).

Figure 7. *Analysis of KW+ in the time distribution (1962-2021)*

Source: *Own elaboration based on records obtained from WoS database by VOSviewer*

Figure 7 shows that the keywords have changed and evolved over time. From analysing aspects such as unemployment, the fast food industry and regulation and legislation in more recent years, topics related to the terms satisfaction, work, job satisfaction, labour market, crisis, governance and credible research designs are investigated. Unemployment was more prevalent in analyses conducted at the beginning of the 21st century; however, employment has been more powerful in recent years, occupies the largest size and is the central theme.

5. Conclusions

The number of studies on the subject of minimum wage research has increased in recent years, although in 2021, this upward trend saw a slight decrease. The increase has been more remarkable from the 21st century onwards.

Due to the multidisciplinary and multidimensional nature of this field of study, two-dimensional bibliometric maps are a suitable tool for understanding the thematic structure of this scientific domain. Bibliometric analyses are becoming increasingly important because they quantify scientific activity through mathematical and statistical methods to discover scientific gaps that provide opportunities for new research (Camps, 2010). With this study, we have quantified the scientific activity in this field of research through bibliometric analysis.

In various scientific journals, articles on minimum wage have been published in more than ninety-seven countries. The journals with the most significant production on the subject are the Journal of Labor Research, Labor Economics and Monthy Labor Review. Spain occupies ninth place in the world ranking on the subject with 46 articles and 369 citations and collaborates with 40 countries. It is, therefore, in the top ten. The total number of authors publishing on minimum wages is 5,861. Fifty-five authors have published five or more articles. The most prolific author of all is David Neumark from the University of California, Irvine (USA), who has also collaborated with the Institute of Labor Economics (IZA) in Germany.

The most popular keywords in the initial years of research were: unemployment, the fast food industry and legislation. However, in recent years, the keywords under analysis are work, job satisfaction and credible research designs. The solid lines of research are employment and impact.

It was possible to transform a complex, underlying, dynamic and multidimensional reality into visible representations. That could help experts better understand the evolution of the minimum wage research field.

Among the limitations of this study is that only the WOS database has been used. In future work, the search for documents could be extended to Scopus or other databases to complete the analysis, and the systematic review could be complemented with the PRISMA 2020 methodology.

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