HEALTH ECONOMICS: IDENTIFYING LEADING PRODUCERS, COUNTRIES RELATIVE SPECIALIZATION AND THEMES

ECONOMÍA DE LA SALUD: IDENTIFICACIÓN DE LOS PRINCIPALES PRODUCTORES, LA ESPECIALIZACIÓN RELATIVA DE LOS PAÍSES Y TEMAS

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Abstract:

Health economics research area was a high evolution from the 1960s and it is constantly growing. Currently, the health expenditure is a key issue worldwide. Bibliometrics provides several methods to explore the impact and evolution of the research. Thus, the main aim of the present study is to understand the current status of the research in health economics for the period 2010-2019. Three different aspects were analyzed: countries production, relative priority index and main themes. The dataset was obtained from the documents indexed in the Web of Science database from 2010 to 2019. SciMAT software was used to obtain the thematic analysis by means of science mapping analysis. The journals *Health economics, Value in Health, Journal of Health Economics,* and *European Journal of Health Economics* are the main producers. USA, England and Germany are those with highest production; Netherlands, England and Australia are those with the highest relative priority index. *Quality adjusted life years* and *Health inequality* are the themes with the highest number of documents and impact measures. This study is a useful evidence-based framework on which to base future research actions.

Keywords Health economics, Bibliometrics, Scientometrics.

JEL Codes B20, I10.

Resumen:

El área de investigación en economía de la salud tuvo una gran evolución a partir de la década de 1960 y está en constante crecimiento. Actualmente, el gasto en salud es un tema clave en todo el mundo. La bibliometría proporciona varios métodos para explorar el impacto y la evolución de la investigación. Así pues, el principal objetivo del presente estudio es comprender la situación actual de la investigación en materia de economía de la salud para el período 2010-2019. Se analizaron tres aspectos diferentes: la producción de los países, el índice de prioridad

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relativa y los temas principales. El conjunto de datos se obtuvo a partir de los documentos indizados en la base de datos Web of Science de 2010 a 2019. Se utilizó el software SciMAT para obtener el análisis temático mediante el análisis de mapas de la ciencia. Las revistas *Health economics*, *Value in Health*, *Journal of Health Economics* y *European Journal of Health Economics* son los principales productoras. Estados Unidos, Inglaterra y Alemania son los que tienen una mayor producción; los Países Bajos, Inglaterra y Australia son los que tienen el índice de prioridad relativa más alto. Los años de vida ajustados en función de la calidad y la desigualdad en materia de salud son los temas con mayor número de documentos y medidas de impacto. Este estudio es un marco útil basado en ciencia que servirá de base para futuras acciones de investigación.

Palabras clave: Economía de la salud, Bibliometría, Cienciometría.

Códigos JEL: B20, I10.

1. INTRODUCTION

The term "Health economics" (HE) appeared in books in the 1940s, four decades after the terms "Agricultural economics" and "International economics" (Wagstaff & Culyer, 2012). This term was a high evolution from the 1960s, ant the growth is constantly increasing. Currently, the allocation of resources in health care is a key issue in the health sector worldwide. An increase in health expenditures per capita is occurring especially in low and middle income countries (Hernandez-Villafuerte, Li, & Hofman, 2016). Therefore, it is important to know the scientific issues and main actors that are developing this research knowledge.

In this sense, bibliometric provides several methods to explore the impact and evolution of several themes and topics over time, facilitating the understanding and evaluation of the study output in a particular field (van Raan, 2005). Research output used to be evaluated using this sort of measurements (van Leeuwen & Wouters, 2017), using them for practical research (Gutiérrez-Salcedo *et al.*, 2018; Moral-Munoz *et al.*, 2020). Therefore, the Science Mapping Analysis (SMA) is applied in the present paper (Chen, 2017; Cobo *et al.*, 2011b). SMA combines with the evaluation of co-word networks, enables the most important terms or keywords of papers to be used to identify a study field structure (Callon *et al.*, 1983). Besides, the relative priority index (RPI) is used to discover the different effort of the countries in the development of HE research production (Moral-Munoz *et al.*, 2019; Sangam, Arali *et al.*, 2018).

During the last years, some bibliometrics studies were published analyzing some aspects of the HE research area. Coast (2018) performed a bibliometric analysis in which analyzed the role of the Social Science & Medicine journal in the development of HE research. Jakovljevic & Pejcic (2017) analyzed the global scientific output of HE from 2000 to 2016. Wagstaff & Culyer (2012) studied forty years of HE publications through the metadata downloaded from EconLit and supplemented by the citation data from Google Scholar. Finally, Rubin & Chang (2003) analyzed the trends in HE articles indexed in economics literature from 1991 to 2000.

In views of this background, the primary aim of the present study was to offer a bibliometric overview of the HE research area from 2010 to 2019. Four different subgoals were established: 1) to know the Top 10 journals of the HE, 2) to know the Top 10 countries that publish in HE, 3) to analyze the RPI of the Top 10 countries, and 4) to discover the main themes of HE by means of SMA.

The structure of the rest of the paper is the following: i) Section 2 present the methodology used to obtain the dataset and to carry out the performance and SMA analyses, ii) Section 3

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shows the results obtained, iii) Section 4 discuss the most relevant findings according to the analysis, and iv) Section 5 details the main conclusions are drawn therefrom.

2. METHODOLOGY

Bibliometrics is commonly used to quantify academic research (Moral-Munoz *et al.*, 2019), which is taken into account for practice-based research (Gutiérrez-Salcedo *et al.*, 2018). Then, several aspects of the method employed are described in the following section: i) the sample analyzed to identify the documents, ii) the different criteria used to analyze the production trends, iii) the relative specialization of the countries, through the Relative Priority Index (RPI) (Moral-Munoz *et al*., 2018; Sangam *et al*., 2018), and iv) the strategic diagram of the published papers into the HE research area (Cobo *et al.*, 2012).

2.1. Sample

The Web of Science (WoS) database was used to identify the core of documents that compound the research topic. According to the literature, it was stated that it contains the most important research output related to the different scientific disciplines since they are considered as a primary criterion in tenure, promotion and other professional decisions (Hodge & Lacasse, 2011; Seipel, 2003). The period 2010-2019 and only Article and Reviews types were considered. The following search strategy was employed to retrieve the overall number of published documents:

SU=ECONOMICS AND TI=HEALTH

The term "Health" was searched in Title field to ensure the document is mainly related to health. Probably, we are losing some relevant papers, but the query employed includes a sample without excessive noise. From the set of documents retrieved, the following metadata were extracted: authors, affiliations, title, year of publication, citations, sources, abstract and keywords.

2.2. Production trends

Once the information was obtained, the set of documents was analyzed by the following criteria: the most cited documents the most productive journals, and the most productive countries. In the next step, the identified countries were compared regarding two different indicators for the year 2018: Gross domestic product per capita (GDP), and Adjustment Index (AI) (Dehdarirad, Sotudeh, & Freer, 2019). These indicators were included in the study to show the differences among countries based on socioeconomic indexes.

GDP reflects the country economic production. In that way, the GDP per capita based on purchasing power parity (PPP) is a more accurate characteristic determining the level of economic development and economic growth. The data was obtained from the World Data Bank 2018 website (https://data.worldbank.org/indicator/NY.GDP.MKTP.CD).

Moreover, AI is based on the GDP (The World Bank, 2018) per capita (Zyoud, Al-Jabi, & Sweileh, 2015), and it is calculated as follows: AI= ((total number of documents/ GDP per capita of the country) * 100).

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2.3. Relative specialization of the countries

Furthermore, to discover the relative scientific effort of the different countries in the development of the HE production, the Relative Priority Index (RPI) (Moral-Munoz *et al.*, 2019; Sangam *et al.*, 2018) was applied. The RPI reflects the relative production of a country taking into account the world publications. In our study, the world publications was delimited to the period 2010-2019. Then, it is defined as RPI=((a/b))/((c/d)) x 100, where:

a = number of publications of a country in HE;

b = number of publications of a country in all fields;

c = number of publications of all countries in HE;

d = number of publications of all countries in all fields (obtained by searching in WoS each country for the period 2010-2019).

A RPI=100 shows that the research priority of a country is on the average, according to the rest of the countries. If RPI>100, the priority is higher than the average; if RPI<100, priority is lower than the average.

2.4. Science Mapping Analysis

Moreover, a co-word assessment was conducted for the period 2010-2019 using the SciMAT software (Cobo et al., 2012; Moral-Munoz *et al.*, 2020). First, several procedures have been employed to the keywords of the papers: I) Concept identification: Through a de-duplication method, synonymous and plural/singular are united to be displayed only by a unique word; the keywords of the authors have been manually reviewed using the specific software module. II) Deletion of irrelevant keywords: certain keywords do not add to the field understanding, such as stop words or general concepts (e.g., system, study, etc.). The following stages were implemented to achieve the co-word analysis (Cobo *et al.*, 2012):

a) Detection of themes: The clusters obtained in this phase are related to points of interest and/or scientific problems attracting the attention of the research community.

b) Low dimensional space layout of the themes identified. For the plotting of each detected cluster, a two-dimensional strategic diagram is used to obtain a spatial layout of research themes (Callon *et al.*, 1991). Then, themes can be categorized into four groups (Cobo *et al.*, 2011a), based on the quadrant: 1) Basic and transversal themes (lower-right quadrant): they are essential for a research area, but they are not highly developed. 2) Motor themes (upper-right quadrant): well-developed and significant for the composition of the area structure. 3) Highly developed and isolated themes (upper-left quadrant): well-established but irrelevant for the area. 4) Emerging or declining (lower-left quadrant): weakly and poorly developed.

c) Analysis of performance. To find the relative contribution of the identified themes to the entire study area, a quantitative and qualitative analysis is conducted. Through these analyses, it is possible to highlight the most relevant, productive and highest impact topics. Several bibliometric indexes could be combined with these themes and thematic areas to enable us this type of analysis, such as the total of documents published, the total number of citations received, and h-index (Alonso *et al.*, 2009; Hirsch, 2005; Martinez *et al.*, 2014).

A strategic diagram is constructed using this method in order to analyze the most important themes for the HE research area. The volume of the spheres represents the document count of each theme. Furthermore, in brackets appear the number of citations reached by each theme.

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3. RESULTS

An amount of 5,010 documents (articles and reviews) under the period 2010 to 2019 were analyzed. In that way, the 10 most cited articles were identified in table 1. The most cited paper received a total of 657 cites (Husereau *et al.*, 2013). All the most cited documents were published in 2016. The most outstanding paper is (Devlin *et al.*, 2018); it is the 7th ranked in a short period after publication.

TABLE 1. TOP 10 DOCUMENTS IN HE RESEARCH FIELD IN THE PERIOD 2010-2019.

Rank	Article	Cites	Reference
1	Husereau, D., Drummond, M., Petrou, S., Carswell, C., Moher, D., Greenberg, D., … Publica, I. H. E. E. (2013). "Consolidated Health Economic Evaluation Reporting Standards (CHEERS)-Explanation and Elaboration: A Report of the ISPOR Health Economic Evaluation Publication Guidelines Good Reporting Practices Task Force". *Value in Health, 16*(2), 231–250.	657	(Husereau *et al.*, 2013)
2	Bridges, J. F. P., Hauber, A. B., Marshall, D., Lloyd, A., Prosser, L. A., Regier, D. A., … Mauskopf, J. (2011). "Conjoint Analysis Applications in Health-a Checklist: A Report of the ISPOR Good Research Practices for Conjoint Analysis Task Force". *Value in Health, 14*(4), 403–413.	572	(Bridges *et al.*, 2011)
3	Cutler, D. M., & Lleras-Muney, A. (2010). "Understanding differences in health behaviors by education". *Journal of Health Economics, 29*(1), 1–28.	556	(Cutler & Lleras-Muney, 2010)
4	Jansen, J. P., Fleurence, R., Devine, B., Itzler, R., Barrett, A., Hawkins, N., … Cappelleri, J. C. (2011). "Interpreting Indirect Treatment Comparisons and Network Meta-Analysis for Health-Care Decision Making: Report of the ISPOR Task Force on Indirect Treatment Comparisons Good Research Practices: Part 1". *Value in Health, 14*(4), 417–428.	509	(Jansen *et al.*, 2011)
5	de Bekker-Grob, E. W., Ryan, M., & Gerard, K. (2012). "Discrete choice experiments in health economics: a review of the literature". *Health Economics, 21*(2), 145–172.	477	(de Bekker-Grob, Ryan, & Gerard, 2012)
6	Finkelstein, A., Taubman, S., Wright, B., Bernstein, M., Gruber, J., Newhouse, J. P., … Grp, O. H. S. (2012). "The Oregon Health Insurance Experiment: Evidence from the First Year". *Quarterly Journal of Economics, 127*(3), 1057–1106.	463	(Finkelstein *et al.*, 2012)
7	Devlin, N. J., Shah, K. K., Feng, Y., Mulhern, B., & van Hout, B. (2018). "Valuing health-related quality of life: An EQ-5D-5L value set for England". *Health Economics, 27*(1), 7–22.	262	(Devlin *et al.*, 2018)
8	Brazier, J. E., Yang, Y., Tsuchiya, A., & Rowen, D. L. (2010). "A review of studies mapping (or cross walking) non-preference based measures of health to generic preference-based measures". European Journal of Health Economics, *11*(2), 215–225.	256	(Brazier, Yang, Tsuchiya, & Rowen, 2010)
9	Clark, M. D., Determann, D., Petrou, S., Moro, D., & de Bekker-Grob, E. W. (2014). "Discrete Choice Experiments in Health Economics: A Review of the Literature". *Pharmacoeconomics, 32*(9), 883–902.	238	(Clark, Determann, Petrou, Moro, & de Bekker-Grob, 2014)
10	Liddell, C., & Morris, C. (2010). "Fuel poverty and human health: A review of recent evidence". Energy Policy, *38*(6), 2987–2997.	179	(Liddell & Morris, 2010)

Source: own elaboration.

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Then, the most productive journals were identified. The Top 10 journals with most production are presented in table 2. Highlights "Health Economics" with 445 documents (8.88 per cent followed by "Value in Health" with 368 manuscripts (7.35 per cent).

TABLE 2. TOP 10 JOURNALS IN HE RESEARCH FIELD IN THE PERIOD 2010-2019.

Rank	Journal	No. Docs	% Docs
1	HEALTH ECONOMICS	445	8.88%
2	VALUE IN HEALTH	368	7.35%
3	JOURNAL OF HEALTH ECONOMICS	327	6.53%
4	EUROPEAN JOURNAL OF HEALTH ECONOMICS	255	5.09%
5	PHARMACOECONOMICS	138	2.75%
6	HEALTH ECONOMICS REVIEW	108	2.16%
7	APPLIED ECONOMICS	101	2.02%
8	ECONOMICS & HUMAN BIOLOGY	101	2.02%
9	APPLIED HEALTH ECONOMICS AND HEALTH POLICY	97	1.94%
10	AMERICAN ECONOMIC REVIEW	65	1.30%
No. Docs: Number of documents; % Docs: Percentage of documents			

Source: own elaboration.

Next, the countries ranking with the most productive documents are presented in table 3. Figure 1 shows the map of the HE production worldwide. All the authors' affiliations and countries signing the manuscript were considered as producers. The USA is the 1st ranked in the production rate with 1,979 documents (39.50 per cent). According to the figure 2, the highest value of AI is obtained by USA, followed by China and England.

TABLE 3. TOP 10 COUNTRIES IN HE RESEARCH FIELD IN THE PERIOD 2010-2019.

| Rank	Countries	No. Docs	% Docs	GDP per capita	AI	Total	RPI
1	USA	1,979	39.50%	62,794.60	3.15	7,213,149	111.64
2	ENGLAND	801	15.99%	42,943.90	1.86	1,862,425	175.00
3	GERMANY	431	8.60%	47,603.00	0.90	1,692,789	103.60
4	AUSTRALIA	377	7.52%	57,373.70	0.65	963,545	159.21
5	NETHERLANDS	331	6.61%	53,024.10	0.62	612,955	219.73
6	CANADA	305	6.09%	46,233.00	0.66	1,105,004	112.31
7	CHINA	241	4.81%	9,770.80	2.46	3,936,170	24.91
8	FRANCE	230	4.59%	41,463.60	0.55	1,144,040	81.80
9	ITALY	203	4.05%	34,483.20	0.58	1,098,454	75.20
10	SPAIN	164	3.27%	30,370.90	0.54	969,390	68.84
No. Docs: Number of documents; % Docs: Percentage of documents; GDP: Gross Domestic Product; AI: Adjustment Index; RPI: Relative Priority Index							

Source: own elaboration.

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FIGURE 1. PRODUCTION MAP OF THE COUNTRIES WITH MORE THAN ONE DOCUMENT; THE PERCENTAGE OF DOCUMENTS WAS USED TO BUILD THE MAP.
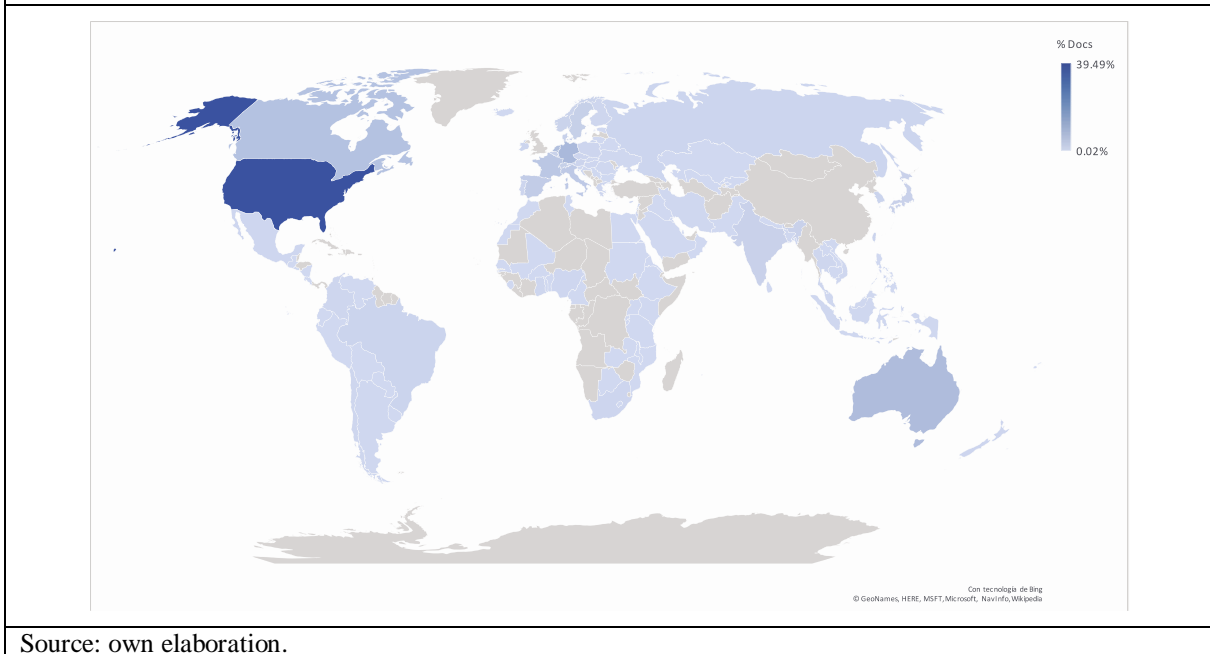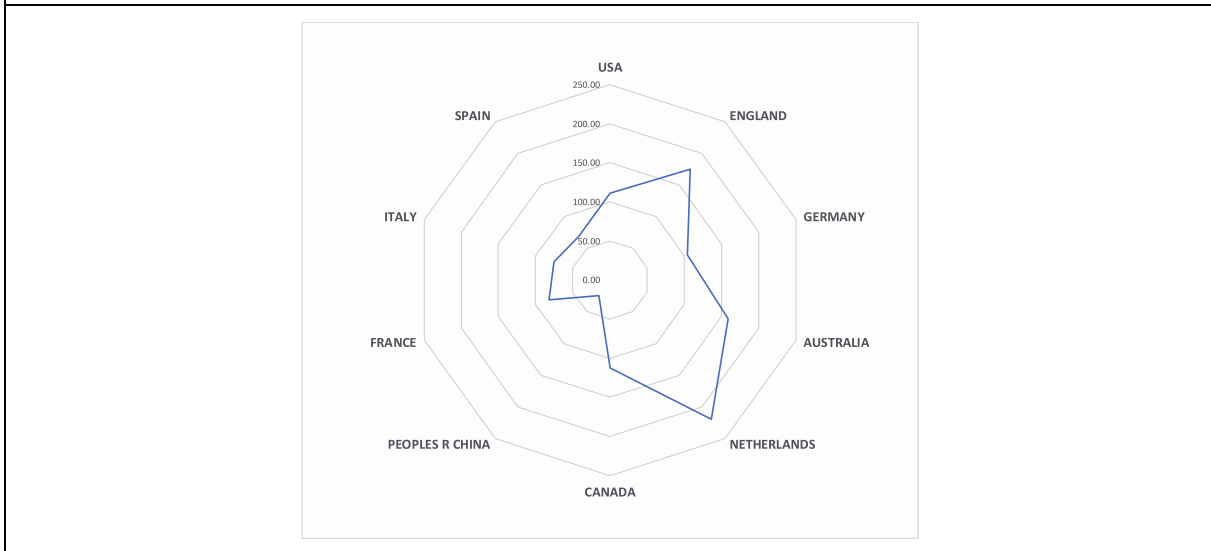

Source: own elaboration.

FIGURE 2. AI OF THE TOP 10 COUNTRIES ACCORDING TO THEIR SCIENTIFIC PRODUCTION; THE VALUES ARE PRESENTED AT THE EDGES.
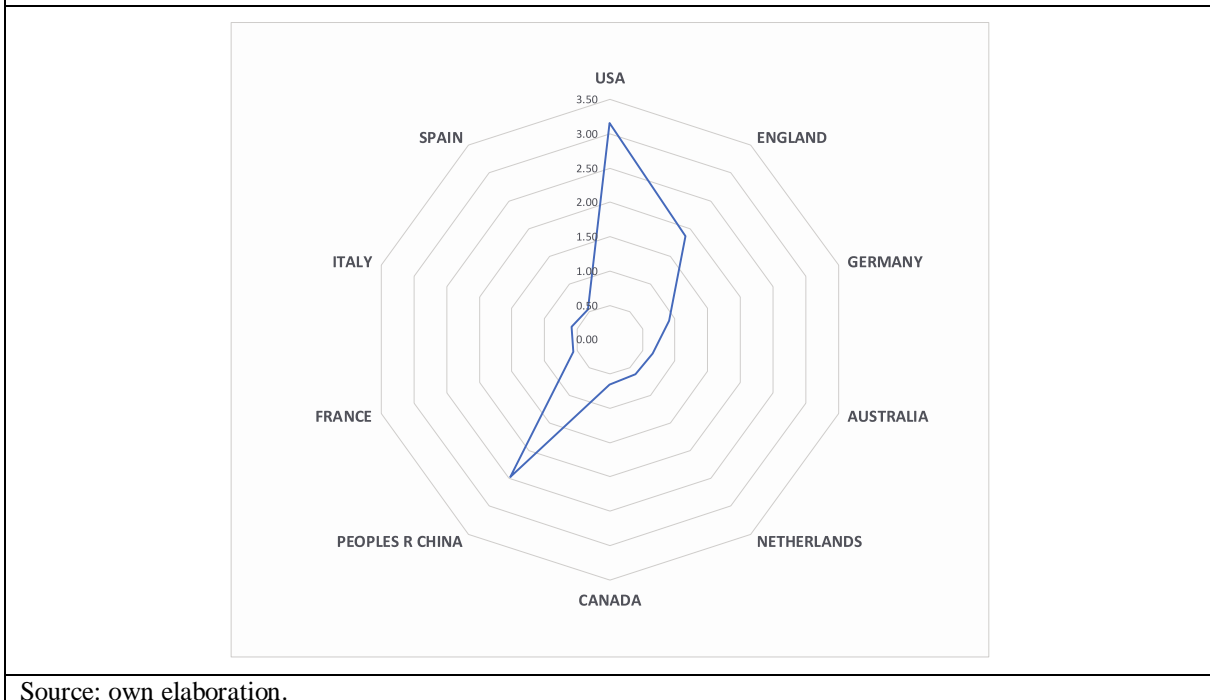
Source: own elaboration.

Furthermore, regarding the RPI approach, figure 3 shows a radial graphic of the countries documents production. In views of this graphic, Netherlands is the country with the highest RPI, followed by England and Australia. These results reflect a highest relative scientific interest in HE with respect to the rest of countries.

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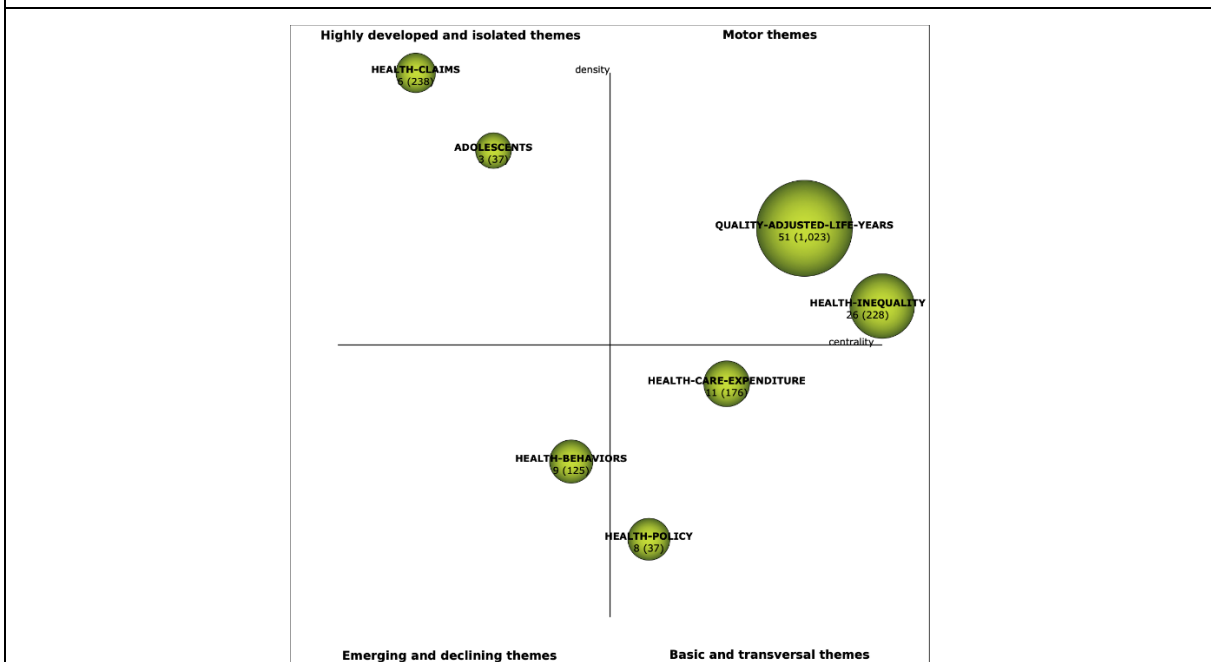
FIGURE 3. RPI OF THE TOP 10 COUNTRIES ACCORDING TO THEIR SCIENTIFIC PRODUCTION; THE VALUES ARE PRESENTED AT THE EDGES.

Source: own elaboration.

Finally, in order to analyse the most remarkable themes of the HE production, a strategic diagram is shown for the period 2010-2019. According to the diagram shown in figure 4, there are 7 themes in which the researchers have been working on: *Adolescents, Health behaviour, Health care expenditure, Health claims, Health inequality, Health policy and Quality adjusted life years*. Some insights about these themes will be reported in the Discussion section.

FIGURE 4. STRATEGIC DIAGRAM OF THE MAIN TOPICS DETECTED IN HE FOR THE PERIOD 2010-2019; THE SIZE OF THE SPHERES IS RELATED TO THE NUMBER OF DOCUMENTS AND THE NUMBER OF DOCUMENTS AND CITES (IN BRACKETS) ARE SHOWN BELOW THE NAME OF THE THEME.

Source: own elaboration.

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4. DISCUSSION

In the present bibliometric study, the results of publication on HE during the period 2010-2019 are presented. According to the results showed in the Result section, some aspect related with the production and thematic interest should be noted.

First, the journal *Health Economics* has the highest rate of document during the period. More than 25 per cent of the production is focused on four journals: *Health Economics*, *Value in Health*, *Journal of Health Economics* and *European Journal of Health Economics*. We can consider that the scope of those journals is highly related to HE, so they could be the firsts options when a researcher wants to submit a paper related with this issue.

Regarding the main countries researching in HE, USA is the highest producer in term of documents published. This finding is not surprising, since it is a big country with a high rate of publications each year. These results are similar to those reported by previous studies (Jakovljevic & Pejcic, 2017; Wagstaff & Culyer, 2012). Nevertheless, if we consider the GDP per capita, USA is also the main producer, but China is the 2nd ranked according to the AI. The greatest scientific growth in China is also reflected in the HE research area (Tollefson, 2018). In that way, England is the 3rd country in which the scientific production in HE according to its GDP is also relevant. Moreover, if we take into account the RPI, the countries that "make a relative effort" in research about HE are Netherlands, England and Australia. Nevertheless, taking into account the Best Healthcare in The World by Population published by The Legatum Institute's Prosperity Index (Legatum Institute, 2014), only Netherlands is in the Top 10 countries with the best healthcare in the world.

According to the thematic interest in the HE research area, the motor themes are *Quality adjusted life years* (QALY) and *Health Inequality*. QALY is an indicator used for economic assessment of the value of medical interventions (National Institute for Health and Care Excellence, 2013). It ranges from 1 (perfect health) to 0 (dead) and it can be used in personal decisions, programs evaluations and to set priorities to the future in health care management (Weinstein, Torrance, & McGuire, 2009). The theme *Health Inequality* is related to the challenge of measure the socioeconomic inequality in health, such as Erreygers & Van Ourti (2011) stated in their manuscript that is the most cited in this theme.

Furthermore, the two basic and transversal themes are *Health care expenditure* and *Health policy*. In that way, Wang (2011) stated that: *"when health care expenditure growth is quantile, the influence of economic growth on expenditure growth is more different"*. The growth in health care expenditure is not only a reflection of the economic growth, it highlights the importance of the health of the population. Moreover, *Health policy* refers to decisions, plans, and actions that are undertaken to achieve specific health care goals within a society (World Health Organization, 2020). It is the framework in which the rest of the actions and decisions are built.

Health behaviors appears as an emerging and declining theme. It is related to the study of how the socioeconomic environment influences the health behaviors of the population, such as the changes occurred with the 2008 economic crisis (Ásgeirsdóttir *et al.*, 2014). Finally, the two highly developed and isolated themes detected are *Health claims* and *Adolescents*. The *Health claims* is related to any statement about a relationship between food and health (European Comission, 2020). The theme *Adolescents*, is related with the study of the differences between adolescents and adults and how it should condition the health policy (Ratcliffe *et al.*, 2012).

While this research gives an interesting overview of the development of HE research, some issues need to be covered. First, WoS use implies that only the document viewpoint

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indexed in this database has been analyzed. In addition, the paper was based on a specific search query, and some documents could be indexed using other terms. Finally, in the RPI analysis, the foundation date and the variety of research themes covered by the institutions could be influencing these results. In that way, a further analysis considering these drawbacks will be performed.

5. CONCLUSIONS

In the present study, a bibliometric analysis, employing performance analysis and SMA, was carried out to present an overview of HE production from 2010 to 2019. Concerning the results obtained, the following considerations could be made:

- *Health economics, Value in Health, Journal of Health Economics,* and *European Journal of Health Economics* are the journals with the highest number of documents.
- *USA, England and Germany* are the countries with the highest production. Nevertheless, *Netherlands, England* and *Australia* are the countries with the highest RPI.
- The motor themes *Quality adjusted life years* and *Health inequality* are those with the highest number of documents and impact measures. They are attracting the interest of the scientific community.

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