Systematic Review

Systemic Review through Bibliometric Analysis with RStudio of Skills Learning to Favor the Employability of Its Graduates

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Abstract: Despite the fact that the member countries of the European Union initiated a reform of university education two decades ago to promote employability, giving importance to soft skills beyond the purely technical ones of each degree, there is still an important contrast between the demand for this type of skills on the part of the labor market and the educational offerings of universities. Therefore, it is necessary to analyze the impact that the concept of employability and soft skills really has on the scientific community and the patterns of collaboration between the European Union, the UK and Switzerland, among researchers in these matters, through a bibliometric study of the scientific publications in the area, collected in the databases Web of Science and Scopus during the period from 1996–2022, presenting the most significant bibliometric data through a descriptive and quantitative methodology. The main results allow us to detect, among other conclusions, an increase in scientific production from 2010 but minimal scientific collaboration, since 90% of the total number of works were signed by a single author. Two countries, the UK and Australia, have 80% more scientific production on these topics than Spain. This bibliometric study offers a descriptive and analytical panorama, from diachronic and synchronic perspectives, of the main bibliometric variables in two of the databases with the greatest impact among the scientific community (WOS and Scopus), allowing researchers and institutions to visualize the most developed study trends and the strongest emerging lines of research. The necessary rapprochement between the university and the company, in this way, will help the university to know its present situation but also to discover what learning strategy it should consider reducing the training gap in competences.

Keywords: employment; skill; graduates; university

1. Introduction

In recent times, increasing attention has been paid to the various types of skills that graduates provide when they enter the labor market. Universities should train their students in the skills demanded by this environment, harmonizing what the university offers its graduates with the characteristics in demand among recruiters.

It is about achieving a university at the service of society by making this institution a means with which to generate an authentic equality of opportunities, integrating it more decisively into the economic and productive fabric of society, promoting excellence through competition, and achieving with them two objectives simultaneously: greater efficiency and equity [1].

In short, a university education must enable its students to have a set of knowledge that allows an adequate transition into the labor market. That is, there must be an adequate correspondence between the learning reflected in a student's credentials and the knowledge that is requested in the workplace. The debate that arises, then, is to know what exactly this knowledge is that people have attempted to define in many ways: qualifications, skills, aptitudes, abilities and, more recently, competences [2].

Human resources experts believe that the qualities that workers will need to demonstrate in 2025 will be focused on transversal skills that all profiles share, regardless of ranks or specific training. They will range from change management to self-image management or intrapreneurship. Different requirements will also lead to different selection criteria when choosing one person or another. Thus, criteria such as personal skills (92.5%), cultural fit (87.5%) and attitudes (82.5%) will be more relevant. Others such as technical skills (60.4%) and extracurricular and volunteer activities (60%) will follow [3].

For this, it is necessary to maintain a close relationship with companies, which will indicate the skills that graduates need beyond the purely technical ones. There have already been some successful initiatives in this line, involving the different actors of the labor market in education and training to help young people improve their employability, as demonstrated, for example, by the OECD in its Report on "Skills Outlook 2021", where it analyzes how different policies can promote the lifelong learning of skills, recalling the need for relationships between different stakeholders. The main recommendations of the report are as follows: (1) Learners should be placed at the center of learning to improve the quality of education and training. (2) It is essential that there be a habit of learning so that people acquire the skills and knowledge necessary to function in changing everyday circumstances. (3) Strong coordination between learning providers is needed to develop high-quality and inclusive learning.

Evidence from the job vacancy data in OECD countries reveals that communication, teamwork and organizational skills are among the cross-cutting skills most demanded by employers across a wide variety of occupations. Cognitive skills, such as analytical, problem-solving, digital, leadership and presentation skills, are also very transversal across jobs and work contexts [4].

At the beginning of 2020, even before the COVID-19 outbreak, the fourth industrial revolution was already transforming jobs and the consequent demand for skills at an ever-increasing rate, so the World Economic Forum (WEF) expected that one billion workers would need to retrain professionally by 2030 and that, by 2022, 42% of the basic skills required to perform existing jobs would have changed. Some of those skills are technical, digital or task-oriented, but, as the pandemic has underscored, developing cognitive, creative, social and emotional skills is just as important.

In this same attitude, the United Nations Educational, Scientific and Cultural Organization (UNESCO) also supports the activities of the partners of the Global Skills Academy. Partners (GSAs) come together to help shape a more sustainable version of the Academy driven by current and future skill and knowledge needs at the national level [5].

Inevitably, the types of skills people need to master today differ from those they will need in the future. Lifelong learning systems play a key role in bridging the gap between current skills needs and future demands, helping people anticipate change, develop new skills and refine others. In addition, many of the decisions related to learning for the future labor market are relevant and long-term.

The anticipation of competences provides the means to identify future imbalances, brings together the key actors to address them and informs society about the future demand and supply of skills. Therefore, the International Labour Organization (ILO) proposes as an objective to promote educational policies with systems for the anticipation of skills that both include all the activities that allow for the development and coordination of the measurement and analysis of skill needs, and validate this analysis with the help of actors broadly representing the demand side (employers), the supply side (educational organizations) and market regulatory institutions (Ministries of Labor and Education, local administrations) [6].

Given this scenario, the European Union (2018) promulgates the idea that labor and employability skills are the key factor in adapting to the rapid and profound changes that the active population will have to face. However, since the creation of the European Higher Education Area (EHEA), several aspects have emerged to be assessed in relation to improvements in employability and skills training. On the one hand, researchers must

identify the key skills that maximize the employability of graduates, but it is also important to know how and when to promote the acquisition of these key competences [7], since transversal skills do not always have a prominent role in learning programs. The way countries and education systems approach transversal skills varies, driven by different histories, structures, needs and ambitions [8].

2. Theoretical Framework

Given the interest of the university in the labor market, the debate should be opened on whether the university has advanced toward the objective of developing the employability of its graduates, already established by the Bologna Declaration of 1999.

Given this, one of the main problems that arises is what we understand by employability and the very definition of the term skill or competence.

The literature has approached the concept of employability from different points of view. The term employability has been used "in a number of contexts adopting a wide range of meanings" [9].

However, for a large majority of authors [10–13], employability is closely related to the possession by the employee of skills, abilities or competencies that allow easier access to the labor market, these being two closely linked concepts, and hence the object of this bibliometric study.

As for the term competence, it should be noted that, for graduates, competences have been classified according to various criteria, and there is no general agreement either in the theoretical or the empirical field as to their categorization, so a brief review of the scientific literature will be carried out that brings us closer to the most current definition and the differential that has always existed between the labor market and university in terms of the knowledge of skills, which we think, after the completion of the study that is presented, already begins to have a clear reductionist tendency.

Researchers from several European countries conducted in 1999 the first representative survey with international comparisons of the main skills of graduates. More than 36,000 university graduates from 12 countries, who had completed their studies three or four years earlier, were surveyed. The study, called CHEERS (Careers after Higher Education—a European Research Survey), included Japan and the following European countries: Austria, Czech Republic, Finland, France, Germany, Italy, the Netherlands, Norway, Spain, Sweden, UK. The questionnaire addressed a total of 35 competencies, and respondents had to assess, on a scale of 1 to 5, the level that the graduates considered they had achieved and the level required in their employment at the time of the job and professional interview. Questions were also raised about the socio-biographical backgrounds of the students, about the resources and conditions of their study and about the grades they obtained in earning their degrees to determine the extent to which these factors could explain the differences in the employment and career paths of university graduates. As a result, it was obtained that only three competences, including the ability to learn, specific theoretical knowledge and general knowledge, all considered academic or scientific and specific to each degree, exceeded the levels required in the workplace, with the least acquired competence being negotiation capacity, which is currently considered as transversal [14].

In Spain, in 2005, the Fundación Universidad Empresa launched a study on social demands and their influence on the planning of degrees in Spain within the framework of the process of European convergence in higher education, whose objective was to analyze the gap between the expectations of recent university graduates and the demands of employers in terms of the knowledge and skills of the graduates [15].

Similar to the CHEERS study, in 2006, the REFLEX survey (Research on the Flexible Professional in the Knowledge Society) revealed divergences between what should be enhanced and the real requirements of a job. This study collected through an extensive questionnaire the opinions and experiences of university graduates at the competency level. In this research project, on which Japan and thirteen European countries collaborated (Italy, Spain, France, Austria, Germany, Holland, UK, Finland, Norway, Czech Republic,

Switzerland, Belgium and Estonia) about 40,000 graduates throughout Europe and around 5500 in Spain were surveyed [16]. The results obtained show, overall, few differences between the Spanish graduates and the rest of the European graduates, both in their own competence levels and in those required in employment. The competence profile of the Spanish graduate does not differ excessively from that of the average European graduate, as Spanish graduates only surpass other Europeans, and with minimal differences, in the skills of teamwork, effective use of time, asserting their authority, writing reports and documents and making themselves understood [17].

In addition, it is clearly appreciated, according to the opinions of the graduates themselves, that jobs require a set of skills that are not those that traditionally concern or, therefore, are taught in the most traditional systems of higher education, especially in the most professional models, such as Spanish.

The competences in question include to activities and attitudes such as being able to perform work independently, having the ability to solve problems, oral communication, knowing how to assume responsibilities, manage time and plan and showing initiative, adaptability and loyalty. Deficits in the competencies of university graduates occur in areas related to skills and attitudes, while graduates report that there is an excess of competences in general knowledge and theoretical knowledge.

According to Van-Der Hofstadt Román and Gómez Gras, authors of the report Competences and Professional Skills for University Students (2006), it seems demonstrable that the univocal relationship that had traditionally been maintained by companies between good academic records (or good training) and optimal performance of a job has been greatly weakened.

This report also shows that companies are increasingly demanding from their candidates certain skills that have not traditionally been part of the academic curriculum, such as soft skills, teamwork skills, emotional intelligence, etc. In this way, young university students must not only have sufficient theoretical knowledge, but also a series of new skills such as leadership, teamwork or stress management, which are detailed in depth in their report.

Subsequently, in 2007, ANECA carried out a study with the aim of investigating the experiences and attitudes of higher education graduates in relation to the difficulties encountered in and the facilitating factors of labor insertion. A new element that emerges from this study is the lack of knowledge and low valuation of the new professional skills required by higher education graduates in a flexible labor market. A series of competences that the labor market is beginning to demand from higher education graduates are considered, such as functional flexibility, international orientation, innovation management or continuous learning, and it is found that the knowledge and valuation of these competences is not very high, although we believe that they are gradually beginning to be introduced in the representations that university students make of the world of work [18].

The 2021 ANECA Report on the framework for the self-evaluation of universities in improving their actions in terms of the employment and employability of their graduates' highlights, among the fundamental actions (more than 70%), the following:

- Train instructors in the teaching of transversal competences and key personal skills for employment;
- Design activity-based teaching-learning processes in the work environment;
- Promote talent development programs, ideas and/or competitions, entrepreneurial projects, challenge solving, etc.;
- Implement procedures to achieve cooperation between universities and employing entities in teaching-learning processes;
- Train instructors in the teaching of specific knowledge and skills in the area of the knowledge of teaching and study practical cases from each field [19].

The European Union has also been giving classifications of these skills over the years, thanks to different projects. For example, the Assessment of Transversal Skills 2020 Project (ATS2020), co-financed with the Erasmus + Program and formed by 17 partners from 11 EU

countries, provides a comprehensive learning model for the improvement of the essential transversal competences of students within the curricula and offers new approaches and innovative tools for teachers for the development and evaluation of these skills. In this project, transversal skills refers to a broad set of key skills that are known to be critically important for success in school, higher education and the world of work. They include the ability to think critically, take initiative, use digital tools, solve problems and work collaboratively [20].

In recent years, an international skills assessment has been conducted in more than 40 countries as part of the Programme for the International Assessment of Adult Competencies (PIAAC). The Programme is an OECD initiative to help governments assess, monitor and analyze the level of the distribution of skills among the adult population, as well as the application of these skills in different contexts. The assessment it conducts measures the necessary cognitive and work-related competencies that enable individuals to participate successfully in society and the economy to thrive. The results help countries better understand how education and education systems can help develop these competencies. Between May–July 2021, the pilot phase of the PIAAC Cycle 2 study was developed, and, between autumn 2022 and spring 2023, the main study from which the desired results can be extracted will take place [21].

In conclusion, as Llinares (2020) [22] states, there is no agreement on what the basic employability competences are. A small number of competences that appear in 50% of sources or more can be extracted from the models studied in the scientific literature, and they are lifelong learning, communication, teamwork, flexibility/adaptation to change, work organization and time management, problem solving, decision making, the ability to relate to other people, initiative and information and knowledge management.

In any case, regardless of whether they are conceived of as competences, "soft skills" understood as transversal employability competences are considered essential in obtaining a job and progressing in the labor market [23].

The question is how to modify teaching methods in order to transmit these skills. Teaching methods can be classified into two types: reactive and proactive. In the former, the teacher acts and the student responds; in the latter, it is the student who acts, while the teacher is fundamentally a guide. The reagents (theoretical and practical classes, even laboratories with directed practices) allow the teaching of knowledge and even skills, but not of methodological, social or participatory competences. To train with the proactive methods, different educational mechanisms are needed: seminars, interactive learning, discussion techniques, presentations, decision making, internships in companies, etc. [24].

The key question is, therefore, how best to support the improvement of these skills. Since most transversal skills are not linked to any particular subject and are developed in all areas of study, innovative orientations tend to avoid subject-oriented approaches, increasingly focusing on specific learning outcomes.

The acquisition of transversal competences requires interactive and active learning. Educational programs at all levels should consider, wherever possible, reflecting real-life applications. For example, collaborative learning (project-based and problem-based approaches to learning) allows students to work together in small groups to achieve a common goal, and can facilitate the simultaneous development of several transversal skills.

On the other hand, interactive learning environments encourage students to be active and autonomous, while collaborating with other students and developing social and communicative competencies [25] Training based on real-world contexts and project-based learning has been shown to motivate learners more than traditional approaches [26], leading them to develop many of the transversal skills demanded by companies.

In any case, better coordination between the labor market and education policies is needed. We believe that training future professionals in any degree of systemic transversal competences is a challenge that must be worked on from the beginning in the universities, to avoid the gaps that still exist between the skills learned by graduates and those needed

by employers that authors such as Osmani et al. (2019) [27] and Abelha et al. (2020) [28] continue to describe.

Career guidance and information on graduates' labor market outcomes are critical to aligning student preferences and labor market needs. Institutions must be able to respond to the demands of employers and the expectations of students and to develop educational offerings oriented to the labor market, giving the opportunity to intervene to all stakeholders in this environment, so that employers can specify competencies for employment, university institutions can develop appropriate programs for learning those competencies and students can know what competencies they need to improve their employability [29].

To guarantee active employability, education, training and employment must always go hand in hand [30]. In this sense, recent studies show that, for political leaders and universities, the incorporation of key competencies or employability into higher education should be a priority [31]. In conclusion, although institutions and researchers talk about the importance of learning transversal competences in employability, not enough progress has been made since the proposal of the EHEA in this regard, and, therefore, the principal objective of this article is to analyze to what extent the collaboration patterns of the European Union, UK and Switzerland, among the researchers in these matters, have been and whether or not they are sufficient, based on an analysis through a bibliometric study of the scientific publications in the area, collected in the Web of Science and Scopus databases for the period from 1996–2022, in order to be able to determine through contrast whether the Bologna Declaration of 1999 was a lever driving skills as an engine of employability.

The fundamental idea of this study is to document and analyze trends in employability and skills in this last 24 years, using a bibliometric method, whose study will allow us to answer the following research questions:

1. What is the total volume, growth trajectory and geographic distribution of the research on employability and skills?
2. Who are the key authors in the employability and skills literature? What are the relationships among them?
3. What topics in employability and skills research have received the greatest attention in the literature? How are these topics related?

3. Methodology

The study has taken into account as a source of information the works on employability and skills carried out in the member countries of the European Union, the UK and Switzerland that were published during the period from 1996–2022, in journals indexed by the main multidisciplinary databases. The consultation has been carried out through the Web of Science platform (WOS) and Scopus, as they are the two databases on which there is the greatest international consensus about their decisive academic importance [32].

We must not forget that an essential part of research is scientific publication, which is usually measured through publications and other scientific results. Among the most used methods to evaluate different aspects of this activity, we must highlight the fundamental role of bibliometric analysis, which not only allows us to retrospectively examine how scientific advances have been achieved and made known and evaluate the research potential of the institutions involved, but also allows us to characterize the development of scientific disciplines and their lines of research, and scientific publications in an area of knowledge, its obsolescence and its dispersion [33].

To date, no studies have appeared that carry out a rigorous analysis, both bibliometric and conceptual, of the terms employability and skills in two of the databases with the greatest global impact, according to criteria and variables that allow us to analyze the state of the art and thus be able to detect threats and weaknesses and plan new paths and calls for action if necessary.

1. Therefore, this research aims at a double objective:

Quantify bibliometrically in the databases WOS and Scopus the scientific production on employability and skills in the form of journal articles published during the period from 1996 to the present, since beginning the study in 1996 makes it possible to determine if this production grew significantly with the Bologna Declaration in 1999 and check if the growth to this day has been progressive, since the study of publications in databases allows us to see and measure both the impact of a term within a topic and the research trends associated with it.

The analysis has been carried out with respect to the following variables: production, sources, authors, documents and conceptual structure.

2.   Analyze the keywords used in the articles to establish possible conceptual and thematic relationships made by researchers at this time.

For bibliometric analysis, the Bibliometrix tool is used, which is an open source tool that facilitates scientific mapping and is programmed in the "R" application [34].

The search equation "Employability" AND "Skills" was used in both WOS and Scopus. With the initial information from both databases, a total of 829 publications from WOS and 883 from Scopus were retrieved, after reducing the study to only the journals from member states of the European Union, Switzerland and Great Britain. Subsequently, the databases configured by concepts, dates and countries were taken to the R application, which, through Bibliometrix, used the automated analysis mechanisms necessary to convert the information into graphs and tables of various types. The extraction of the data has been carried out through the direct consultation of the databases attending to the following variables:

1.   Overview of scientific production:

   (a)   Total number of items.
   (b)   Number of citations each article receives and average citations per year.
   (c)   Flows between authors, countries worldwide and keywords.

2.   Sources of publications:

   (a)   Growth in H-impact factor publications.
   (b)   Dispersion in the scientific literature.

3.   Authors:

   (c)   Lotka's law or relationship between authors and articles.
   (d)   Country of the lead author (correspondence).

4.   Documents:

   (a)   Word clouds.
   (b)   Word treemap.
   (c)   Trending topics.

5.   Structural concepts:

   (a)   Co-occurrences and relationships between the key concepts forming different clusters.

4. Search Criteria

"Employability" and "Skills" were the concepts used to perform the search within the title, abstract and keywords, finding, in the case of Scopus, a total of 4025 documents, and 3987 for the WOS database. The articles included in the systematic review were selected according to the following criteria: (1) Thematic area: Social Sciences; (2) Type of publication: articles only; (3) Publication stage: end; (4) Spanish and English language; (5) Only countries of the European Union, Great Britain and Switzerland.

In the case of the Scopus database, the total number of publications was reduced to 870 after applying the previous filters, and the total for WOS was reduced to 1029 after applying similar filters.

5. Prism Screening

The PRISMA flowchart has been used, which represents the flow of information through the different phases of a systematic review and shows the number of records identified, included and excluded, and the reasons for the exclusions. The different steps carried out to reduce the sample to the cited data appear in Figure 1.
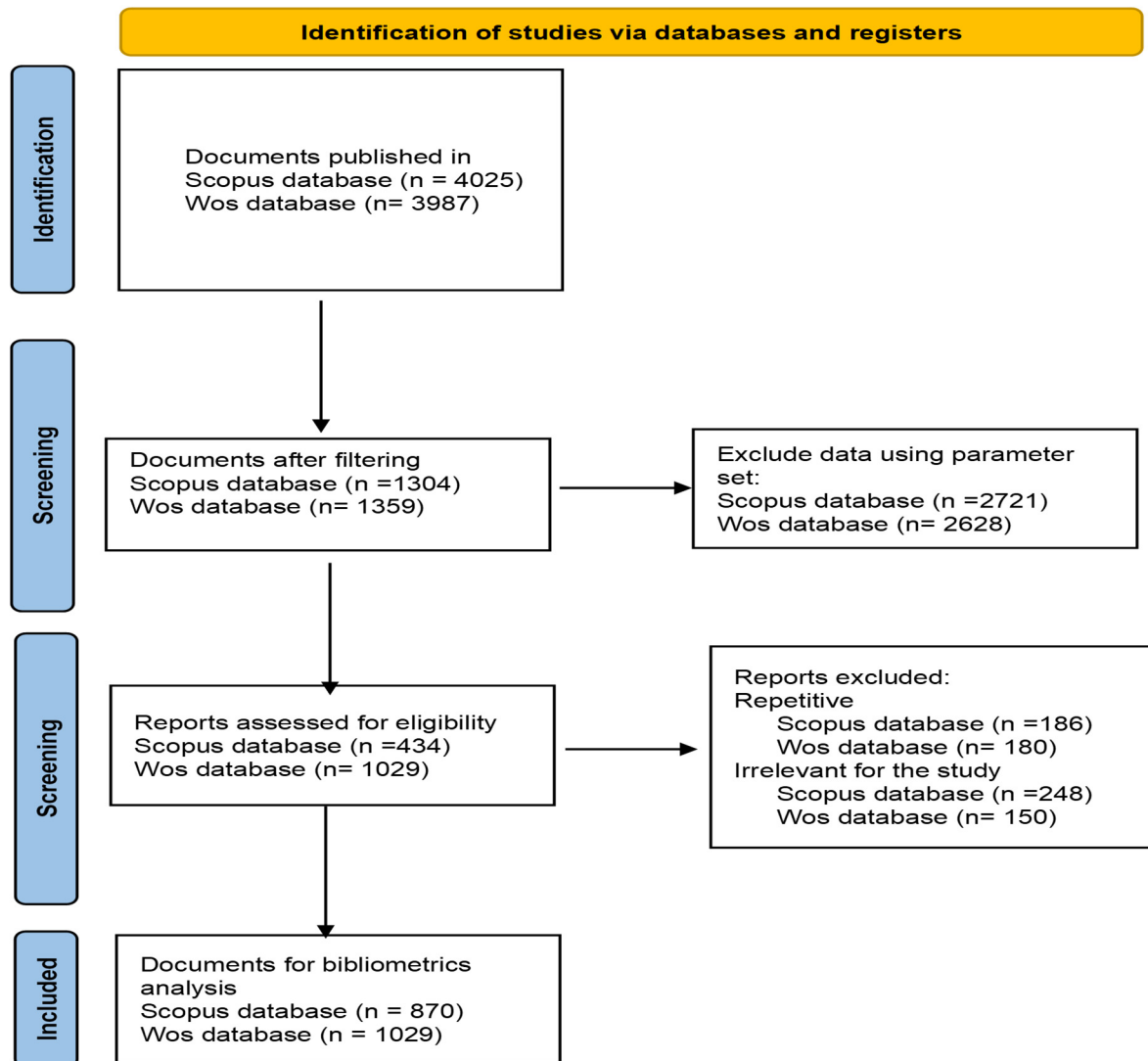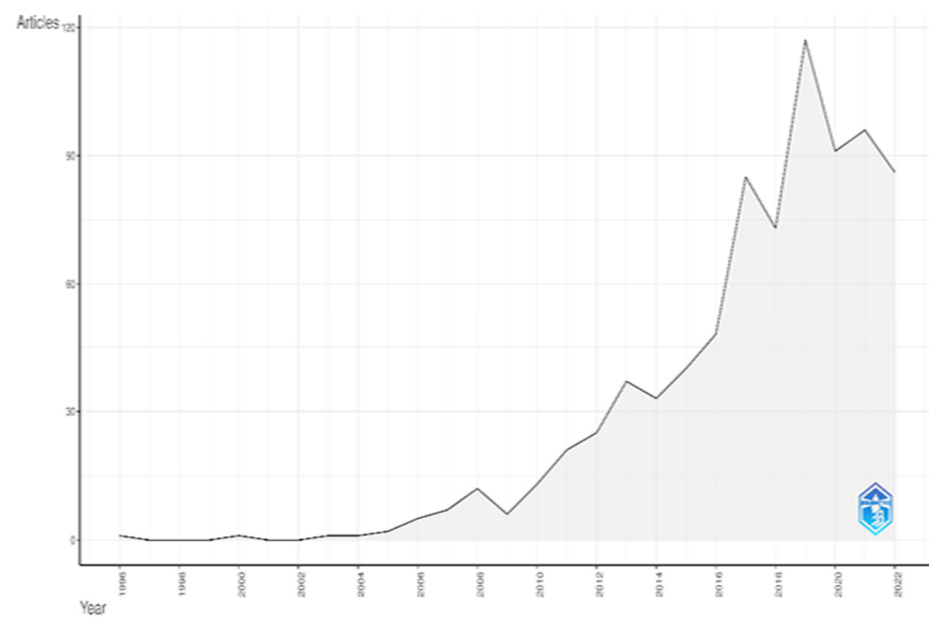

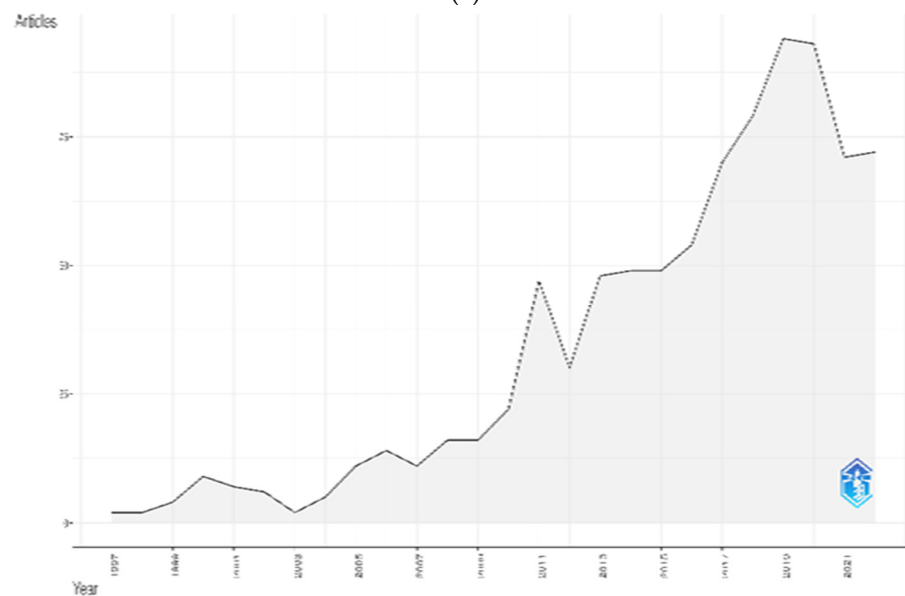**Figure 1.** Processing of document eligibility based on Prisma guideline.

6. Results

The quantitative and qualitative data obtained from the analysis of the two databases are presented in a differentiated way, in order to be able to evaluate both.

The annual scientific production follows the same patterns in both databases, with a notable increase since 2010, which may be due to the fact that the Bologna Plan aimed to establish by 2010 a European Higher Education Area (EHEA) in order to facilitate employability, mobility and the recognition of university degrees in the member countries, although the growth rate in WOS is 18.69%, compared to that of Scopus which is somewhat lower: 15.41%, as shows as Figure 2a,b and Table 1.

(**a**)

(**b**)

Figure 2. (**a**) Annual scientific production WOS. (**b**) Annual scientific production Scopus.
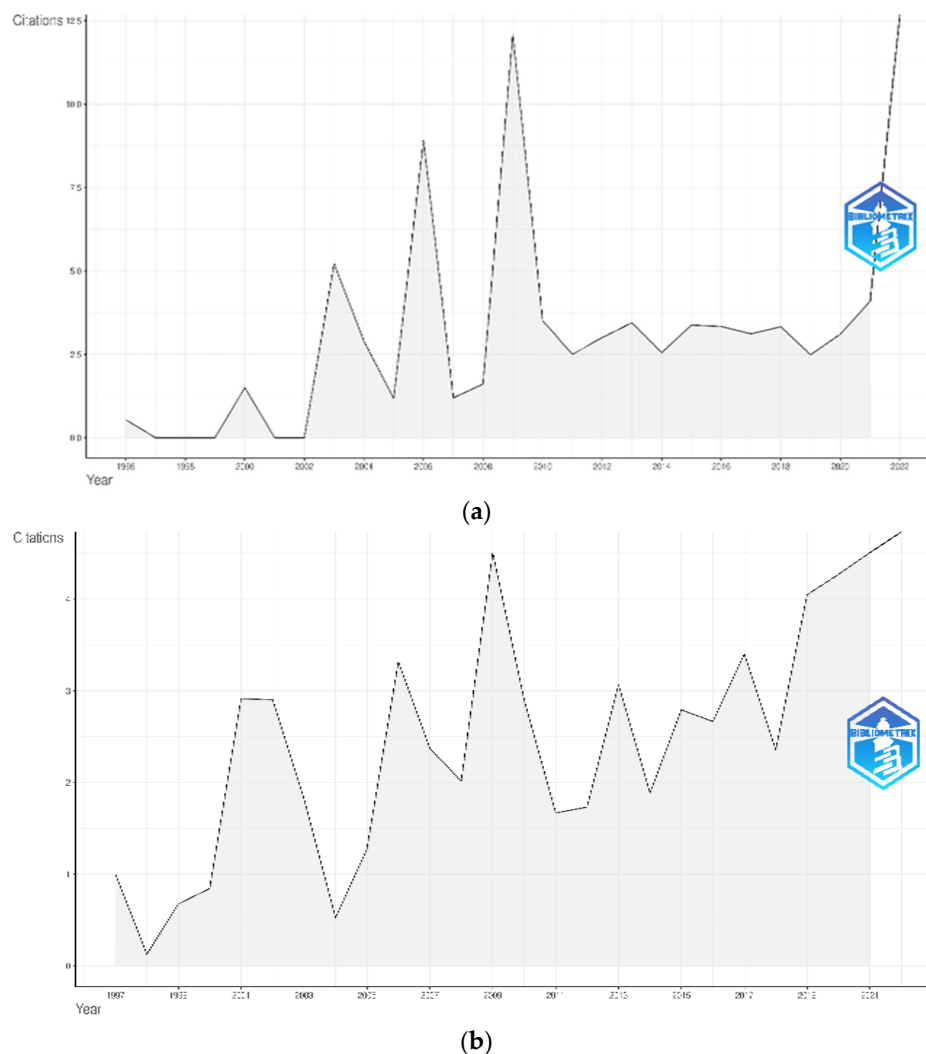
Table 1. Annual scientific production Scopus.

	Articles	
Year	**WOS**	**Scopus**
2010	13	22
2011	21	47
2012	25	30
2013	37	48
2014	33	49
2015	40	49
2016	48	54

Table 1. *Cont.*

	Articles	
Year	**WOS**	**Scopus**
2017	85	70
2018	73	79
2019	117	94
2020	91	93
2021	96	71
2022	86	72

The years 2019 and 2020 are the years of the greatest scientific production on these topics, due to the importance that companies began to give to soft skills or abilities such as communication, creativity, teamwork, etc., in those years, possibly in connection with the pandemic.

As for the average number of citations per year, it is also in 2009 when the largest number of citations occurs in the two databases, as a result of the increase in publications on these concepts, as shown Figure 3a for the database of Wos and Figure 3b for the database of Scopus.

(a)

(b)

Figure 3. (**a**) Average citations/year WOS. (**b**) Average citations/year Scopus.

Next, the data from the Sankey diagram are analyzed, which shows the data flow between categories and their volume proportionally. The volume is the magnitude of the relationship between those categories and is represented by arrows: the larger the arrow, the greater the magnitude of the relationship.

The following graph (Figure 4) from the Sankey or Three Fields Plot shows the data flow between authors, the countries of these authors and the main keywords. The UK and Australia are the countries where the largest number of authors write about the concepts we are looking for and the keywords related to them.

Figure 4. Sankey diagram for data extracted from WOS.

We have included in this graph all the countries in which there are scientific studies on these terms to analyze the role occupied by Spain in this regard, enabling us to verify that it is the country where the third most authors investigate employability and skills, and to draw attention to the fact that countries with little scientific production, such as Nigeria and Malaysia, also investigate these terms.

The Figure 4 shows ss for the most researched keywords, employability, higher education, employability of graduates and skills necessary for employability stand out, and one of the authors who most investigates these concepts is Jackson, D.

As for the results extracted from Scopus, they are similar, although Spain ranks second in terms of information flow, behind only the UK. The most studied concepts are practically the same, and the order also coincides with that in WOS.

Therefore, we can conclude that, in Spain, there has always been an interest in the scientific investigation of the concepts studied, as seen in the Figure 5.

The following graph, Figure 6, shows the main journals in which these authors have published in WOS and Scopus, also noting how the number of scientific publications begins to grow from 2010 in journals with a high impact factor H, such as *Education and Training*, with an H of 24, or *Studies in Higher Education*, with an H factor of 18.

The H index is applied to a journal based on the number H of articles that have been cited H times, so, if the H index of the journal is 24, it means that it has 24 publications that have been cited at least 24 times, which is a very high data point and indicates that the research in these journals determinations the most important research in this field.

The following graph (Figure 7) shows Bradford's Law, or the law of the dispersion of the scientific literature, which measures the relationship between the number of journals and the number of articles published in these journals on a scientific research topic, in our case on employability and skills. It can be seen that there only five journals publish practically all the research articles regarding these concepts, so the dispersion is very low.
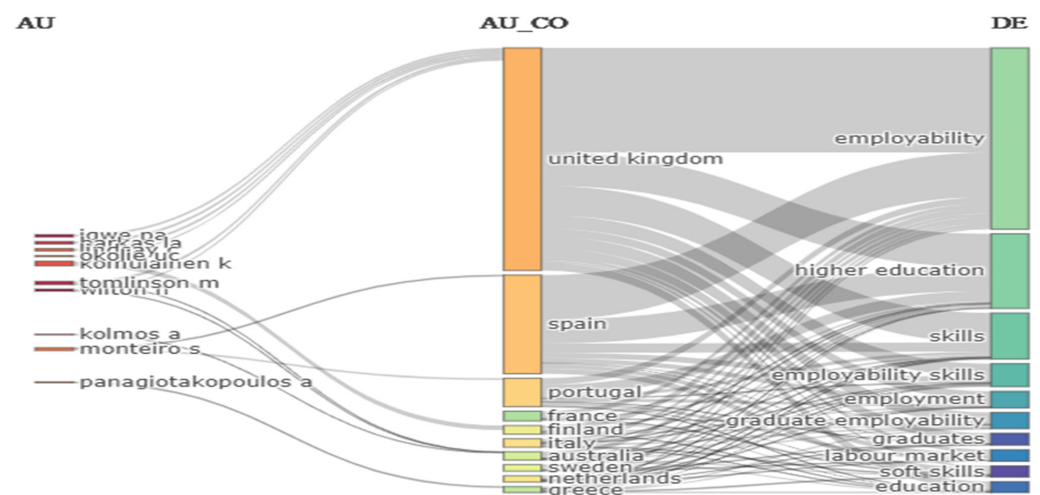
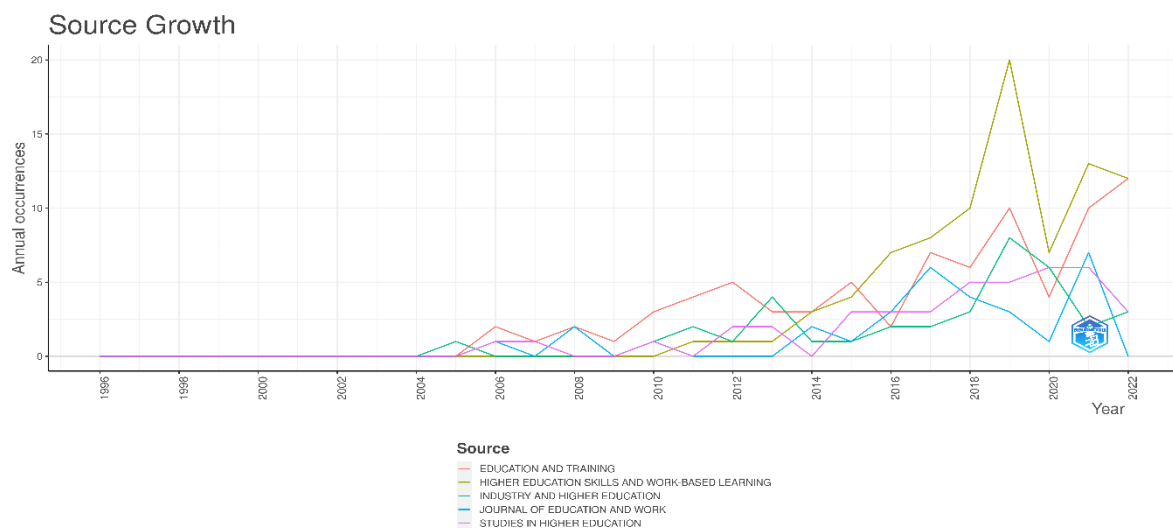**Figure 5.** Sankey diagram for data extracted from Scopus.

Figure 6. Variation in publications of impact journals (WOS).

The data for the Scopus database are very similar in terms of journals that publish scientific articles on these concepts and when they do so, although with some variation in the sources since journals such as *Sustainability* are introduced. On the other hand, the dispersion shown by Bradford's Law is higher, with many journals accepting publications on the terms analyzed, although it is only the four most important that publish the largest number of articles, as shown Figures 8 and 9.

Regarding the variable authors, it should be noted that, according to Lotka's Law, which describes a quantitative relationship between the authors and the articles produced in a field over a period of time, there is an unequal distribution, since the production of most articles is concentrated in a small number of authors of high productivity, since a single author represents 90.1% of the production in WOS (Figure 10a), a figure very similar to that of Scopus (Figure 10b), where a single author represents 91.5% of the scientific production.
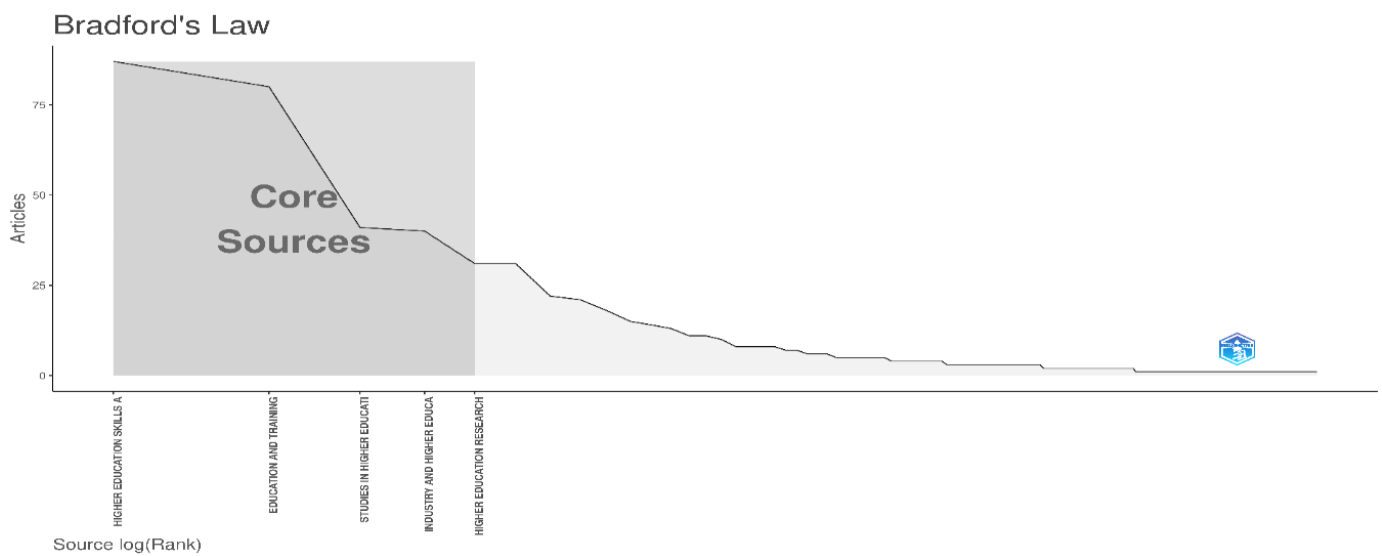
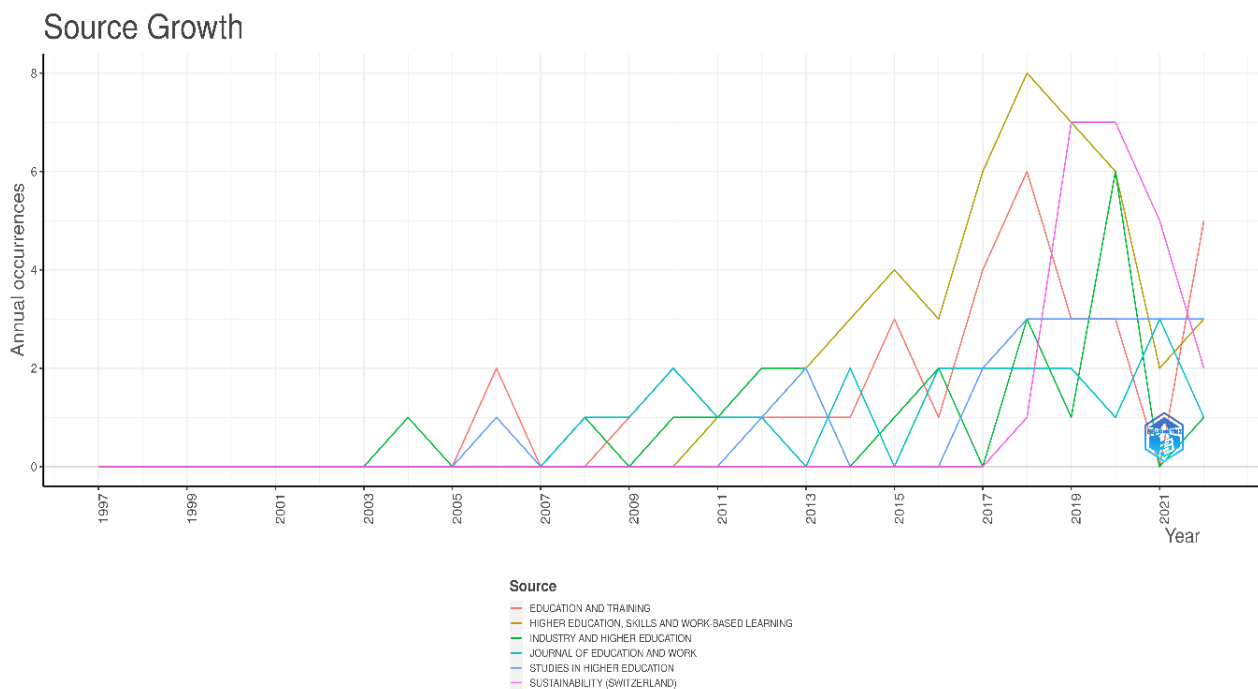**Figure 7.** Clustering of sources obtained from Bradford's Law (WOS).

Figure 8. Variation in publications of impact journals (Scopus).

As for the countries of origin of the authors who publish the most, it is worth highlighting the UK, with 184 collaborations within the country and 26 with other countries, Australia, with 174 within the country and 29 with other countries, and Spain, with 32 collaborations within the country and 10 outside, as seen in the Figure 11. The data are matching for both databases.

Finally, with regard to the documents variable, the most frequent words in relation to the words with more co-occurrences in the analyzed documents are graphed in the following word clouds for WOS and for Scopus, as shown in the Figure 12a,b, respectively drawing attention to the fact that the central word for WOS is skills, while, for Scopus, the most named words are employability and students, and the term skills does not appear.
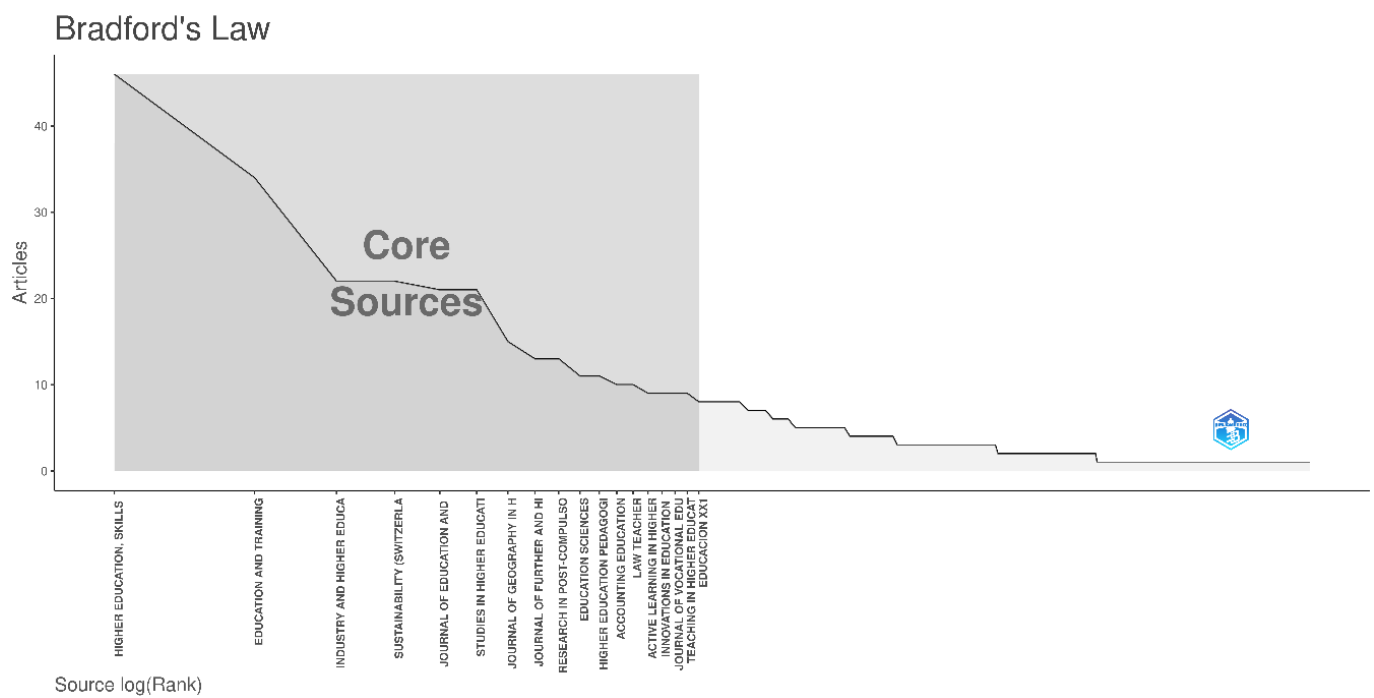
Figure 9. Clustering of sources obtained from Bradford's Law (Scopus).

The Treemap, in Figure 13a for Wos and Figure 13b for Scopus being a purely hierarchical visualization, measures the relative surface (like a rectangle) occupied by a set of data according to a first variable, its subsets according to a second, etc., and so on to the desired level.
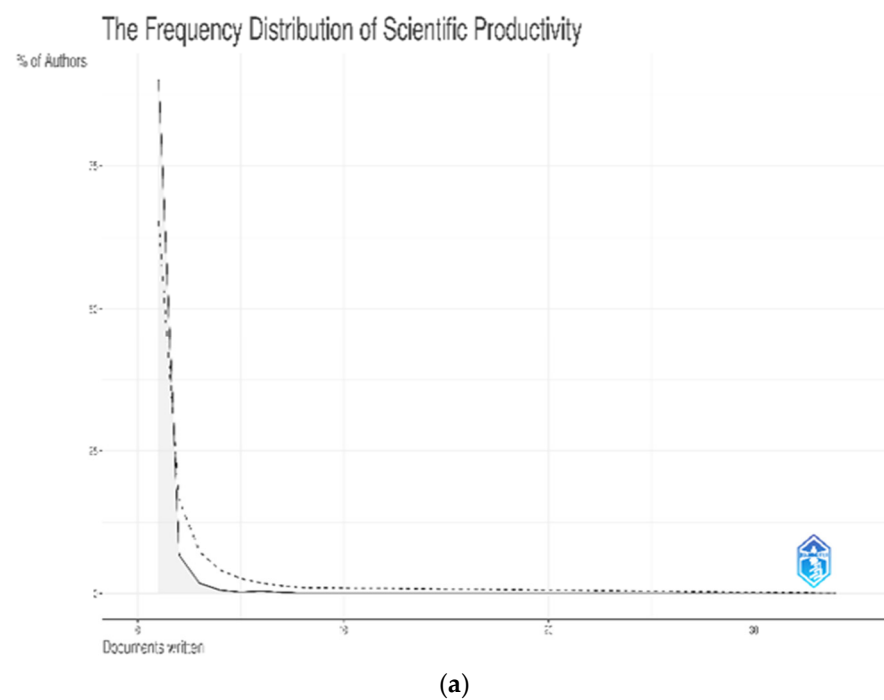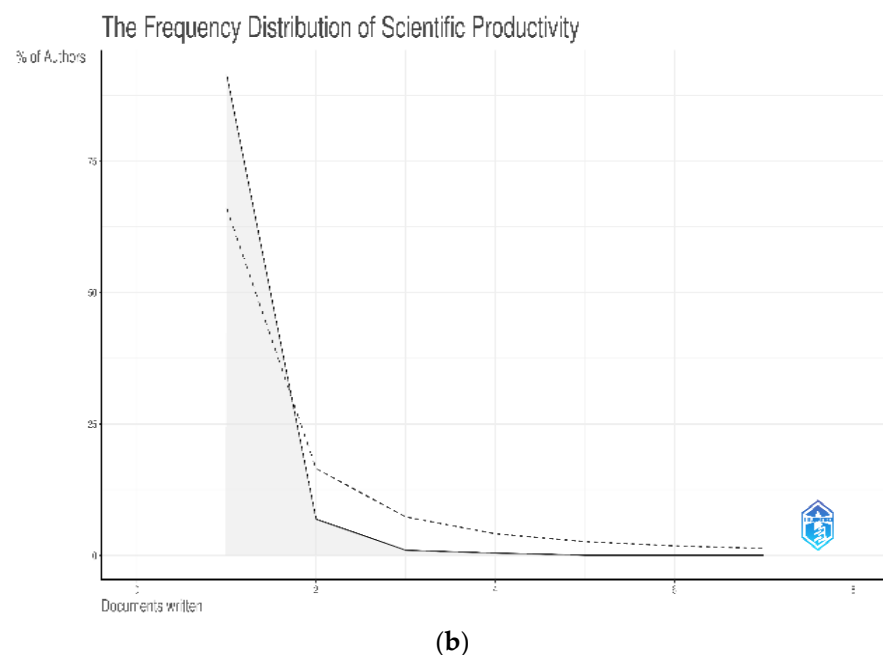

(**a**)

Figure 10. *Cont.*

(**b**)

Figure 10. (**a**) Lotka's law in WOS. (**b**) Lotka's law in Sopus.

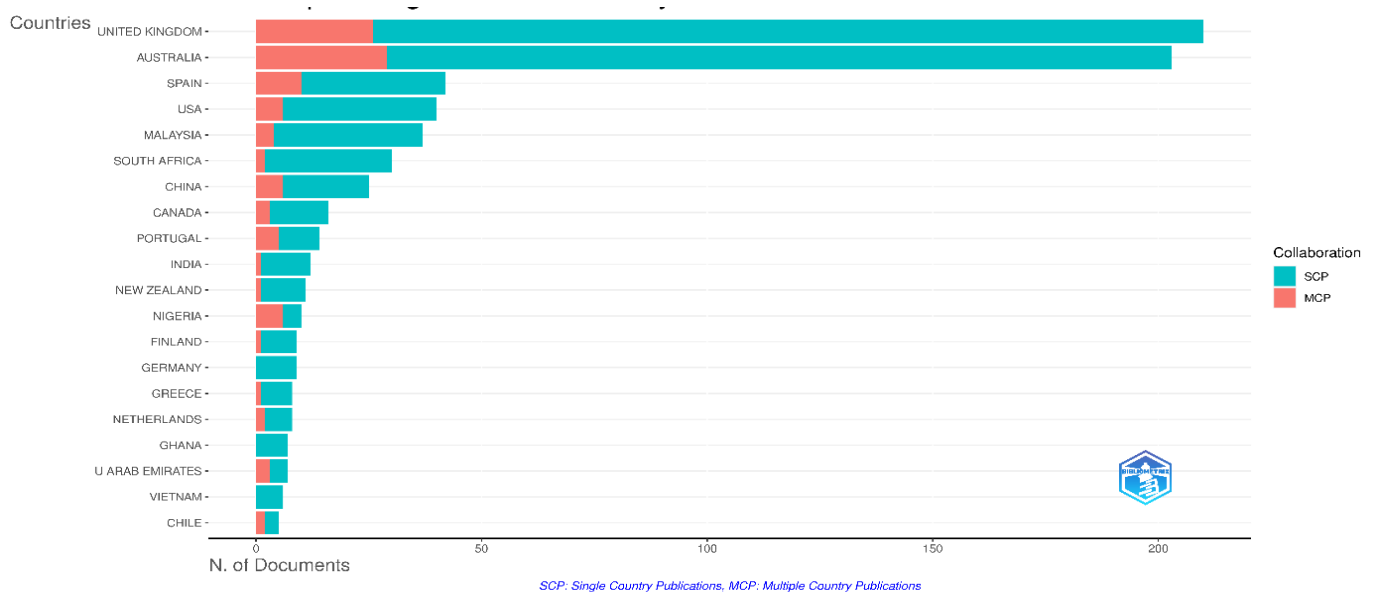SCP: Single Country Publications, MCP: Multiple Country Publications

Figure 11. Country of correspondent. Intra-country (SCP) and inter-country (CCM) collaboration during 1996–2022.

In this case, both Treemaps show something similar to, although more detailed than, the Word cloud chart. For the Scopus database, the skills concept only has a frequency of 6 compared to 166 in the WOS database, so it only appears in 1% of cases, unlike concepts such as employment, with a frequency of 69 (9%).

It is also important to know where scientific production is heading and whether research is currently being conducted on the terms employability and skills. While, for Scopus, the key words are currently sustainability, professional aspects, perception and students, although infrequently still in publications, for WOS, they are graduates, gap and commitment, concepts more in line with what Bologna proposed, i.e., a greater rapprochement between university and business, and more in line with what companies currently

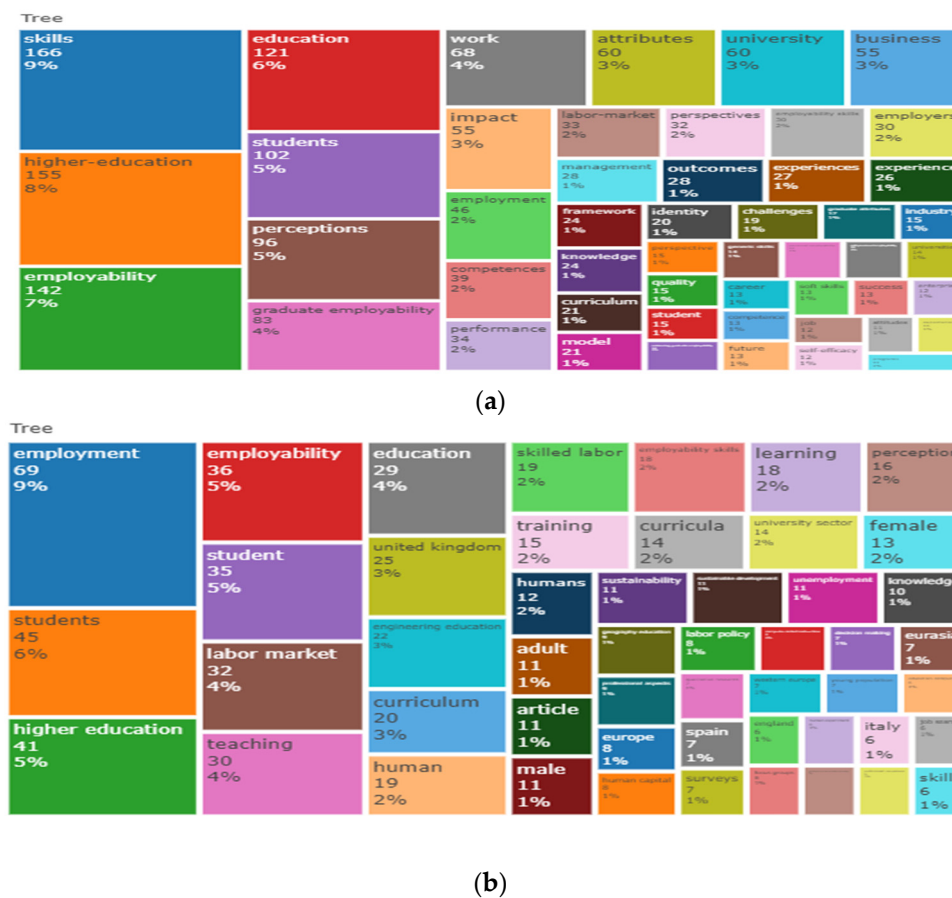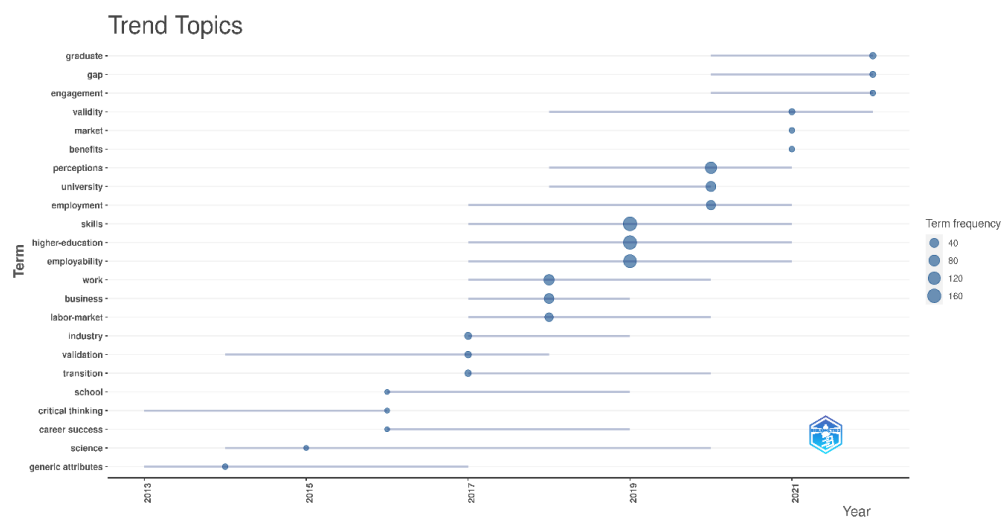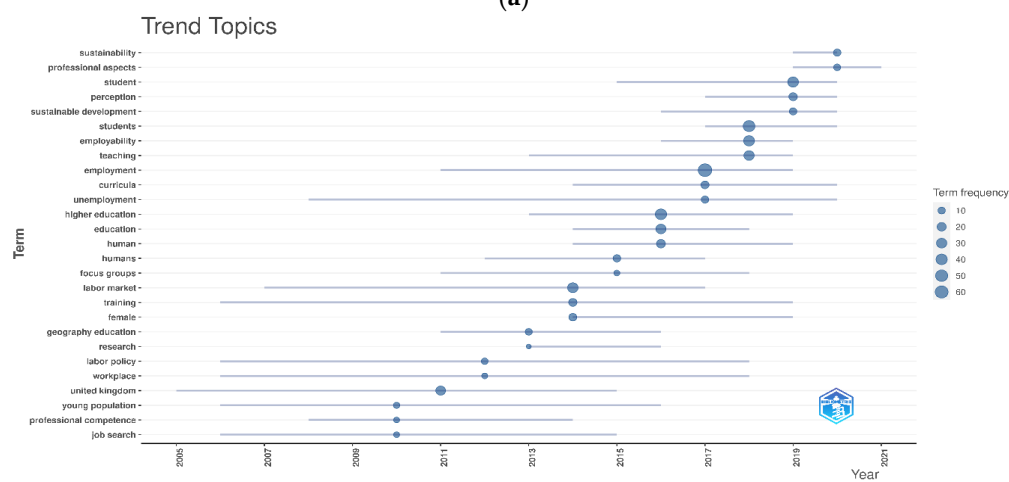demand: a university commitment that reduces the competency gap between university studies and labor needs.

(**a**)

(**b**)

Figure 12. (**a**) WordClouds for WOS. (**b**) WordClouds for Scopus.

The following graph, Figure 14, in this same line, highlights the words, trending topics or referents in the years under study with their respective frequencies, which allows us to study the evolution of the main concepts related to employability and skills in recent years in the two main databases, and, although there are differences between the two sets of results there is also a coinciding term: "student", either as a graduate, in the case of WOS, or student, as it appears in Scopus. This is important, as it indicates that the focus is finally being placed on the most important actor.

(**a**)

(**b**)

Figure 13. (**a**) and (**b**). Treemaps for WOS and Scopus.

Now, we will analyze the conceptual structure variable, which refers to a network of co-occurrences as a grouped interconnection of terms, taking into account their presence in the documents retrieved from the initial search of WOS (in Figure 15a) and Scopus (in Figure 15b). Networks are generated by connecting pairs of terms using a set of criteria that define co-occurrence. For example, the terms skills and higher education can be said to coexist if both appear in a particular article. Another article may contain the terms higher education and work. The linking of skills with higher education and higher education with work creates a network of co-occurrence of these three terms. Again, the co-occurrences almost always occur between the same terms (employability, work, higher education, perceptions, teaching.

In our case, the keywords have been organized into two clusters for WOS and four for Scopus, including a central one in which the highest co-occurrence index is denoted for higher education for WOS and employment for Scopus These words establish important relationships with the employability of graduates, which is the second cluster for WOS, and students, human resources and labor market, as main secondary cluster terms for Scopus.
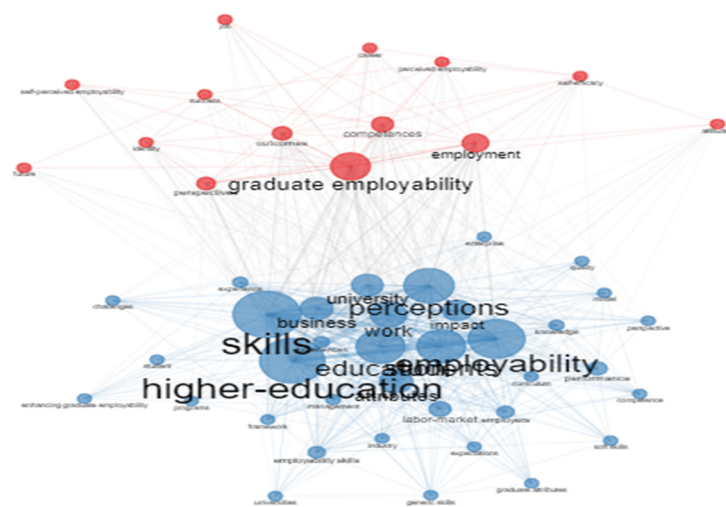
(**a**)

(**b**)

Figure 14. (**a**). Trend words WOS. (**b**). Trend words Scopus.

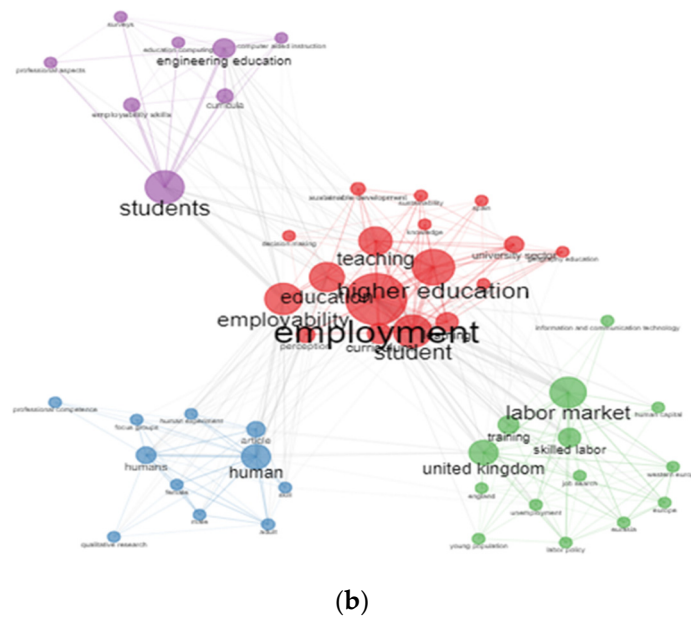(**a**)

Figure 15. *Cont.*

(**b**)

Figure 15. (**a**). Co-occurrence Networks for WOS. (**b**). Co-occurrence Networks for Scopus.

7. Conclusions

There is a clear trend towards a new model of the university, characterized by globalization, universality and the need to respond to the new demands of society, where the Bologna process is only the realization at European level of this new change of context that must be extended much further, towards an uncertain and complex environment, where universities are able to respond quickly and adequately to changes in their contexts.

These changes suggest new questions about the adjustment between education and employment for European graduates that must be addressed in order to close the existing gap. Among these issues, especially since 2010, the year in which the European Higher Education Area (EHEA) should have been established in order to achieve its main goals, among which is the improvement of employability, there are two that have preferably attracted the interest of researchers.

The first question is the identification of competences relevant for the professional success of graduates, and the second revolves around how to promote the acquisition of these key competences from the educational system, anchored in old traditions where compliance with strict programs requires a good development of technical competences, but leaves out the learning of transversal or soft competences.

Universities must make an effort to adapt their curricula to the competency training demanded by employers, for which it is necessary to know the business profile that incorporates graduates through internships or as employees and know with what competency preparation students arrive at their first job. Therefore, it is necessary to carry out research that analyzes through a bibliometric study the degree of interest aroused in the European scientific and academic community by the concept of employability and competences in the historical timeframe (1996–present) that includes the Bologna Declaration and the creation of the EHEA.

The objective of this study was to review the scientific production on the interaction between employability and skills in two of the databases with the greatest impact on the scientific community, WOS and Scopus.

Through the results obtained, a state of the historical situation for more than 25 years of the evolution of research in this field is offered, as well as the identification of the main research perspectives on both terms.

In all, 829 WOS and 883 Scopus publications have been documented, selected from the initial totals of 2014 and 1826 found in the two databases (WOS and Scopus). The filtering referred to the type of document, discarding proceedings, books and other papers, and

focusing only on journals with articles published in these years in the European Union, UK and Switzerland. The latter two are countries that we think that are important, despite not belonging to the Union, given the importance of their university institutions, although, for some results, a world vision has been made, given the importance of countries like Australia in the scientific production on the terms analyzed.

Since 2010, the production on the terms studied has been increasing gradually, up to 89% and 76.5% in WOS and Scopus, with the years 2019 and 2020 being the years with the greatest scientific production, possibly due to the pandemic, which meant more time for research before the reduction of leisure.

On the other hand, the UK and Australia are, for both databases, the countries where the largest number of authors write about the concepts we are looking for and the keywords related to them, although there are really few journals that incorporate these investigations: *Higher Education Skills*, *Education and Training*, *Studies in Higher Education*, *Industry and Higher Education* and *Higher Education Research*, all of them indexed in Scopus and the Emerging Sources Citation Index (Clarivate Analytics), indexes that measure the quality of scientific journals.

Spain is the country that appears in third place among the main authors of articles that write about employability and skills, but its production is far from that of countries such as the UK and Australia, since it only accounts for around 20% of both.

Finally, the analysis of the relational nodes of the keywords shows us that there are three main trends:

1. The interaction of employability with higher education.
2. The relationship of skills to employment.
3. The relationship between teaching, higher education and employability.

Therefore, apart from skills, importance continues to be given to the relationship between employment and the university, with higher institutions bringing graduates closer to the labor market.

This bibliometric study on competencies and employability offers a descriptive and analytical overview from a diachronic and also a synchronic perspective of the main bibliometric variables in two of the databases with the greatest impact among the scientific community (WOS and Scopus). It allows, therefore, researchers and institutions to visualize the most developed study trends and the most prominent emerging lines of research aiming to advance the necessary rapprochement between the university and the company. This study allows the university to know its present situation and also to discover what learning strategy it should consider to reduce the training gap in competences.

The access of university graduates to the labor market has been an issue of great importance for universities in the last decade. The development of society and knowledge depends on the production of new knowledge, its transmission through education and training, and the dissemination of its use through the university, having as its fundamental mission to provide sufficient training and qualifications that allow the employability and competitiveness of its graduates [23]. Students must acquire the skills required by the new reality in which we live, meaning that the university, as an institution that seeks social progress, must include these skills in the curricula.

Despite international publications (both European and Latin American) on the subject, the complexity of analyzing the insertion of graduates into the workforce and the need to approach the process from different disciplines makes ignorance of the situation of graduates of different degree programs one of the first concerns of most higher education institutions, making this one of its biggest future challenges.

8. Limitations and Suggestions for Further Investigation

One of the main limitations may be the use of the Scopus and WOS databases as a source of data, since, despite the fact that they are scientific bases par excellence, there is little evidence that inclusion in WOS and Scopus is a good, reliable indicator of journal quality. The use of these databases is essential to searching, finding and consulting the most

significant scientific publications in different areas of knowledge. Publishing in journals indexed in Scopus or in the Web of Science means the visibility of the author in these databases, and guarantees the adequate and necessary dissemination for the scientific production to reach all potential audiences: researchers, libraries, universities, students and teachers who want to be updated on any topic of interest. Therefore, they will be valuable tools for the researcher. A possible alternative to reduce this limitation could be to include in the study one more database, such as Google Scholar.

However, in general, while we have found a high correlation and a high degree of overlap between both databases, the Scopus database, compared to WOS, for the concepts analyzed and for the period studied, presented a greater number of journals, and we think that the same thing will happen when using the Google Scholar database.

Finally, utilizing only the scientific mapping instrument may have been another limitation, and other researchers may use alternative methods of analysis.

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