

Bibliometric Analysis of Publications Related to Supply Chain Management in Restaurants Before and After the COVID-19 Pandemic in the Period 2010-2022

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Abstract

The impact of the Covid-19 pandemic on supply chain logistics is on a global scale. This impact extends to the smaller, family-owned businesses, whose owners often rely on for their day to day living expenses. This study explores the current state of existing literature relating to supply chain management in restaurants on a global scale from the last 12 years. A distinction is made on the pre-Covid-19 period (2010-2019) and the years of its biggest impact (2020-2022) to better identify the evolution of the focus of studies and the strategies implemented to counteract the impact of the pandemic. The bibliometric analysis will be performed on scientific source database websites, such as Scopus and Web of Science, using keywords to identify relevant documents. VosViewer will be used to visualize the bibliometric network between authors, keywords and publication periods.

Keywords

Supply Chain, Restaurants, Fast Food, Logistic Solutions, Pandemic

1. Introduction

This investigation's aim is to explore the current state of existing literature on supply chain management for restaurants, with an additional focus on studies realized during and after the years of highest impact of the pandemic caused by Covid-19.

The advances in supply chain management of small restaurants in metropolitan Lima is limited by different social and economic factors, which is reflected in a diminished income. In many cases, these small businesses are the household's only source of income. This investigation aims to identify the main contributors and focuses of studies in supply chain management and reflect on the trends identified to promote further studies on unexplored topics.

The first year of Covid-19 has had an accelerating effect on the digital transformation and development of the retail supply chain. To keep operations running, retail businesses had to adapt quickly to a consumer that would not go to the store where your product is sold. This is reflected in a prioritization of investment in digital transformation on many businesses. While the costs incurred from investments in new technologies and training were high, long term, these businesses have shown a reduction on fixed costs.

The surge of third-party platforms that serve as both a distributor and a storefront for restaurants presents itself as an additional factor to take into consideration while evaluating the supply chain. This caused a new focus on new solutions to distribution since it provided an easy way of connecting clients and restaurants without major technological investment from the restaurant. Additionally, measures were taken to maintain a constant stream of feed on social media, as well as client service and post-sales support to retain presence in consumer's minds.

Another effect of consistent quarantines was a reduction in on-site workers. This affected directly how supply chain processes like material reception, production and dispatch took place. In all, the lack of direct commercialization, increase in supplier costs, and the reduction of staff size arose as a challenge during the initial months of quarantine. This research hypothesizes that the introduction of engineering tools in the supply chain of small restaurants will allow a better management of the chain and will allow reaching suppliers and the final consumer in a more direct and simple way, reducing the total costs of the restaurant.

1.1 Objectives:

General Objectives:

To explore the difference in literature production on supply chain planning in different time periods separated by the emergence of COVID-19.

Specific Objectives:

1. To explore scientific knowledge databases and rescue studies relevant to the topic.
2. To organize existing studies in a bibliometric network to visualize the correlation of authors and research topics.

2. Literature Review

To perform this investigation, we looked for a standard on supply chain research. (Chan, 2003) for example, establishes two main criteria to measure supply chain: quantitative and qualitative; and within these, multiple subcategories. Amongst the main quantitative indicators are costs of different steps in the supply chain like distribution and storage and the use of man hours and machine hours. From the qualitative indicators, factors like supplier negotiation power, flexibility of the supply chain and client trust are taken into consideration.

In addition to supply chain management, it's necessary to further look into restaurant or food industry focused investigations. Studies like the one from Janssen, Chang and the rest of their team in *Frontiers in Nutrition* (2021) present the change in consumer preferences in Denmark, Germany, and Slovenia. Their investigation demonstrated how food consumption had shifted at the beginning of the pandemic towards a trend to consume just what was necessary and, preferably, obtain these resources in a remote manner (via delivery or courier). Closer to our social context, a study by (Oliveira et al., 2020) presents the situation of providers, distributors, and consumers in Brazil. The

study features, in addition to supply chain numerical data, qualitative factors like the supply chain's main actors' average liking to the policies introduced by the government.

Finally, it's necessary to identify the nature of studies created as a response to the pandemic. (Alsetoohy et al. 2021) propose the option to opt for "green" providers that operate with sustainability as a focus. This change results in overall higher product quality and reductions in times and costs throughout the chain and, additionally, an added value in the eyes of clients and consumers alike. In another study, (CAF, 2020) proposes a focus on the company's digital transformation. An adaptation of this study's changes to a restaurant context offers a direct response to the problems exposed in the study from *Frontiers in Nutrition* (2021) relating to the consumers preference of remote acquisition methods. In a similar but far more advanced way, (Kumar et al. 2021) propose the automatization of multiple parts of the supply chain with the use of artificial intelligence (A.I.), deep learning and drones. The advantages of this investigation are much more noticeable, but the economic barrier of entry is just as high.

3. Methods

The research will be theoretical, since the focus of the research is to explore the volume of literature created in the defined period.

The research paradigm is interpretative, since the intention of this research is to reflect on the state of the literature. The research approach is longitudinal, since when collecting data, special note will be made of authors with a constant presence over the years or with multiple published studies.

Finally, the scope of the research is descriptive, since the volume of existing knowledge will be explored and presented in a visual way that allows better identification of trends.

4. Data Collection

Data was obtained from the Web of Science (WOS) and Scopus databases. Both international databases collect bibliographic information and provide the option of analyzing and generating bibliometric indicators (Rodriguez, 2013). A search strategy was used with the keywords "SUPPLY CHAIN" and "RESTAURANTS". Studies in Spanish and English were considered, from 2010 to 2022, divided into two periods: 2010-2019 and 2020-2022, with the aim of making a bibliographic comparison of research published before and after the COVID 19 pandemic. There is a possibility that relevant studies were not considered because they did not include keywords or were published in other databases.

To present the results, the documents were classified by number of publications, countries, institutions, authors, journals to which they belong and research categories. For data analysis and presentation of results, the bibliometric analysis graphs provided by the Scopus and WOS databases and the Microsoft Excel search tool were interpreted for registration through tables. The search for the second period (2020-2022) was delimited by adding the keywords "COVID 19" or "PANDEMIC" to examine research related to the restaurant supply chain in the context of COVID 19. In addition, studies with the highest impact were presented using bibliometric indicators to assess the quality and influence of the research. For this purpose, the articles with the highest number of citations in both. Periods were chosen based on data from Scopus, WOS, CrossRef. To visualize the H index of the journals of each publication, the Scimago Journal & Country Rank platform was used. Finally, the bibliometric network analysis tool VOSviewer was used to graphically describe the relationship between the keywords used, the level of cooperation between identified authors and their relationship with the titles found in both periods.

5. Results and Discussion

5.1 Number of publications on supply chain in restaurants

As of April 20, 2022, a total of 586 publications were found on the topic supply chain in restaurants, of which 344 belong to Scopus and 242 to Web of Science. In the first period (2010-2019) there were 322 published studies on this topic. In the second period (2020-2022), 264 research were registered. The year 2021 was the year with the highest number of publications in both databases, in Scopus (n=64) and in WOS (n=57). Within the latter period, 76 publications related to COVID 19 were found in both databases. Figure 3.1 below shows the publications found in the research period 2010-2022 according to the database.

5.2 Distribution of literature by country

Documents by country or territory

Compare the document counts for up to 15 countries/territories.

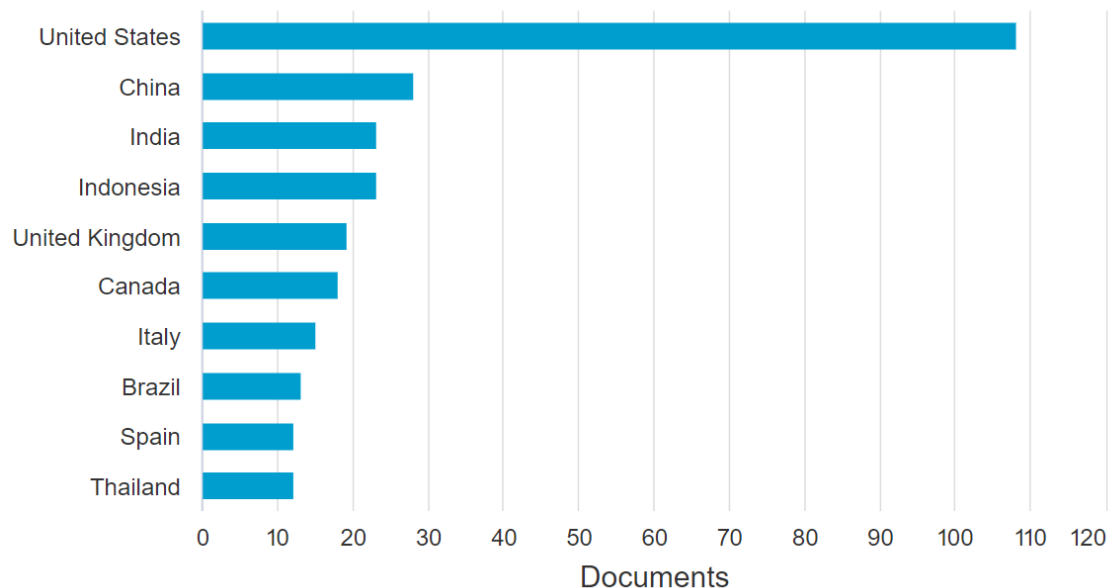


Figure 1. Number of documents published according to the database in the period 2010-2022

As shown in Figure 1, more than 72 countries around the world have published on the restaurant supply chain. The main countries that researched in both databases during the first period were USA (n=108) of which the journal “Renewable agriculture and food systems” stands out with a citiscore of 4.3 citations per paper and with an 82 percentile in “Agronomy and crop science” and a 75 in “Food Science”, China (n=28) with “Applied Energy”, a citiscore of 17.6 citations per paper and a 99th percentile in both “Building and construction”, “Management, monitoring, policy and law” and India (n=23), while in the second period the USA (n=38), India (n=14) and China (n=12) also lead. Within the latter period, the countries with the highest number of studies focused on the restaurant supply chain and COVID 19 were the USA and China in the case of Scopus. However, in Web of Science, the USA, Canada and China stand out.

5.3 Main authors, institutions and journals in the literature.

As shown in Figure 2, in Scopus we found 352 authors who conducted research on the topic, 205 of them published between 2010 and 2019, being Hall, C. (citiscore 8.8 citations per paper and percentile 94 in management) Michael and Bleich, S.N. the most active. In contrast, 146 authors published between 2020 and 2022, with Geng, N. and Sun, Y in “Journal of advanced transportation” with 77th percentile in economics and econometrics having the highest number of publications. Within the latter period, the number of authors publishing research related to COVID 19 and the restaurant supply chain was 160, with Larue, B. and Maples, J.G. publishing more than one study. In the case of WOS, a total of 960 authors who published in this database were identified, of which 486 were published in the first period, with Bonn MA in “International journal of contemporary hospitality management” with citiscore 9.3 and 95th percentile in “Tourism, leisure and hospitality management” having the highest number of publications. In the following period, 484 authors published, of which Cho M and Geng NN have the highest number of publications (n=3). In the case of authors who published on the restaurant supply chain and COVID 19, there are 92 authors, of which Larue B and Maples JG were the only ones to publish on more than one occasion.

For the analysis of the relationships between authors, the criterion was that the authors had more than one published article.

In the first period of the 1312 authors, only 38 met this criterion, in whose map 20 clusters were identified. In the case of authors who published in the second period of the 644 authors, only 33 met this criterion, in whose map 13 clusters were identified. Finally, in the case of authors who published research related to the restaurant supply chain and COVID 19, the 252 authors who published on this topic were taken into account, generating a map with 68 clusters.(Figure 2).

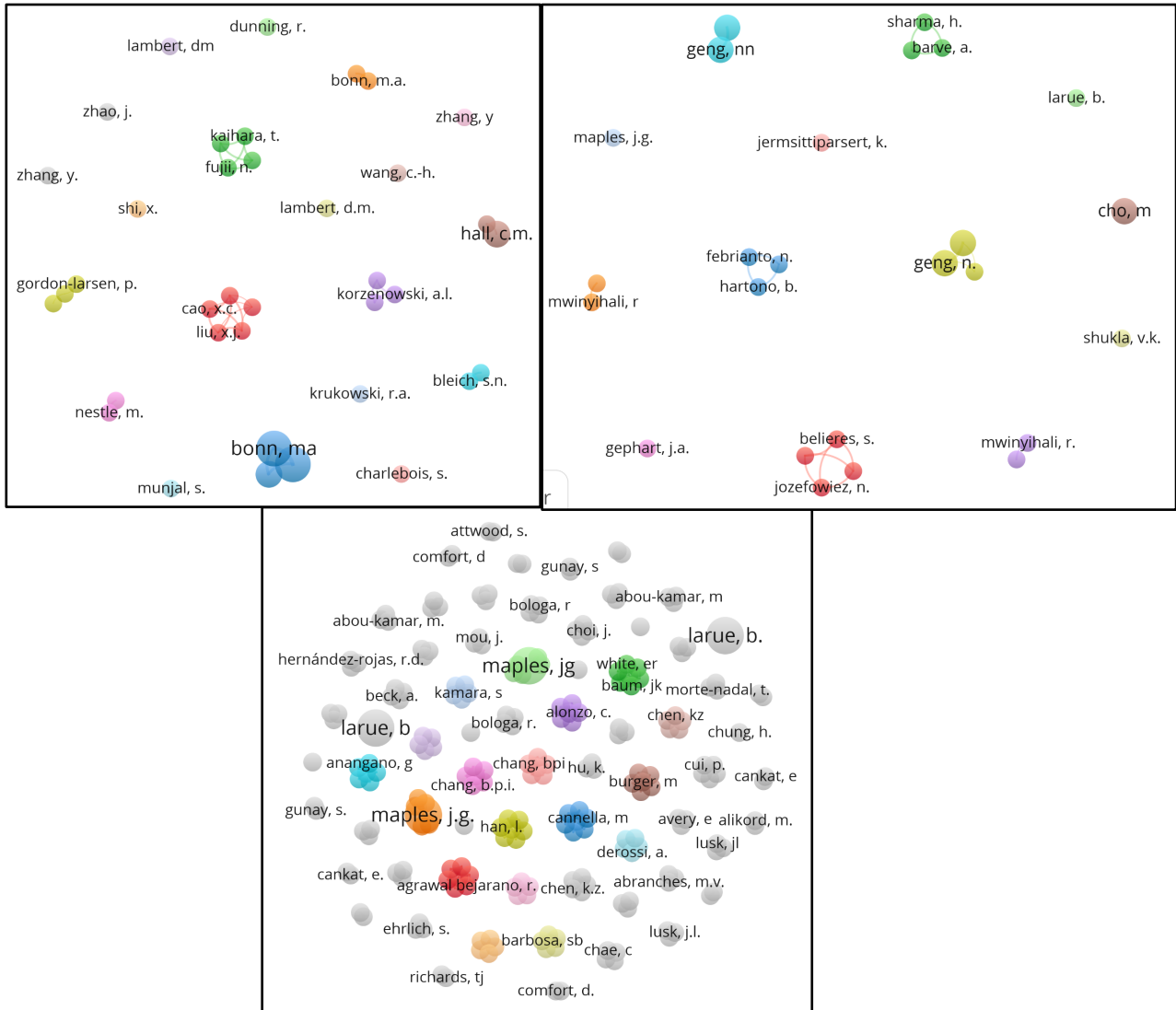


Figure 2. Conglomeration of authorship within Scopus and WOS in periods 2010-2019 (left), 2020-2022 (right) and linked to COVID-19 (bottom).

It can be seen on Table 1 that, while there are many authors who have published studies on this literature, there is little Correlation between the clusters of authors. This is evidence that there is a low strength of co-authorship between the different studies conducted on the subject. However, within the map, smaller clusters can be identified where there is a higher correlation. In general, the generation of literature occurs in isolation by country, even prior to the Covid-19 period, where social distancing was preferable. Countries such as China, Japan and the United States stand out as the main creators of scientific content that follow this trend. Within the European sphere, there is a presence of multiple

countries in research. In the pandemic context this trend continues, but, at the same time, new spheres of authors are created that generate literature relevant to the supply chain.

Table 1. Bibliometric network according to co-authorship

Period	Cluster	N° Items	Correlation	Coauthorship
2010-2019	1	5	7	Zhang, D., Cao, X.C, Liu, Y., Liu, X.J., Cheng, S.K.
	2	4	6	Nonoka, T., Kaihara, T., Fujii, N., Shimmura, T.
	3	3	7	Bonn, Ma., Cho, M., Guinipero, L.
	4	3	4	Korzenowski, A.L., Scavarda, A., Schiavo, G.
2020-2022	1	4	6	Belieres, S., Hewitt, M., Jozefowicz, N., Semet, F.
	2	3	4	Barve, A., Shanker, S., Sharma, H.
	3	3	4	Febrianto, N., Hartono, B., Yulinarsari, A.P.
	4	3	4	Geng, N., Sun, Y., Zhng, Y.
COVID-19	1	7	1	Agrawal Bejarano, R., Barum, J.K., Branch, T.A., Cottrell, R.S. Froehlich, H.E., Gephart, J.A., White, E.R.
	2	7	1	Canella, M., Han, L., Kitsos, A., Liu, CQ., Wang, QB., Wang, SK., Zhao, YF.
	3	6	1	Alonzo, C., Awwad, M., Chevalier, R., Mediati, N., Surdyk, J., Wei, A.
	4	7	1	Anangano, G., Camacho, O., Pado, A., Tasiguano, C., Toapanta, A., Zea, D.

5.4 Bibliographic research category

The main subject areas of the papers published in both databases in both periods were: Environmental sciences, biological sciences and agriculture, Business, management and accounting, Engineering, Social sciences. Whereas, of the studies that focused on the restaurant supply chain and COVID 19, of the main subject areas were Biological and agricultural sciences, Economics, econometrics and finance, Agricultural economics policy, Environmental studies and Decision sciences.

5.5 Co-citation of keywords

For the research conducted on restaurant supply chain, 160 keywords were extracted for both periods. To delimit the data, only keywords with 3 or more occurrences were taken into consideration. In the first period, 5 major clusters of

keywords were generated: food industry, supply chain, medical, demographic, and economic. In the second period, 5 major clusters of keywords were generated: logistics, food industry, supply chain, COVID-19 and consumer. In the case of studies published in relation to COVID-19, 3 major clusters of keywords were generated: logistics, supply chain, pandemics, and COVID-19. (Figure 3)

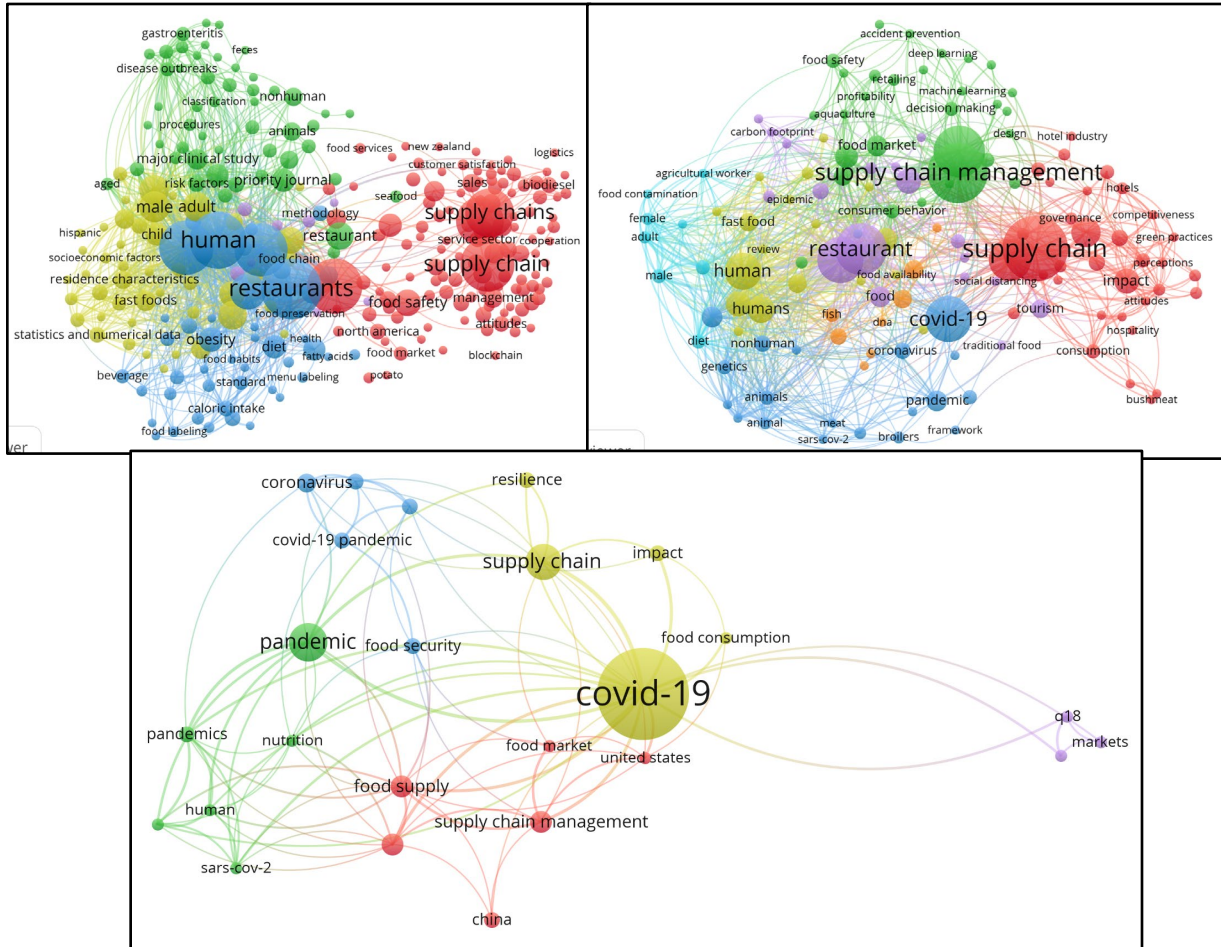


Figure 3. Keyword clustering within Scopus and WOS in periods 2010-2019 (top), 2020-2022 (middle) and linked to COVID-19 (bottom).

For all maps, "Supply Chains" and its variants were the keywords with the most occurrences. (Table 2) From the first period, the clusters show a focus on the consumer, evidenced by words related to consumer demographics such as "socioeconomic factors", and on the preservation of materials in transportation, evidenced by words such as "food handling". Predictably, once we enter the second period a focus on "Covid-19" or "pandemic" and its variants appear, but we should also mention the appearance of words that were not present before or did not have enough presence but are now more relevant. Words such as "innovation", "tourism", "retailing" and "consumption behavior" are terms that are affected by or are responses to Covid-19.

Table 2. Bibliometric network according to co-occurrence of keywords

Period	Cluster	N° Items	Key Words
2010-2019	1	125	Supply Chains, Agriculture, Food Industry, Local Food, Risks.
	2	51	Biodiversity, Clinical Study, Food Handling, Food Contamination, Infection Risk
	3	47	Human, Catering Service, Diet, Obesity, Consumer, United States, Nutrition, Food Preference
	4	46	Demography, Adult, Child, Male, Female, Food Availability, Socioeconomic Factors.
2020-2022	1	34	Supply Chain, Management, Innovation, Sustainability, Industry.
	2	30	Supply Chain Management, Consumption Behavior, Decisión Making, Retailing, Food Safety.
	3	20	COVID-19, Coronavirus, Pandemic, Resilience, Meat, Animals, Genetics, Value Chain
	4	18	Human, Fast Food, Commerce, Obesity, Restaurants, Food Industry, Fast Foods.
COVID-19	1	6	China, Food Market, Food Supply, Supply Chain Management, Sustainability, United States.
	2	6	Human, Nutrition, Pandemic, Sars-cov-2
	3	5	Coronavirus, Covid-19, Pandemic, Food Security, Social Distancing, Tourism
	4	5	Covid-19, Food Consumption, Impact, Resilience, Supply Chain

5.6 Discussion

It is evident that the first period had a greater number of publications, since more years are considered in the search range, however the second period obtained more publications per year, but less than 50% of them are related to COVID 19 since it is a recent topic and the results of the impacts are not really obtained immediately, as it will be in a few years. It was also observed that many of the authors with more publications in the first period, decided to publish in the second period, enriching their previous publications with updates about their study with the effect of a pandemic. The institutions with the highest number of publications in the restaurant supply chain in both periods are concentrated in the USA and China. This could be a result of multiple factors such as population density or the fact that both countries are among the largest exporters and importers in the world. The journals where the collected articles were published belong mostly to the first quartile and all have high citation values for multiple topics. This is indicative of the relevance of the articles to the topic of food logistics.

With respect to the analysis of co-authorship for the most part, the studies come from circles of researchers from the same institution or country. Within these, the studies conducted in Asian countries are those that involve the participation of more authors. While research conducted in China involves 5 authors from the same circle, European research involves a maximum of 3 authors. Once the Covid-19 period is entered, due to the lowering of the limitation on the number of studies to be taken into consideration, the density of the bibliographic network becomes higher. However, the same trend present in the 2010-2019 period of isolated creation by country can be seen. While this is not an exceptional occurrence, a study with authors from multiple countries and contexts to address the pandemic would be a possibility to take the reactions of different socioeconomic realities to a pandemic into consideration when developing future logistical solutions. This situation could be considered idyllic, but it would not be surprising if such a global study were to be conducted in the future or even currently underway.

6. Conclusion

Science and research in the restaurant supply chain sector is important for the economic development of a country, which is reflected in better utilization of productivity and implementation of technological advances in countries such as the USA or China. This study was able to identify and show the differences in scientific research on the restaurant supply chain before and after the pandemic in internationally recognized databases. It showed that the number of publications has gone from less to more in relation to a global event with high impact in recent years. and is expected to continue to do so in the coming years: However, there is no evidence of a large number of publications in relation to the restaurant supply chain to Covid 19. It shows that research published in both periods shows different approaches in relation to current trends.

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