
ESTUDIOS / RESEARCH STUDIES

From Bibliometrics to Entrepreneurship: A Study of Studies

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Abstract: Bibliometric studies of entrepreneurship as a discipline have contributed fundamentally to the creation of a certain order in an apparently chaotic and contradictory literature, examining how the discipline has developed, giving a comprehensive vision of the structure of the field, observing its social networks, detecting trends, discovering knowledge gaps and helping to plan future research lines. The purpose of this article is to explore this special type of research. In terms of methodology, it uses an adaptation of the Systematic Literature Review, and a content analysis using text-mining software in order to look deeper into objectives, conclusions and limitations. Among the main findings, there is some evidence that indicates that the image presented to date about entrepreneurship has not considered the multidisciplinary nature of the field and could, therefore, be distorted. At the same time, a series of inherent problems have been detected, and it has become evident that there is a need to incorporate the latest advances in bibliometrics and to improve collaboration between experts from both fields in order to solve those mentioned issues and move towards future progress.

Keywords: Entrepreneurship; bibliometrics; systematic review; research field.

De la bibliometría al emprendimiento: un estudio de estudios

Resumen: Los estudios bibliométricos sobre emprendimiento como disciplina académica han contribuido fundamentalmente a crear orden en una literatura aparentemente caótica y contradictoria, examinan su desarrollo y dan una visión integral de la estructura del campo, observan sus redes sociales, detectan tendencias, descubren brechas de conocimiento y ayudan a planificar futuras líneas de investigación. El objetivo de este artículo es explorar este tipo especial de investigación. Desde el punto de vista metodológico se utiliza una adaptación del proceso de revisión sistemática de la literatura y un análisis de contenido a través de software de minería de textos para profundizar en objetivos, conclusiones y limitaciones de este tipo de análisis. Entre los principales hallazgos encontramos evidencias que indican que la imagen ofrecida hasta la fecha sobre el emprendimiento no ha considerado la naturaleza multidisciplinaria del campo y, por tanto, podría estar distorsionada. A su vez, se detectan una serie de problemas inherentes a su desarrollo, se hace evidente la necesidad de incorporar los últimos avances en bibliometría, mejorando la colaboración entre expertos de ambos campos para resolverlos y avanzar hacia el progreso futuro.

Palabras clave: Emprendimiento; bibliometría; revisión sistemática; campo de investigación.

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1. INTRODUCTION

Romano and Ratnatunga (1996) and Ratnatunga and Romano (1997) brought bibliometrics into the world of entrepreneurship studies towards the end of the 1990s with their works focused on small businesses. However, the first bibliometric analysis dealing with entrepreneurship as a discipline was carried out by Dery and Toulouse (1996) in order to shed light on its social structure. Ever since those first seminal bibliometric research projects on entrepreneurship, there have repeatedly been works dealing with the discipline as a whole, culminating in a special issue published in 2006 by one of the most prestigious journals in the field (Gartner et al. 2006).

All of those studies, and some of the more recent ones (Ferreira et al. 2019; Xu et al. 2018; Landstrom and Harirchi 2018), have contributed fundamentally to the creation of a certain order in an apparently chaotic and contradictory literature with disparate meanings, views, and ways in which entrepreneurship is used and referred (Audretsch et al. 2015), examined how the discipline has evolved, given an overall view of the structure of the field, observed its social networks, spotted tendencies, discovered knowledge gaps and helped plan future lines of research. However, despite being a special, and particularly difficult, type of research that brings together two fields (bibliometrics and entrepreneurship) with peculiar characteristics, and approaches a discipline in its totality, little is known still about it. No review has yet taken up the task of analysing the works that are the result of this kind of research. The study presented below attempts to bridge that gap and is designed as a study of studies, offering a double perspective, looking at the contributions made to entrepreneurship as well as presenting a vision from a point of view of bibliometrics.

The aim of this article is to explore the different bibliometric analyses carried out on entrepreneurship as a discipline by putting together a representative sample selection of documents and subjecting them to a subsequent analysis. In terms of methodology, it employs an adaption of the Systematic Literature Review (SLR) developed by Tranfield et al. (2003) and a content analysis using text mining software in order to detect key features and to respond to the following research questions: How have studies of this type evolved? Have they been able to offer a picture that faithfully reflects the discipline? What have their main objectives and conclusions been? Which specific problems were they confronted with? Have researchers been applying the latest tendencies in bibliometrics? What has bibliometrics been able to contribute to the research in entrepreneurship so far, and what can it still contribute in the future? What is the future for this kind of research?

The rest of the study is divided into five sections. The starting point is a literature review that looks mainly at the origins, evolution, fundamentals, tendencies and limitations of bibliometrics. The next section deals with bibliometric research in entrepreneurship. The third is centred around the most significant methodological considerations. The fourth shows a discussion of the main results obtained. The final section is a presentation of the main conclusions.

2. LITERATURE REVIEW. BIBLIOMETRIC RESEARCH IN ENTREPRENEURSHIP

Entrepreneurship is an extraordinary phenomenon. It is a field that is able to bring together the interests of institutions, scientists and society as a whole. It is so special that there is almost unanimous agreement on its significance. This has led to a situation in the last decades where the number of institutions that offer their support to new entrepreneurs has not stopped growing, and a document corpus has evolved, which aims to decipher its key characteristics. The question remains, however: Is it a phenomenon, a field or a discipline?

Despite its undeniable social recognition and 'popularity', a series of questions have always provoked a profound debate about it in academic circles, as shown in Kushkowsky (2012). The debate includes questions related to the way in which research is conducted (Venkataraman 1997), to methodology (Busenitz et al. 2003; Low and Macmillan 1988), or to the fierce debate over whether it is an independent and legitimate discipline (Shane and Venkataraman 2000) or an interdisciplinary field based on the study of empirical phenomena (Sorenson and Stuart 2008), and even those tackling its essence, the actual definition of entrepreneur (Carlsson et al. 2013), and the lack of consensus hereon.

This definition remains elusive, heterogeneous and complex like each of the entrepreneurs it represents. On the political-institutional level there is an elevated consensus traditionally based on the important economic and social benefits entrepreneurship generates, which has almost without exception been the main reason for its study (van Praag and Versloot 2007). These widely studied benefits can be translated into more and greater economic growth, increasing productivity and competitiveness, the discovery of opportunities, emergence of innovation and dynamic generation of employment (Shane and Venkataraman 2000; Audretsch and Thurik 2001; Audretsch et al. 2006; Acs et al. 2009).

Characterised by an apparently chaotic and contradictory literature (Audretsch et al. 2015), it positions itself as an ideal candidate to take advantage

of the potential of bibliometrics. Zupic and Cater (2015) point out that in the context of management and organisation, bibliometric methods contribute, among other effects, to the synthesis of past research findings, to the advancement and discovery of new lines of investigation, to the introduction of systematic, transparent and reproducible review processes, to the improvement of the quality of reviews, to the mapping of different specialties, to the introduction of objective measures for literature evaluation leading to increased rigor and reduced bias, and to the detection of formal as well as informal networks (invisible colleges). These tools when applied to entrepreneurship multiply its possibilities. Their use allows researchers the opportunity to make headway in their theoretical understanding of it and to analyse such relevant questions as the ones mentioned, in greater depth. Research in this area is still young and its representation is weakened as it blurs into other categories in the two main scientific reference bases (Web of Science and Scopus).

The generalised use of databases such as Web of Science (WoS), Scopus and others as a crucial resource which allows scientists to access an elevated number of documents and all the bibliometric information they index (references, citations, etc.) in their research area, as well as the development of software that provides better handling of the resulting data and makes the tasks involved in their analysis more efficient, has led to a more widespread use of bibliometric tools: Sitkis (Schildt

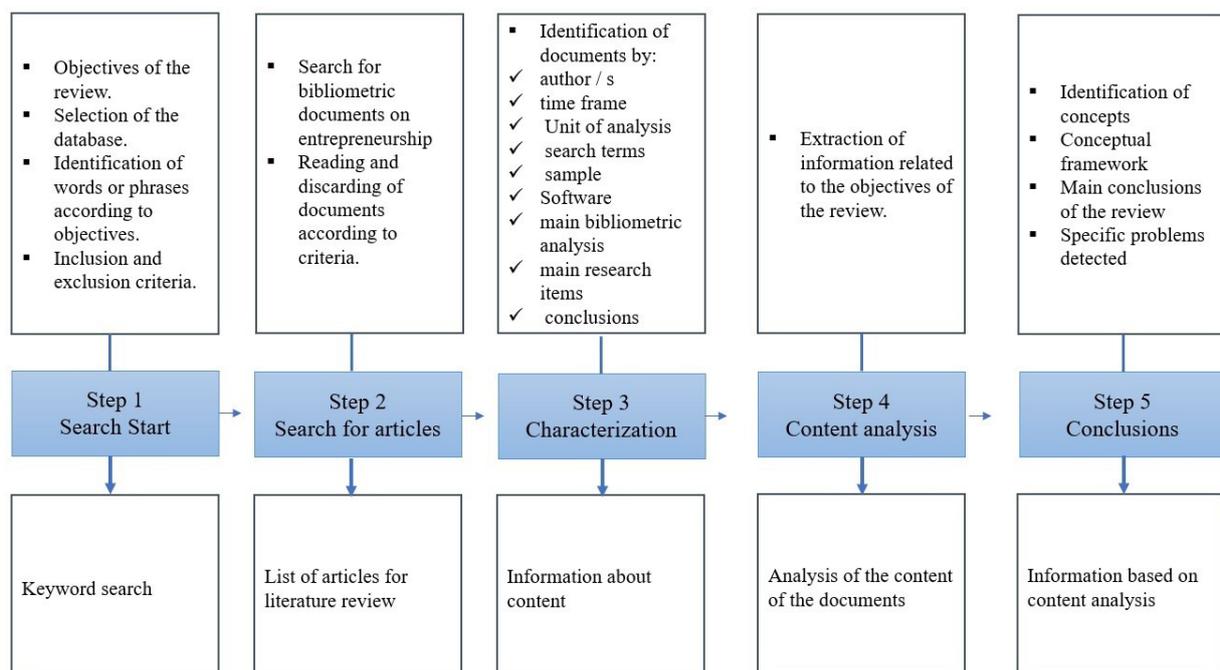
2002), one of the first; Bibexcel in combination with Pajek (Persson et al. 2009), and others such as SciMAT, HistCite, CiteSpace, VOSviewer.

The documents that contain the knowledge accumulated in entrepreneurship are scattered over a variety of, at times very different, categories in the two mentioned databases. As Landstrom et al. (2012) indicate, the phenomenon is multidisciplinary in nature, and registers mainly under Management, Business, Economics (WoS) or Business Management and Accounting, Economics, Econometrics and Finance (Scopus), as well as in other categories like Psychology, Sociology, History, etc., but to a lesser degree.

3. METHODOLOGY

An adaption of the procedures developed by Tranfield et al. (2003) has been followed. Systematic literature reviews (SLR) differ from traditional ones in that the process is reported openly in the same way empirical research would be, and that they are governed by transparency, clarity, equality and accessibility (Pittaway and Cope 2007). The methodology, applied and developed in detail in the context of Management and Social Sciences in works such as Liñan and Fayolle (2015), Pittaway et al. (2004), Thorpe et al. (2006), has been modified to adapt itself to the objectives and requirements of this study. The procedure which has been followed is illustrated in the Figure 1.

Figure 1. SLR Process. Adapted from Tranfield et al. (2003)



Step 1 Search Start: The objective of the review is to respond to different research questions: How has bibliometric research on entrepreneurship as a discipline been conducted? What have been the main objectives and conclusions? What specific challenges had to be faced and how were they overcome? Has a reliable image of the field emerged? Are the results up to date? What can bibliometrics offer to research into entrepreneurship and what has it contributed so far? Have advances in bibliometrics been used to keep research up to date? What does the future of this type of research look like?

In order to comply with such a variety of objectives, a non-restrictive strategy has been opted for, performing the document search in the two reference databases of the scientific community, WoS and Scopus, and using Google Scholar as an auxiliary tool to find more documents and download those whose access is restricted in the former.

In terms of the formula applied in the search, after testing different combinations and performing a number of tests runs it was decided to carry out accumulative searches for word pairs without applying any type of filters such as year or document type. Keywords associated with bibliometrics detected in previous works on information sciences were used (Chang et al. 2015), in total 23 terms and their possible lexical variations of occurrence were collected (for example: co-citation analysis / cocitation analyses), combined with the root "entrepr *", strategy previously used in bibliometric analysis on entrepreneurship (Cornelius et al. 2006, Schildt et al. 2006). A combination of terms that could include the different bibliometric works were used for document **selection**. The complete sequence is detailed as supplementary material in Annex 1.

Following this strategy, 260 documents were compiled from WoS and 257 from Scopus. The inclusion/exclusion criteria were established in accordance with the previously mentioned objectives

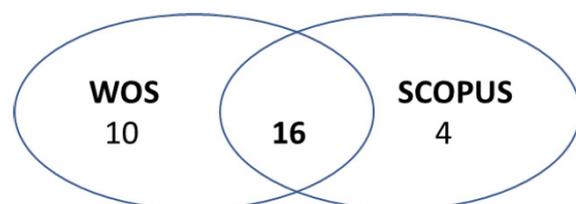
- Documents with a global focus on entrepreneurship (as a field or discipline), using bibliometric tools, indicators or analyses form part of the review.
- Documents focusing only on fragments or specific areas in entrepreneurship research (social entrepreneurship, female entrepreneurship, family firms, small enterprises, etc.) and those that do not carry out a whole analysis have been discarded.

Step 2 Search Start: All titles and abstracts of every document compiled according to the previously described criteria were read. Applying

the first filter, the result already provides valuable information for the study. Among those documents discarded for their lack of global focus on entrepreneurship, an increasing amount of literature can be found where bibliometric analyses are used as a main tool or as a complement to explore specific lines or sub-fields of research that are closely linked with entrepreneurship (family business, female entrepreneurship, social entrepreneurship, born global firms, informal entrepreneurship, international entrepreneurship), or simply to answer very specific questions in certain lines of investigation (Caputo et al. 2018; Galvao et al. 2018).

The result was a first list of 30 documents:

Figure 2. Common documents



The wide search sequence produces documents that do not tie in with the proposed objectives. It does, however, offer more results to process and picks up some as Yu and Tang (2014) or Qian (2014) that would not have been included otherwise. Furthermore, the results are enriched by allowing any type of document to be included. Auxiliary searches were carried out in Google Scholar, using the same strategy, which resulted in 6 additional documents that had previously not been detected in Scopus or WoS.

This section and the next one will inevitably introduce a certain level of subjectivity, as the inclusion or exclusion, for example, of those documents which generate doubts, such as Bhupatiraju et al. (2012) or Schmitz et al. (2017), was decided in accordance with the objectives of this review, although it is subject to different interpretations. In the end, the mentioned documents were not included.

Step 3 Characterization: In the third phase, the definitive sample emerged. To achieve this, all documents produced in the previous phase were read, discarding those where access has been impossible (some documents in the sample are proceedings that weren't available in their complete form). Additionally, conference presentations were substituted by the articles that later reported on them.

The list contains two works that compiled a list of bibliometric studies in entrepreneurship as part of their research: Landstrom and Persson (2010) and Teixeira and Ferreira (2013). They were used in order to be contrasted with the results obtained and to add documents that had not been found but which comply with the criteria for the review. The final result consisted of 40 documents¹, subsequently, the sample was characterised, and all the relevant information required to respond to the proposed research questions was identified.

Step 4 Content Analysis: Text mining software was used to detect key characteristics and to increase the objectivity of the study. The process followed mainly consisted of:

- New reading and independent extraction of objectives, conclusions and limitations of the document sample. This resulted in 120 text files (40 for each item)
- Pre and post-processing tasks carried out in Wordsat 8.0.7 and Qda Miner 5.0.23 by Provalis Research: mainly consisting of the exclusion of terms not required for the analysis (a, about, an, another, etc.) as well as word substitutions (develop, developed, develops = development, etc.), and the definition of the frequency threshold of words to be included in the analysis (add words with frequency = higher than 4).
- Topic extraction using the WordStat function. Application of a combination of natural language and statistical analysis; mainly factor analysis. Topic extraction is achieved by calculating the frequency matrix of documents and words. Clustering and co-occurrences. The following configuration was used: occurrence (same document), index (Jaccard's coefficient); type (word co-occurrence first order).

This phase and the next one (step 5: conclusions) are developed together with the results and conclusions of the article.

4. DISCUSSION AND RESULTS

4.1. Characterisation of the Document Sample Set

According to various authors like Landstrom and Persson (2010), Sassmannshausen and Volkmann (2018) the seminal bibliometric research in entrepreneurship is to be found in the articles by Romano and Ratnatunga (1996), Ratnatunga and Romano (1997), both of which are centred on small enterprises. According to the list, the first research

of this type focusing on entrepreneurship as a field was carried out by Dery and Toulouse (1996) in an attempt to shed light on its social structure.

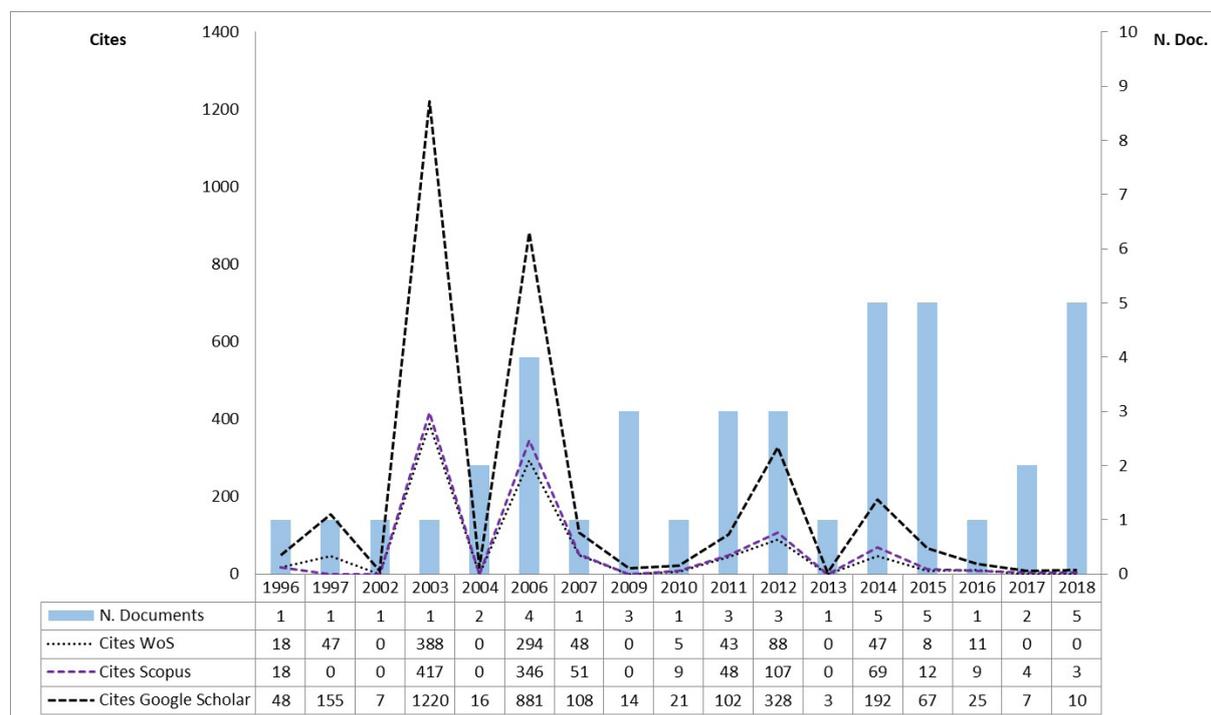
Two works appear next: Shane (1997), Busenitz et al. (2003). They do not mention the use of bibliometric tools specifically in their methodology. They have, however, been considered to be studies of this type by Landstrom and Persson (2010), which is the reason why they have been included in the list, as they respond to the definition of what a bibliometric study is ("*Bibliometric studies, in which a given field is studied by means of quantitative analysis and statistics to describe publication patterns*"), and comply with the proposed objectives for this review. Both were published in *Journal of Management* and show how certain areas, categories or even journals are more likely to be cited as references in later works. Busenitz et al. (2003) were the most cited from the Google Scholar, Web of Science and Scopus sample.

Figure 3 shows how global bibliometric studies have gradually gained importance and have shown a stronger and more consistent presence in a number of publications. As Sassmannshausen and Volkmann (2018) point out, the publication in 2006 of a special issue of "Entrepreneurship Theory And Practice" (Gartner et al. 2006) that brings together some of the most valued articles in number of citations, can be seen as the starting point of a growing reputation. Since then, other studies have been carried out which show that the community of researchers in entrepreneurship has felt the need to regularly compile the acquired knowledge in the subject by using these types of tools as a way to help lead to new advances. Especially the article by Landstrom et al. (2012) stands out among the previously mentioned documents as the one that required the shortest exposure period to accumulate the citations necessary to position itself as a reference. The sample concludes in 2018; the year for which 5 documents have emerged so far. Together with 2006 (4), 2014 (5) and 2015 (5) it is one of the years which records the greatest number of works.

4.2. Characterisation of Content

This has been divided into two parts. The first analyses technical aspects of the documents: time frame, data retrieval, unit of analysis, search terms, sample, software and main bibliometric analysis, and the second examines the main objectives, conclusions and limitations encountered in the different bibliometric studies of entrepreneurship as a **discipline**.

Figure 3. Bibliometric Studies in Entrepreneurship. N. of documents and cites



4.2.1. Technical Aspects

A summary with the main technical aspects is available as supplementary material (Annex 3). Showing up next, the most significant results are extracted.

Time Frame: The studies of the sample have generally covered ample periods of time: 77.5% of works cover more than 16 years of research in entrepreneurship. Some documents examine more than one period of time, as do Dean et al. (2007), da Costa Ferreira (2009), Campos et al. (2012). Percentages do not necessarily add up to 100% as studies can use multiple time frame or data retrieval. The most-studied periods of analysis are those ending in 2004 (Cornelius et al. 2006; Gregoire et al. 2006; Schildt et al. 2006; Dean et al. 2007), 2009 (da Costa Ferreira 2009; Chen et al. 2011; Campos et al. 2012; Busenitz et al. 2014; Meyer et al. 2014; Jing et al. 2015b) and 2013 (Yu and Tang 2014; Jing et al. 2015a; Chen 2015; Ferreira et al. 2019; Xu et al. 2018; Chandra 2018).

The most recent documents reach 2016 and 2017 (Cabeza-Ramirez et al. 2018; Dan and Goia 2018; Landstrom and Harirchi 2018), which goes to show that bibliometric research in entrepreneurship on the whole offers quite a complete time coverage. However, there is a certain deficit in trend research,

i.e. analyses of shorter intervals between 5 and 10 years, which would present the most recent picture of the current state of research. This can be explained because the majority are based on studies of citations, and documents need at least three years of exposure in order to accumulate them. Moreover, they tend to subdivide those ampler periods into smaller intervals in order to better observe their evolution.

Data Retrieval: When it comes to compiling the information required to elaborate different analyses, many of the samples establish a search sequence, and extract it directly from ISI-WoS. Another large group does it by choosing several journals that are representative of entrepreneurship research and then extracting the information. That group too, however, regularly uses ISI-WoS once the appropriate sources have been established, except in rare cases like Teixeira (2011), which uses Scopus for retrieval.

There have been few works that have required the prior creation of a specific database to be studied subsequently, or that have used alternative sources such as books Landstrom et al. (2012) to retrieve articles and references.

The choice of database for information retrieval exposes one of the biggest problems any study of this type must face: trying to find a collection of

documents that represents the discipline as a whole. Different authors in the sample favour various strategies, and mostly tend to justify their choice by referring to the coverage offered by the chosen databases or journals. Dery and Toulouse (1996) and Gregoire et al. (2006) choose their exclusive source in this way, *Journal of Business Venturing* (JBV) and *Frontiers in Entrepreneurship Research* (FER), respectively, and note this as a major limitation. However, selecting more than one source like da Costa Ferreira (2009) or Teixeira (2011), for example, does not solve the problem either, as not all the documents contained in the chosen journals deal exclusively with entrepreneurship.

It can also be observed that with the exception of Cabeza-Ramírez et al. (2017), which use frequency to unify data in one single index and thus manage to work with two databases, the possibility of using different ones in order to complement each other has not been explored. This is because the majority of works are based on citations, and different citation patterns cannot be mixed.

Unit of Analysis: One aspect that tends to go unnoticed is that it is necessary to observe units of analysis for data retrieval. The most commonly used units in bibliometric studies, network building and science mapping are documents (including any indexed typology and information: articles, books, notes, proceedings, papers, reviews, letters, etc.), articles (with indexed information: authors, cited references, journals, etc.) authors (including affiliations) and words or terms of description. According to our sample, more than half of the documents exclusively use articles. Although 25% of the sample reach into other typologies, not including books might represent a major bias in a field like entrepreneurship, where the elaboration of textbooks is common.

It is noteworthy that content studies using words, for example, are hardly represented at all. On the other hand, there are no studies focused specifically on references either, as these have been analysed like any other element in those studies that use the article as a unit of analysis, and it is difficult to find works that specifically deal with references.

Search Terms: The absence of specific categories for documents on entrepreneurship in the main databases together with the difficulty of defining entrepreneur or entrepreneurship means that the search strategies used to find documents that are representative of the discipline become more complicated. In most cases of our sample, the root "entrepr*" or the combination of different terms has been the chosen option. Selecting one

or another option can lead to a significant change in the results. Although there is no literature on the topic, taking a definition of entrepreneur/ entrepreneurship that is in accordance with the proposed objectives can make the task easier. It can be used to create different search terms, the most adequate of which will then be used to filter the documents. On the other hand, including all the results obtained from a specific source, one or several journals, for example, or compiling documents randomly without first applying a filter, would mean that documents that are less likely to be classified as dealing with entrepreneurship would end up being included.

Sample: When it comes to the sample documents selected for the different bibliometric studies, there is no connection between the number of documents chosen and the number of years under study. In the group of studies that used the article as a unit of analysis, we can find Busenitz et al. (2003), which use a sample set of 97 articles to cover a period of 15 years, or Chen et al. (2011), which use 2667 articles for a similar period of analysis (18 years). The same happens with those studies that widen their unit of analysis to include other typologies. Ramos (2004), for example, uses a sample set of 1356 documents to analyse 48 years of research in entrepreneurship, while Dan and Goia (2018) use a similar sample size to study a period of 17 years.

All of this brings us back to the problem researchers face, which is to find an adequate and representative sample of documents. When observing the 40 documents, it seems that most of them have chosen to select a wide-ranging sample in order to use the greatest number of articles and documents possible. This might, however, not be the perfect strategy, since even if we manage to compile all accumulated knowledge, not all of it has had real repercussions and led to an advance in understanding. In the sample, Cabeza-Ramírez et al. (2018) use this idea to look for possible solutions from a bibliometric approach, using citation thresholds. A method suggested by Martínez et al. (2014) was used here to identify the classics of a scientific area applying the H-Classic approach and the H-Index.

Software: In recent years, significant advances have been made in bibliometric software, tools specifically designed to aid with complete workflows as well as with science mapping (Gutiérrez-Salcedo et al. 2018; Cobo et al. 2011), which have had an impact on research (Pan et al. 2018). It is noteworthy to see though, that more than half of the sample documents (Table I) do not make use of them or specify them.

Table I. Bibliometric Studies in Entrepreneurship. N. of documents and cites

Not indicated/ Not used	Bibexcel and other software	SPSS and others	Sitkis and others	Endnote and others	Microsoft Excel and others	Citespace	Scimat and others	VOSviewer
22	5	4	3	2	2	2	1	1
55%	12,5%	10%	7,5%	5%	5%	5%	2,5%	2,5%

Main Bibliometric Analysis: In the sample, citation and co-citation analyses including authors, documents or co-cited journals stand out first (Table II). The second-most relevant type (35%) are works where evaluation, performance or scientific production are analysed, establishing different rankings of authors, articles, countries, universities, journals or impact. Co-word content and bibliographic coupling studies have hardly been used.

The only document that uses co-word analyses (Lopez-Fernandez et al. 2016) was meant as a complement to an author co-citation analysis (ACA) "to trace the connections between researchers and fields". The sample documents as a whole display a clear interest in getting to know the authors and the most representative works, as well as in understanding the relationships that they have established between them. Aspects related to the actual content of those works are of secondary importance. This seems to present a major gap in the representation of the discipline and an opportunity for future research.

Another noteworthy aspect is that practically all the works are based on citations as an indirect measure of quality. Two problems emerge which have hardly been dealt with: the time citations need to accumulate and the multidisciplinary nature of entrepreneurship. This means that articles with a shorter period of exposure to citation or belonging to another discipline with different exposure and citation patterns have been assessed in the same way. Recent research in bibliometrics reveals possible solutions, which would require normalisation of citations (Waltman and van Eck 2013; Bornmann and Marx 2018; Bornmann and Wohlrabe 2017). In this

sense, only Landstrom et al. (2012) and Meyer et al. (2014) have performed approximations to counteract these disadvantages. The former developed the J index in order to let works with low citations rates, but a more recent publication date, move up in the ranking, and the latter used the mean observed citation rate (MOCR) as an indicator for impact. In this last article, one of the authors (W. Glänzel) is an expert in bibliometrics. It is the only one in the sample that uses bibliographic coupling analyses as an alternative to citation studies. This methodology has been proven to be effective in identifying changes in research topics (Chang et al. 2015).

It is also noteworthy that, even though the H-Index has been a major milestone in the world of bibliometric indicators it has hardly found application in the study of entrepreneurship (i.e Cabeza-Ramírez et al. (2017) and Cabeza-Ramirez et al. (2018) used it not only to determine the citation threshold but also for sample selection). Observing a single citation pattern, the one used in ISI-WoS, is the norm. Experimenting with other ones like those used in Google Scholar or Scopus or to make comparisons would, no doubt, be enriching for the results. New metrics linked to the social development or the use of science are also not used, although their application could contribute to a better understanding of the discipline.

4.2.2. Objectives, Conclusions and Limitations

A summary with the three main content items is available as supplementary material (Annex 4). The results obtained with the word processing software (Qda Miner and Wordstat) and their qualitative analyses are presented below.

Table II. Main Bibliometric Analysis type

Co-citation/ citation analysis	Performance	Co-citation/ Co-Word	Cluster	Bibliographic coupling and text mining
22	14	1	3	1
55%	35%	2,5%	7,5%	2,5%

5. OBJECTIVES

The analysis of the objectives of the 40 studies of the sample was carried out after the individual reading of each document. The objectives were isolated in an individual text document for each element of the sample and the 40 resulting files were introduced in the text mining software. According to the WordStat User Guide, the Topic Extraction function attempts to uncover the hidden thematic structure of a text collection through natural language processing and statistical analysis. This function is used to increase objectivity and facilitate interpretation of content.

The objectives of the articles are usually found in the introduction section. The number of words that shape the text of the objectives is usually reduced; therefore, it was decided to extract only the 7 most representative thematic nuclei at the level of lexical coherence and statistical figures, as shown in Figure 4.

The thematic study of the items obtained showed a high thematic coherence, this metric is based on measures of how frequently individual

words occur and pairs of distinct words co-occur (Kuhn, 2018). Values close to 0 indicate optimal figures and consequently increase cohesion in the topics (Mimno et al. 2011). Table III shows the 7 topics detected. WordStat uses an algorithm to automatically assign a label to each group, as well as the main keywords associated with that topic in descending order according to the cut-off criteria (in this case, minimum frequency, 4); the total frequency of the main keywords of the thematic core, the number of cases or documents that contain at least one of the keywords and their percentage.

As can be seen, the thematic core Field of Entrepreneurship, how could it be otherwise, is the most prominent, has a coherence of 0.388; a total frequency of 98; appears in the objectives of 39 of the 40 documents, that is, in 97.5% of cases. The rest of the thematic cores also show very positive values, for example Based Citation, Entrepreneurship Research and Evolution Studies. It is noteworthy that two particular thematic nuclei, Region Similarities and Convergence Cohesion, are appearing in 10 and 6 documents respectively.

Figure 4. Topic Groups in Objectives

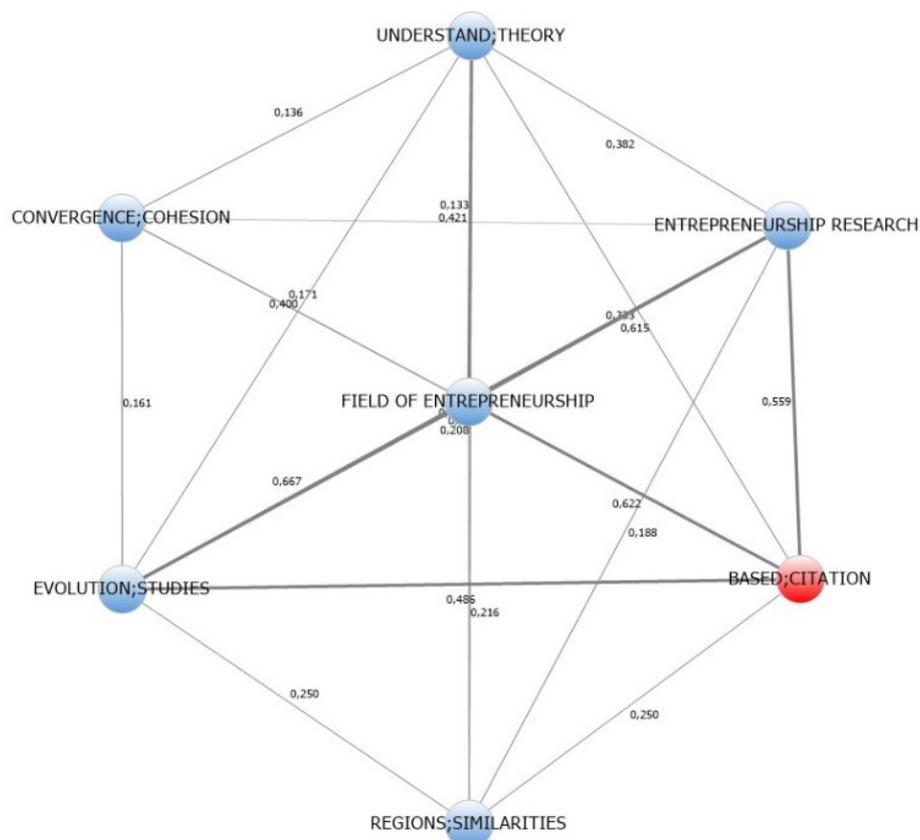


Table III. Topic Groups in Objectives

TOPIC	KEYWORDS	COHERENCE	FREQ	CASES	% CASES
CONVERGENCE COHESION	CONVERGENCE; COHESION; LEGITIMACY; PARADIGM;	0,435	26	6	15,00%
REGIONS SIMILARITIES	REGIONS; SIMILARITIES; DIFFERENCE; INTERNATIONAL; CHARACTERISTICS; UNDERSTAND;	0,431	18	10	25,00%
BASED CITATION	BASED; CITATION; CONTRIBUTIONS; SCHOLAR; RESEARCH; ANALYSIS;	0,401	42	31	77,50%
FIELD OF ENTREPRENEURSHIP	ENTREPRENEURSHIP; RESEARCH; FIELD; FIELD OF ENTREPRENEURSHIP;	0,388	92	39	97,50%
UNDERSTAND THEORY	UNDERSTAND; THEORY; STRUCTURE; SCIENTIFIC; INTELLECTUAL; DEVELOPMENT; TRENDS;	0,388	19	19	47,50%
ENTREPRENEURSHIP RESEARCH	INTELLECTUAL; IDENTIFY; LITERATURE; RESEARCH; PAPER; TRENDS; ENTREPRENEURSHIP RESEARCH;	0,372	37	28	70,00%
EVOLUTION STUDIES	EVOLUTION; STUDIES; DISCIPLINE; ARTICLE; FIELD; SOCIAL; ANALYSIS; LITERATURE;	0,357	38	32	80,00%

The analysis of the main motivations for carrying out this type of research by looking at proposed objectives reveals that 1996 was the year when the first global work (Dery and Toulouse 1996) of this type was elaborated to "reveal the social structuration of knowledge in entrepreneurship". The objectives have changed over time and show unique characteristics that are not typical of bibliometric research in general; e.g. namely to prove the legitimacy of the discipline. Observing the frequency with which authors employ words, and the topical groupings by means of factor analyses carried out using text mining software, a group of significant documents appears which are based on a solid theoretical foundation and recur to bibliometrics in order to expose cohesive and converging features in the discipline (Busenitz et al. 2003; Campos et al. 2012; Cornelius et al. 2006; Gregoire et al. 2006; Reader and Watkins 2006; Schildt et al. 2006).

The rest of the topic groups that emerge are more common and tie in with the need described by Low and Macmillan (1988), "a body of literature develops, it is useful to stop occasionally, take inventory of the work that has been done, and identify new directions and challenges for the future". They use bibliometrics to compile the most fundamental works and authors, and to show their evolution as well as their social structure to improve understanding of them, and to make advances in their theoretical construct.

6. CONCLUSIONS

The procedure followed with the limitations and conclusions is similar to that described in the previous section. Only the thematic nuclei have been extended to 8, since the texts that include them are usually more extensive at the end of the documents. The analysis

of the conclusions of the sample documents shows different topic groups: Category Management, Program top, Significant article, Concepts Strong, Appears Identified, Innovation Related, Entrepreneurship Research and Core Themes (Figure 5).

Table IV shows the main statistics related to the conclusions and the main thematic associations. Three of them appear in a greater number of documents:

"Appears Identified": It is linked to obtaining and identifying main trends within the field of entrepreneurship, presents high frequencies of the keywords contained, appears in 36 documents and shows high cohesion.

"Entrepreneurship Research": It is a group related to the objectives of the documents, it also appears in 36 articles and keywords emerge related to the increasing disciplinary cohesion and converging nuclei.

"Category Management": reflects the idea that most of the bibliometric research coincides in signalling that entrepreneurship is a discipline with a markedly multidisciplinary character whose essence lies in other main fields or categories (Management, Business and Economics). The words that configure it are present in 32 of the 40 documents in the sample with high frequency and cohesion.

The rest of thematic associations (program top, concepts strong, innovation related, core themes, significant article), although they decrease in the number of cases and frequency (even if they are high) deepen conclusions related to greater internal theoretical strength related to innovation and the emergence of nuclei of recognizable authors linked to the strong growth of the field of entrepreneurship.

Figure 5. Topic Groups in Conclusions

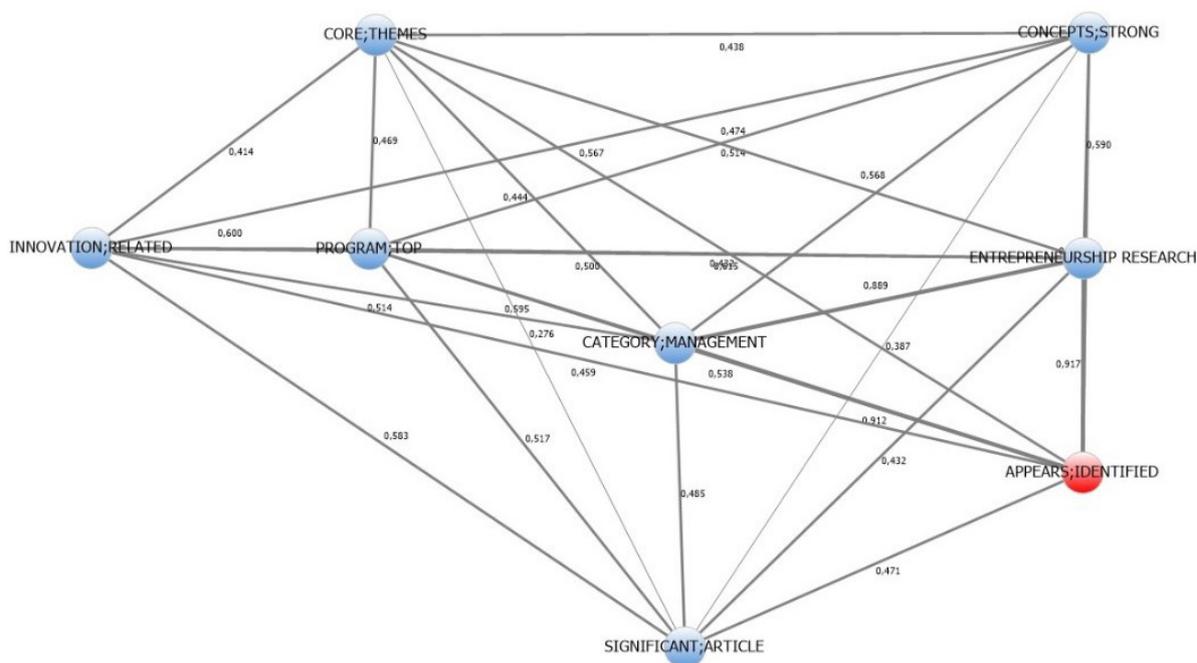


Table IV. Topic Groups in Conclusions

TOPIC	KEYWORDS	COHERENCE	FREQ	CASES	% CASES
APPEARS IDENTIFIED	APPEARS; IDENTIFIED; INFLUENCE; MAINSTREAM; FIELD; GROWTH; DEVELOPMENT; FORCE; INTERNAL; ENTREPRENEURSHIP; NUMBER; FIELD OF ENTREPRENEURSHIP;	0,429	70	36	90,00%
ENTREPRENEURSHIP RESEARCH	KNOWLEDGE; TOPIC; CONVERGENCE; ENTREPRENEURSHIP; RESEARCH; FIELD; ANALYSIS; EVIDENCE; APPROACH; GROWING; CORE; ENTREPRENEURSHIP RESEARCH;	0,411	108	36	90,00%
CATEGORY MANAGEMENT	CATEGORY; MANAGEMENT; INCLUDED; BUSINESS; SUBJECT; STUDIES; MAINSTREAM; INCREASING; ECONOMIC; CONTRIBUTION; DEVELOPMENT; FIELD;	0,609	62	32	80,00%
PROGRAM TOP	PROGRAM; TOP; FORCE; INSTITUTIONS; SCHOLARS; AUTHOR; CENTRAL; EVIDENCE; CLUSTER; HIGHLY; DEVELOPMENT; STUDY; ARTICLE; CONTRIBUTION;	0,512	53	27	67,50%
CONCEPTS STRONG	CONCEPTS; STRONG; BASED; THEORY; DISCIPLINE; STUDY; FINDINGS; RELATED; INNOVATION;	0,445	34	26	65,00%
INNOVATION RELATED	INNOVATION; RELATED; ECONOMIC; CITATION; SUBJECT; GROWING; COUNTRIES; SCHOLARS;	0,418	23	21	52,50%
CORE THEMES	CORE; THEMES; ISSUES; RESULTS; CHARACTERISTICS; CLUSTER; AUTHOR; INCLUDED; APPROACH;	0,383	26	20	50,00%
SIGNIFICANT ARTICLE	SIGNIFICANT; ARTICLE; FINDINGS; AREA; CONTRIBUTION; COUNTRIES; CENTRAL; GROWTH; GROWING;	0,499	26	17	42,50%

6.1. Limitations

As for the limitations offered by the authors of the sample set, a significant number of documents do not indicate them expressly. In 12 of them no limitations are mentioned. That represents 30% of the total and is due to the fact that some of these works were preliminary presentations at conferences.

There are 8 interconnected topical nuclei as can be seen in Figure 6. The one that displays the greatest cohesion and frequency (Evolving SSCI) has to do with limitations with respect to the coverage of the sources and databases used in the analyses, as well as the inclusion or lack of it of certain document typologies such as books or proceeding papers.

Table V shows the statistics of the following thematic groups, their evolution related to the words used by authors, and reflects problems associated with the limitations of bibliometrics as a methodology and, in second place, those inherent to research in entrepreneurship, e.g., the multidisciplinary essence of the discipline.

Two topic groups (limitation contribution; nature subjective) show how difficult it is to decipher the results obtained and how subjective they are. This illustrates the need to possess prior understanding of entrepreneurship as well as bibliometrics in order to be able to interpret them. Most works were

elaborated by authors, who come from a background in entrepreneurship research. Exploring the union of the two knowledge areas through the collaboration of authors from both fields might contribute to minimising possible biases and offer a more realistic image of the discipline by minimising errors in interpretation.

Other limitations are linked to the static nature of results in contrast with the dynamic structure of a field in constant expansion, or to the measurements used; in this case the number of citations as an exclusive measure, disregarding a complementary analysis of content.

The analysis of the main technical aspects revealed:

- Most of the bibliometric studies on entrepreneurship analyse long periods of time, without any relationship between the number of documents analysed and the selected period of time.
- The main technical problem of this type of analysis is to find a set of documents representative of the discipline. The favourite options have been to recover the ISIWoS data or choose a set of journals as representative of the area. There are no optimal search strategies, or sets of representative terms to perform them, beyond the use of the root *entrepr ** or the arbitrary combination of keywords.

Figure 6. Topic Groups in Limitations

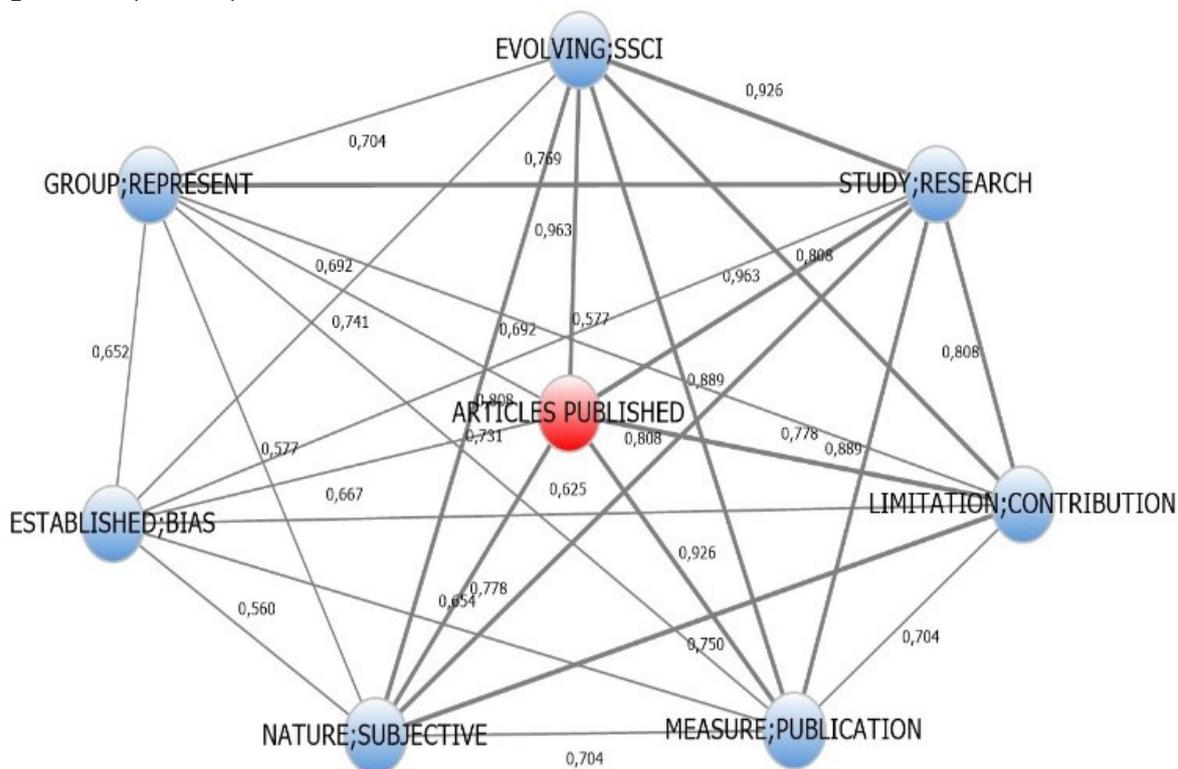


Table V. Topic Groups in Limitations

TOPIC	KEYWORDS	COHERENCE	FREQ	CASES	% CASES
EVOLVING SSCI	EVOLVING; SSCI; COVERAGE; COMMUNICATION; CONCERN; BIBLIOMETRIC; BOOKS; SCIENCE; QUALITY; JOURNAL; DATABASE; CONFERENCE; RESEARCH; CITATION; PUBLICATION; BIAS; SOCIAL; FIELD; LIMITATION;	0,604	102	26	65,00%
ARTICLES PUBLISHED	WORK; PUBLISHED; ARTICLE; JOURNAL; SOURCE; ISI; CHOICE; WEB; PRESENTED; SCIENCE; REFERENCES; CITATION; METHODS; STUDY; DATABASE; SOCIAL; ARTICLES PUBLISHED;	0,504	98	27	67,50%
STUDY RESEARCH	STUDY; RESEARCH; EXAMINE; STRUCTURATION; INTERPRETATION; ANALYSIS; METHODS; SOCIAL; STATIC; NUMBER; ISSUE; OBTAINED; ENTREPRENEURSHIP; COVERAGE;	0,453	78	26	65,00%
LIMITATION CONTRIBUTION	LIMITATION; CONTRIBUTION; WEB; BIBLIOMETRIC; GENERAL; INCLUDE; BOOKS; RESULT; QUALITY; ANALYSIS; ISI; KNOWLEDGE; SCIENCE; JOURNAL;	0,557	66	21	52,50%
MEASURE PUBLICATION	MEASURE; PUBLICATION; DISCIPLINE; SCHOLAR; QUALITY; CONFERENCE; TIME; RESULT; CHOICE; PAPER; ENTREPRENEURSHIP; JOURNAL; SCIENCE;	0,552	52	25	62,50%
NATURE SUBJECTIVE	NATURE; SUBJECTIVE; AUTHOR; CONCEPT; COMMUNICATION; CONCERN; TIME; STATIC; CITATION;	0,550	48	21	52,50%
GROUP REPRESENT	GROUP; REPRESENT; DIFFICULT; THEORETICAL; FIELD; ENTREPRENEURSHIP; SCHOLAR; REFERENCES;	0,514	44	20	50,00%
ESTABLISHED BIAS	ESTABLISHED; BIAS; DATA; CONFERENCE; IDENTIFY; ISSUE; BOOKS; INCLUDE; FIELD; ISI;	0,501	36	18	45,00%

- The favourite unit of analysis has been the article, leaving aside too many other types of important typologies in the discipline such as books or manuals.
 - The main bibliometric analyses carried out are based on the citation as the only quality measure. The time needed for the citations to accumulate or the possible disciplinary differences between documents from different areas of study have not been taken into account. Bibliographic coupling focused on references and content co-words analysis have hardly been used.
 - Regarding the use of bibliometric software, a large number of studies do not indicate whether they use it.
- The analysis of the objectives, conclusions and limitations of this type of research showed:
- Some characteristic objectives such as the search for cohesion and convergence patterns to strengthen the legitimacy of the discipline.
 - Conclusions that expose the marked multidisciplinary nature of entrepreneurship.
 - Limitations linked precisely to the multidisciplinary nature of entrepreneurship and associated with the bibliometric methodology such as the static nature of most analyses or the difficulty in interpreting the results.
- The results obtained in the analysis of the selected documents offer a solid base for a better understanding of a research field that presents enormous difficulties on account of its multidisciplinary nature. The application of bibliometric methods is showing great potential for a quantitative confirmation of pre-supposed ideas associated with its structure and growth. The literature review that has been carried out shows only the tip of an iceberg when it comes to the possibilities that bibliometrics offer for analysis. Researchers who published some of the most influential works in entrepreneurship (Busenitz et al. 2003; Cornelius et al. 2006; Gregoire et al. 2006; Schildt et al. 2006) in a quest to find an answer to the question of legitimacy have defined the search for patterns of cohesion and convergence as a key objective. The review also confirms that studies of this type have contributed significantly

to a successful definition of a highly fragmented field and helped offer a comprehensive vision of it. Certain gaps have been detected, however, and there are areas which require greater attention.

Moreover, a series of problems and gaps have been identified which need to be addressed in the future. Some of the most significant ones are:

- The need to incorporate a bibliometric focus in this type of analysis, taking into consideration the recommendations made in the Declaration on Research Assessment (DORA) and the Leiden Manifesto (Hicks et al. 2015); especially those that make reference to the differences in publication and citation practices between scientific fields. It seems imperative to take into account the time citations require to accumulate and to consider the multidisciplinary nature of the discipline, looking at the normalisation of citations as a possible solution (Bornmann and Wohlrabe 2017; Waltman and van Eck 2013).
- The challenge of selecting significant document samples to carry out the different analyses must be explored in greater depth. Arbitrary criteria and strategies aimed at producing the greatest number of documents possible are generally used even though not all works have contributed equally to the discipline. There is also no relationship between the number of sample documents and the time period under study.
- There is an almost exclusive dependence on citations as the only representative or qualitative reference to a document that belongs to the area or discipline. It would be necessary to explore the possibility of applying other types of indicators, or even to work on elaborating indicators that are specific to the field. The H-Index, one of the biggest milestones in bibliometrics, has hardly found application. The sample does not contain any documents (not even among the most recent) using metrics linked to the social development of science and the new information platforms like user metrics and altmetrics.
- The references the main documents contain and are used in the different analyses have hardly been studied, and the article has almost always been the main unit of analysis. On too many occasions, other document categories such as books or textbooks, which are of great importance to the discipline, as explained in Landstrom et al. (2012), have been left out.
- The bibliometric methods that use a quantitative approach have the potential to

improve systematic review processes. They aim to provide transparency and offer reproducible and replicable results. However, a significant number of documents among the sample do not indicate whether a bibliometric software was used or what limitations they had to deal with.

This article largely confirms some of the conclusions presented by Zupic and Cater (2015) in Management and Organization, like the need to use new bibliometric methods which are based more on content, so as to obtain more accurate groups as defined by semantic similarities between documents, for instance. It is also necessary to employ less exploited types of analysis such as bibliographic coupling, co-word analyses and hybrid methods as well as the combination and comparison of results obtained when using different methodologies. Despite all of these problems, the review provides indications of collaboration between the two fields of knowledge aimed at resolving them, as in the case of Meyer et al. (2014). A certain degree of specialisation can also be appreciated. Hans Landstrom is the most outstanding example of this.

The article is not without its limitations, which are mostly due to aspects of methodology. Firstly, the search for the sample literature might have failed to pick up and include every relevant document in existence despite including three different databases in order to widen coverage. Secondly, the review includes subjective components, which could lead to a bias in the results. They are the result of inclusion/exclusion criteria used on the documents which make up the final sample. Thirdly, these subjective components extend into the parameters used to perform the content analysis of the documents. A different configuration might have led to a different interpretation. However, we believe that the findings presented are sufficiently significant to help obtain a better understanding of the discipline and, more importantly, they could be helpful in the quest to introduce more rigour to future bibliometric analyses.

Finally, a promising future can be foreseen for the relationship between bibliometrics and entrepreneurship. It is a special type of research, which needs to incorporate the latest theories and advances emerging in both fields in order to stay up to date. Two suggestions can be made regarding future lines of investigation: the scope of this review ought to be widened by including the remaining bibliometric studies in entrepreneurship in order to verify the results obtained, and efforts should be made to better understand whether the use of this type of study merely serves to provide new bibliometric research, or if it is actually instrumental in obtaining a greater understanding of the discipline.

7. NOTES

1. In a bibliometric work it is convenient to separate those articles or documents that have been useful for the writing of the research, from those others that make up the sample and that are available. The whole list is included in supplementary material Annex 2 (although some of the documents appears both in the sample and in the references).

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Annex 1. Search Configuration

Web of Science Core Collection (topic)	/	Scopus Document Search (article title, abstract, keywords)	Wos List	Scopus List
Entrepr* and bibliometric			101	102
Entrepr* and infometric			101	103
Entrepr* and webometric			101	103
Entrepr* and citation analysis/citation analyses			207	166
Entrepr* and direct citation/direct citations			209	167
Entrepr* and cocitation analysis/cocitation analyses/co-citation analysis/co-citation analyses			222	168
Entrepr* and bibliographic coupling			222	168
Entrepr* and cword analysis/cword analyses/co-word analysis/co-word analyses			224	171
Entrepr* and coauthorship/coauthorship network/coauthorship networks/co-authorship network/co-authorship networks			230	174
Entrepr* and self citation/self citations/self-citation/self-citations			233	179
Entrepr* and network analysis/networks analyses (refine by bibliometric)			233	184
Entrepr* and citation map			235	185
Entrepr* and citation visuali*			235	186
Entrepr* and science policy (refine by bibliometric)			235	200
Entrepr* and research policy (refine by bibliometric)			235	223
Entrepr* and impact factor/impact factors (refine by bibliometric)			235	228
Entrepr* and h-index/h index/hirsch index			245	232
Entrepr* and patent analysis/patent analyses (refine by bibliometric)			245	236
Entrepr* and zipf			250	239
Entrepr* and bradford			255	247
Entrepr* and lotka			257	253
Entrepr* and Intellectual structure (refine by bibliometric)			257	253
Entrep* and invisible college			260	257

Annex 2. 40 Documents in the Systematic Literature Review

N.	Title	Authors	Source	Public year	Total Citations Wos	Total Citations Scopus	Total Citations GS
1	Social structuration of the field of entrepreneurship: A case study	Dery, R, Toulouse, JM	Canadian Journal of Administrative Sciences	1996	18	18	48
2	Who is publishing the entrepreneurship research?	Shane, SA	Journal of Management	1997	47	-	155
3	Identifying current trends in entrepreneurship research: A new approach	Reader, D, Watkins, D	ARPENT: Annual Review of Progress in Entrepreneurship	2002	-	-	7
4	Entrepreneurship research in emergence: Past trends and future directions	Busenitz, LW, West, GP, Shepherd, D, Nelson, T, Chandler, GN, Zacharakis, A	Journal of management	2003	388	417	1220
5	Intellectual structure of entrepreneurship research: A bibliometric study, 1956-2003	Ramos, R.A.	Doctoral dissertation, Universidad de Cadiz (Spain)	2004	-	-	0
6	The field of entrepreneurship: a bibliometric assessment	Schildt, HA, Sillanpaa, A	Conference Paper, Babson Kauffman Entrepreneurship Research Conference Glasgow	2004	-	-	16
7	Entrepreneurial studies: The dynamic research front of a developing social science	Cornelius, B, Persson, O, Landstrom, H	Entrepreneurship Theory and Practice	2006	87	96	283
8	Is there conceptual convergence in entrepreneurship research? A co-citation analysis of Frontiers of Entrepreneurship Research, 1981-2004	Gregoire, DA, Noel, MX, Dery, R, Bechard, JP	Entrepreneurship theory and practice	2006	65	86	251
9	Scholarly communities in entrepreneurship research: A co-citation analysis	Schildt, HA, Zahra, SA, Sillanpaa, A	Entrepreneurship Theory and Practice	2006	100	114	243
10	The social and collaborative nature of entrepreneurship scholarship: A co-citation and perceptual analysis	Reader, D, Watkins, D	Entrepreneurship theory and practice	2006	42	50	104
11	The past, present, and future of entrepreneurship research: Data analytic trends and training	Dean, MA, Shook, CL, Payne, GT	Entrepreneurship Theory and Practice	2007	48	51	108
12	Searching for "invisible colleges" in the Entrepreneurship literature	Ferreira, E.M.	Master Dissertation Universidade do Porto	2009	-	-	0

N.	Title	Authors	Source	Public year	Total Citations Wos	Total Citations Scopus	Total Citations GS
13	The entrepreneur, the organization and the world out there: A bibliometric review of 1239 papers on networks, social capital, cooperation, inter-organizational relations, and alliances in entrepreneurship	Sassmannshausen, S. P.	Frontiers of Entrepreneurship Research	2009	-	-	2
14	The evolution of the literature on entrepreneurship. Uncovering some under researched themes	Teixeira, AAC, Santos, C.	FEP Working Papers	2009	-	-	12
15	Entrepreneurship research: research communities and knowledge platforms	Landstrom, H, Persson, O	Historical foundations of entrepreneurship research	2010	5	9	21
16	Mapping the (in)visible college(s) in the field of entrepreneurship	Teixeira, AAC	Scientometrics	2011	35	39	83
17	Perspective Research Entrepreneurship Output Performance in 1992-2009	Chen, JKC, Ho, YS, Wang, MH, Wu, YR	Proceedings of PICMET'11	2011	0	0	3
18	The Intellectual Influence of Entrepreneurship Journals: A Network Analysis	Dos Santos, BL, Holsapple, CW, Ye, Q	Entrepreneurship Theory and Practice	2011	8	9	16
19	Charting the Growth of Entrepreneurship: A Citation Analysis of FER Content, 1981-2008	Kushkowsky, J.D	Journal of Business & Finance Librarianship	2012	-	3	7
20	Entrepreneurship: Exploring the knowledge base	Landstrom, H, Harirchi, G, Astrom, F	Research Policy	2012	88	104	321
21	Mapping the Intellectual Structure of Entrepreneurship Research: revisiting the invisible college	Campos, HM, Parellada, FS, Palma, Y	Revista Brasileira de Gestão de Negócios	2012	3	5	18
22	Intellectual structure of the entrepreneurship field: a tale based on three core journals	Teixeira, AAC, Ferreira, E.M.	Journal of Innovation Management	2013	-	-	3
23	A visual analytic study of articles in entrepreneurship research	Yu, L. -C, Tang, T.-I	Proceedings of the Fourteenth International Conference on Electronic Business	2014	-	0	-
24	Computational and visual analysis of the development stage of theories in the social sciences: a case in the entrepreneurship field	Qian, G	Current Science	2014	0	0	0

N.	Title	Authors	Source	Public year	Total Citations Wos	Total Citations Scopus	Total Citations GS
25	Entrepreneurship Research (1985-2009) and the Emergence of Opportunities	Busenitz, LW, Plummer, LA, Klotz, AC, Shahzad, A, Rhoads, K	Entrepreneurship Theory and Practice	2014	25	36	112
26	Origin and emergence of entrepreneurship as a research field	Meyer, M, Libaers, D, Thijs, B, Grant, K, Glanzel, W, Debackere, K	Scientometrics	2014	15	23	56
27	Trends in and contributions to entrepreneurship research: a broad review of literature from 1996 to June 2012	Luor, TY, Lu, HP, Yu, HJ, Chang, KL	Scientometrics	2014	7	10	24
28	Entrepreneurship across regions: Internationalization and/or contextualization?	Landstrom, H, Jing, S, Quinghua, Z.	Handbook of Research on Global Competitive Advantage through Innovation and Entrepreneurship	2015	-	0	3
29	Entrepreneurship Research Dynamics (1992-2013): Aim at Entrepreneurial, Innovative Firms and Business Operations	Chen, JKC	Portland International Conference on Management of Engineering and Technology	2015	0	0	0
30	Entrepreneurship research in three regions-the USA, Europe and China	Landstrom, H, Jing, S, Zhai, QH	International Entrepreneurship and Management Journal	2015	2	5	15
31	The evolution of the small business and entrepreneurship field: A bibliometric investigation of articles published in the International Small Business Journal	Volery, T, Mazzarol, T	International Small Business Journal	2015	6	7	23
32	Thirty years of entrepreneurship research published in top journals: analysis of citations, co-citations and themes	Ferreira, M.P., Reis, N.R., Miranda, R.	Journal of Global Entrepreneurship Research	2015	-	-	26
33	Entrepreneurship and Family Firm Research: A Bibliometric Analysis of An Emerging Field	Lopez-Fernandez, MC, Serrano-Bedia, AM, Perez-Perez, M	Journal of Small Business Management	2016	11	9	25
34	Entrepreneurship as a dynamic field of study: a bibliometric analysis of research output	Cabeza-Ramirez, LJ, Cañizares, SMS, Fuentes-García, FJ	Tourism & Management Studies	2017	-	-	1

N.	Title	Authors	Source	Public year	Total Citations Wos	Total Citations Scopus	Total Citations GS
35	Entrepreneurship research: mapping intellectual structures and research trends	Ferreira, J.J.M., Fernandes, C.I., Kraus, S.	Review of Managerial Science	2017	-	4	6
36	Characterisation of the classics of entrepreneurship (1968-2016). An analysis based on Web of Science	Cabeza-Ramirez, LJ, Cañizares, SMS, Fuentes-Garcia, FJ	Revista Española de Documentacion Científica	2018	0	0	0
37	Contributing Forces in Entrepreneurship Research: A Global Citation Analysis	Xu, NH, Chen, YN, Fung, AN, Chan, KC	Journal of Small Business Management	2018	0	0	1
38	Entrepreneurship and regional development. A bibliometric analysis	Dan, MC, Goia, SI	Proceedings of the International Conference on Business Excellence	2018	0	0	0
39	Mapping the evolution of entrepreneurship as a field of research (1990-2013): A scientometric analysis	Chandra, Y	PloS one	2018	0	2	6
40	The social structure of entrepreneurship as a scientific field	Landstrom, H, Harirchi, G	Research Policy	2018	0	1	3

Annex 3. Main technical aspects of the sample

Article	Time frame	Data retrieval	Unit of analyses	Search Terms	Sample	Software	Main Bibliometric analysis
1	1986-1993	JBV	Articles	-	237 articles	-	Co-citation
2	1987-1994	19 Appropriate or Better Quality Journals	Articles	-	472 articles	-	Performance
3	2000-2001	ARPENT	Words	-	521 Words	Endnote/RefViz	Cluster analysis
4	1985-1999	AMJ, ASQ, AMR, SMJ, JBV	Articles	entrepreneurial, entrepreneurship, small business (emerging business), new venture (emerging venture), and founder(s)	97 articles	-	Performance
5	1956-2003	SSCI/SCI (ISIWOS)	Documents	entrepreneurship	1356 articles and meetings	Bibexcel/SPSS and Ucinet/Netdraw	Co-citation/Citation analysis
6	1994-2003	SSCI (ISIWOS)	Articles	"entrep*" , "venture*" or "start-up"	1667 articles	Sitkis	Co-citation
7	1982-2004	SSCI (ISIWOS)	Articles	"entrep*"	3951 articles	Bibexcel	Co-citation
8	1981-2004	FER	Articles	All in period	20,184 references listed in the 960 full-length articles	-	Co-citation
9	2000-2004	SSCI (ISIWOS)	Articles	"entrep*"	733 articles	Sitkis	Co-citation
10	1972-2000	Database created for research (SSCI source)	Authors	"Entrepreneurs\$"	3003 Authors	SPSS	Co-citation/Cluster/ Individualized questionaries
11	1976-2004/1985-2004	ETP, JBV	Articles	Randomly chosen articles	276/316 articles	-	Performance
12	1976-2009/1987-2009/1992-2009	ETP, JBV, SBE	Articles	were collected manually	479/558/854 articles	Microsoft Office Excel 2003	Co-citation
13	1950-2006	Database created for research from different sources	Documents	it has been built by use of 29 sources	1,239 documents	EXCEL 2007, SPSS 16, UCInet and NetDraw	Co-citation

Article	Time frame	Data retrieval	Unit of analyses	Search Terms	Sample	Software	Main Bibliometric analysis
14	2001-2010	GoogleScholar and EconLit	Documents	manual search in various libraries	13 handbooks and 84 books+12 journals	-	Performance
15	1956-2007	SSCI	Articles	'entrepreneur*' or 'small business*' or 'small firm*' or 'emerging business*' or 'emerging firm*' or 'new venture*' or 'emerging venture*' or 'founder*'	14 388 articles	-	Citation analysis
16	2005-2010	ERD, ETP, FBR, ISBJ, JBV, JSBM, SBE (Scopus Source)	Articles	All articles	1414 articles	-	Co-citation/Citation analysis
17	2000-2007	23 journals	Journals	Articles in journals and cites	23 journals	-	Performance
18	1992-2009	SSCI (ISIWOS)	Articles	"entrepreneurship"	2667 articles	-	Performance
19	1981-2008	FER	Documents	All documents	3395 documents	-	Performance
20	origins-2006	12 handbooks	Documents	All references in pioneers and followers	2,722 references/pioneers and 87,751documents/followers	Bibexcel/pajek	Co-citation/Citation analysis
21	1981-2009/2000-2010	FER, JBV	Articles	-	1112/378 articles	-	Co-citation
22	1989-2008	ETP, JBV, SBE	Articles	collected manually SSCI	2716 articles	-	Co-citation/Citation analysis
23	1941-2013	SSCI (ISIWOS)	Articles	entrepreneurship	2167 articles	CiteSpace	Co-citation/Citation analysis
24	origins-2012	SSCI (ISIWOS)	Articles	entrepreneurship	5117 articles	CiteSpace	Co-citation

Article	Time frame	Data retrieval	Unit of analyses	Search Terms	Sample	Software	Main Bibliometric analysis
25	1985-2009	AMJ, AMR, SMJ, JOM, OS, MS, ASQ	Articles	entrepreneur, entrepreneurial, entrepreneurship, small business, emerging business, new venture, emerging venture, or founder(s) as a keyword	216 articles	-	Citation analysis
26	1990-2009	SSCI/A&HCI (ISIWOS)	Documents	strategy that was based exclusively on the truncated string 'entrep'	5029 documents	-	Bibliographic coupling and text mining
27	1996-2012	SSCI (ISIWOS)	Articles	entrepreneur	5476 articles	-	Performance
28	2004-2013	SSCI (ISIWOS)	Articles	"entrep*", "start-up"/ "startup", "new firm*"	10591 articles	-	Co-citation/Citation analysis
29	1992-2013	SSCI/SCI (ISIWOS)	Articles	entrepreneurship, entrepreneurial, and entrepreneurs	7480 articles	-	Performance
30	1980-2009	SSCI/CSSCI (ISIWOS)	Documents	"entrepreneur (s)", "entrepreneurial" and "entrepreneurship", "创业"	9,475 documents	Bibexcel/Pajek	Co-citation
31	1982-2012	ISBJ	Articles	All articles in period	660 articles	SPSS/Leximancer	Content analysis
32	1981-2010	17 Journals	Articles	entrepreneur*, entrepreneurial*, entrepreneurship*, small business, new ventures and founders.	1777 articles	Bibexcel/Ucinet	Co-citation/Citation analysis
33	1992-2011	SSCI (ISIWOS)	Articles	"family business*" or "family firm*" or "family own*" or "family control*" AND "entrepreneur*" or "venture*"	129 articles	Microsoft Access/SITKIS/UCINET/ NETDRAW	Co-citation/Co-words

Article	Time frame	Data retrieval	Unit of analyses	Search Terms	Sample	Software	Main Bibliometric analysis
34	origins-2015	WoS and Scopus	Documents	entrep*	281 documents	STIcCI.eu/Endnote	Performance
35	1962-2013	SSCI/SCI Expanded/A&HCI (ISIWOS)	Articles	"entrepreneurship theories", "entrepreneurship theory", "theories of of entrepreneurship"	124 articles	-	Co-citation/Citation analysis
36	1968-2016	SSCI (ISIWOS)	Documents	entrep*	205 documents	Scimat/WoS (Analyze Results and Creation Citation Report)	Performance
37	2002-2013	JBV, ETP, JSBM, FBR, ERD, SEJ	Articles	We manually reviewed the titles, keywords, and abstracts of articles published in the set of top management journals and identified articles that are related to subjects such as entrepreneurship, entrepreneur, small business, new venture, venture capital, opportunity, corporate venturing, start-up company, innovation, and family business.	2154 articles	-	Performance
38	2001-2017	WoS core collection (ISIWOS)	Documents	entrepreneurship and regional development	1147 documents	-	Performance
39	1990-2013	WoS core collection (ISIWOS)	Articles	entrep* Categories: Business of Management	3693 articles	VOSviewer	Co-citation
40	2016	Database created for research	Authors	-	870 entrepreneurship scholars	-	Descriptive statistics/Cluster

Annex 4. Main objectives, conclusions and limitations of the sample

Article	Main Research items	Main Conclusions	Main Limitations
1	"Reveal the social structuration of knowledge in entrepreneurship"	"The field of entrepreneurship research appears as an intricate network, where researchers and institutions are involved in a social and collective game of strategic struggles and alliances. Furthermore, this field of research appears as a largely fragmented space fraught with the traps inherent to disciplinary introversion."	"A) One loses in the possibility of applying the results obtained to the whole field of entrepreneurship. B) the research sketches a static portrait, whereas structuration of the field is dynamic. The research thus offers an ahistorical image of this structuration. C) the research masks the links between the theoretical and methodological content of the articles studied and the structuration movements it reveals. D) Finally, although co-citation analysis methods made it possible to construct the characteristic networks involved in the social structuration of the corpus studied, they alone are not enough to exhaust the sociological complexity of the corpus."
2	"This research looked at the impact of individuals and institutions on research in the field of entrepreneurship"	"It provides the first measure of the impact of entrepreneurship programs on research in entrepreneurship. The paper also provides a measure of the impact of individuals on research in the field of entrepreneurship. This paper provides an alternative to the subjective interpretations of individual external reviewers for the field of entrepreneurship."	"Editorship of journals, the publication of scholarly books, the sponsorship of research conferences, and the training of doctoral students or other activities. These contributions are excluded from this analysis. A second limitation is that this study measured contribution as the quantity and quality of articles, rather than the content of those publications. A third limitation of this study is that it is static. This paper measured the impact of scholars and institutions on entrepreneurship research at one moment in time. A fourth limitation is that the results of this study may not be predictive. Shifts in institutional affiliations of scholars can alter institutional rankings quickly."
3	"Trends and Growth Points in the field"	"The use of textual analysis software does allow clustering which, by and large, seems to accord with the expectations of those in the field"	Not indicated.
4	Legitimacy: "How is entrepreneurship emerging? Are entrepreneurship scholars obtaining increased legitimacy? Where should research be directed to build the field?"	"We find that the boundaries of the entrepreneurship field continue to be highly permeable. Accumulated fragmentalism Evidence of a growing internal culture and knowledge base, and thus a growing level of exchange internal to the entrepreneurship community"	Not indicated.
5	"Get an overview of research in Entrepreneurship" "Identify and analyze the relationships between the documents that have had the greatest impact for the construction of the knowledge base of the discipline"	"Axes of convergence: 1) the study of entrepreneurial behavior in existing organizations and their relation to the performance of the organization, also known in the academic field as "corporate entrepreneurship"; 2) the sociocultural or institutional approach and, predominantly, within this one, the study of the influence of belonging to certain ethnic groups on the creation of companies known under the theory of marginalization, 3) the psychological traits approach or identification of the psychological factors of successful entrepreneurs and 4) the economic approach to explain the entrepreneur's role in economic growth and development. "	"Number of cites, it is impossible to distinguish the intention with which they were made. The interpretation of the factors and graphs obtained is subjective" The criterion of selection of the citing sample and the division of the time horizon of analysis in three subperiods.

Article	Main Research items	Main Conclusions	Main Limitations
6	<p>"There is no widely accepted categorization of different streams of entrepreneurship research, and it is not even clear if distinct streams exist."</p> <p>"In addition, a considerable diversity in the field across countries has been noted, but there is little systematic knowledge regarding country or continent specific differences in entrepreneurship research"</p>	<p>"We identify and describe the 15 most cited dense groups representing the most central theoretical streams."</p> <p>"Our findings reveal that collaboration across universities tends to be relatively modest, although the level of co-operation varies greatly."</p>	<p>"15 Groups of references that were most commonly cited by entrepreneurship articles. There is considerable amount of more recent literature that is making a significant impact on the field. Is difficult to define the group of articles constituting "entrepreneurship" and it could be questioned whether they all belong to the field of entrepreneurship. People cite articles with varying purposes, and therefore the popularity of the groups does not necessarily represent their importance to theoretical argumentation or empirical."</p>
7	<p>"In order to determine the stage of maturation of the field of entrepreneurship"</p> <p>"Determined whether researchers have provided the foundation for systematic disciplinary advance"</p>	<p>"Entrepreneurship research has been increasingly self-reflective"</p> <p>"The increasing complexity of the research in entrepreneurship alone indicates a greater maturity in the discipline. Theoretical issues, while not previously dominant, are more pervasive as entrepreneurship attracts those in particular business subdisciplines."</p>	<p>"A cutoff for inclusion in our key periods was not constant but varied according to the number of authors that would be examined in each. Our authors are, to some extent, self-selected. That is, they had to include "entrep*" in the title, as a keyword or in the abstract. Additionally, given the multidisciplinary nature of much of this research, various authors may use the concept of entrepreneurship differently, a problem that is not just one of semantics, as studies of "small business" have shown."</p>
8	<p>"The question of entrepreneurship's maturity as a field of study (or lack thereof) remains hotly debated. Yet, evidence of this maturity in terms of conceptual convergence has rarely been explored for its own sake, and particularly in light of theoretical and empirical considerations about the evolution of scientific disciplines."</p>	<p>"Our results show that there has been convergence in entrepreneurship research over the last 25 years. The nature of this convergence has neither been stable. The field of entrepreneurship research continues to draw from a wide array of disciplines. But in addition, it also relies increasingly on scholarly discussions that are articulated within the field itself."</p>	<p>"The evidence presented above is bound by its reliance on a single source of references—articles published in FER. Investigating the various forces that drive progress in the field would demand to go beyond analysis of the most-cited works."</p>
9	<p>"A debate persists about the distinctiveness of entrepreneurship research. Entrepreneurship research is seen as fragmented and its results are considered noncumulative, handicapping the evolution of the field as a respected scholarly discipline. In this article we conduct a bibliometric analysis to shed light on these issues."</p>	<p>"Identify the 25 most central research streams in entrepreneurship. The United States represents by far the greatest source of entrepreneurship articles, other countries represent significant sources of research in specific streams."</p> <p>"This research remains highly fragmented, perhaps reflecting the "pre-paradigmatic"</p> <p>"Research findings appear to be noncumulative"</p> <p>The possibility that entrepreneurship researchers do not communicate their findings well to others outside their immediate "territory," which limits the impact of their research and its potential contributions."</p>	<p>"This article presented a brief look at 25 groups of researchers who study particular themes that were most commonly cited by entrepreneurship articles. It is difficult to define the group of articles constituting "entrepreneurship." People cite articles with different reasons, and therefore the popularity of the groups does not necessarily represent their scholarly importance to theoretical argumentation or empirical findings within the field."</p>

Article	Main Research items	Main Conclusions	Main Limitations
10	<p>"This article explores the structure of the "metafield" of entrepreneurship</p> <p>The present study is an attempt to identify some of these "fragments" of entrepreneurship research in a more formal manner, to examine their intellectual cohesion, and to assess whether linkages between intellectual contributions as evinced by literature analysis are associated with the more general academic and social networks in which these researchers are embedded."</p>	<p>"Entrepreneurship research strong social and collaborative ties are associated with the intellectual ties established by the ACA."</p> <p>"The questionnaire used in this study has directly evaluated the nature of these relationships, and it is clear from the results that there is strong evidence that closely related authors share both formal and informal communication links..."</p>	<p>"The co-citation analyst requires considerable knowledge of the specialty being examined; but even then, interpretation can be difficult for a number of reasons. This raises questions as to whether this study covers a sufficiently representative sample of entrepreneurship research, specifically nonjournal literature. Our ACA shows a static snapshot of entrepreneurship."</p>
11	<p>"To assess the past and present state of research techniques used in entrepreneurship studies. Specifically in this manuscript, our goals are to: (1) determine which quantitative data analytic techniques are considered to be important in entrepreneurship research..."</p>	<p>"In general, data analysis in entrepreneurship is becoming more sophisticated.</p> <p>Entrepreneurship researchers have increasingly utilized longitudinal designs, which are more effective in establishing causality..."</p>	<p>"We limited our examination to a random half of all studies published in ETP and JBV. We did not account for theoretical issues associated with choice of data analysis technique. Because research methods and various statistical techniques are simply tools used to test theory and address specific research questions, interpretation of these trends should be made with caution."</p>
12	<p>"The purpose of the present study is to fill this gap in entrepreneurship research literature and assess for the existence of invisible colleges within the entrepreneurship field."</p>	<p>"Our assessment that two invisible colleges exist in the field of entrepreneurship: one devoted to entrepreneurship research, per se, and associated to ETP and JBV; the other, economic-oriented, related with SBE' scope of research."</p>	<p>"Only one research area was imputed to each top cited author, which narrows down the academic scope of the researchers. Which provides a static report of entrepreneurship. Also, the subjective nature of the key element, "informal communication relations", that underlies the concept of the invisible colleges raises some concern."</p>
13	<p>"The aim of this research is to gain insights into our research behavior. The paper follows the argument by Low and MacMillan (1988) that „[a]s a body of literature develops, it is useful to stop occasionally, take inventory for the work that has been done, and identify new directions and challenges for the future"</p>	<p>"Common bibliometric laws and hypotheses have been tested and results point in the same direction: Entrepreneurship research has become a field of its own and does not belong in the disciplines any longer</p> <p>The number of internal citations has increased over the past two decades, but in total is still low..."</p>	<p>Not indicated.</p>
14	<p>"Our goals in this paper are to provide an overview of the research themes on entrepreneurship and identify possible gaps to which we might contribute to fulfill, setting the grounds for future research..."</p>	<p>"Our analysis shows that entrepreneurship education is still a poorly explored dimension of entrepreneurship literature despite being a new hot topic.</p> <p>We observed that in general, entrepreneurship education studies are centred on US Universities, and, to a lesser extent, on some European cases."</p>	<p>Not indicated.</p>
15	<p>"(1) Analyze the development of research communities and knowledge platforms within the field of entrepreneurship research, and (2) discuss the possibilities of creating a cross-disciplinary and theory-driven entrepreneurship research."</p>	<p>"Based on our findings we conclude that the strong disciplinary boundaries may constitute an obstacle to the importation of concepts and theories from mainstream disciplines and the creation of cross-disciplinary research within the field."</p>	<p>"In terms of precision or relevance, the search will naturally identify a certain number of papers that do not belong to the study of entrepreneurship. Another limitation is that Web of Science does not include books as citing documents; however it includes cited books. We have no indication so far that the books in the field have different citation behavior than the articles in the field."</p>

Article	Main Research items	Main Conclusions	Main Limitations
16	"To delimit the 'relational environment' of the field of entrepreneurship and to analyze the existence and characterization of (in) visible college(s) based on a theoretically well-grounded framework, thus offering a comprehensive and up-to-date empirical analysis of entrepreneurship research."	<p>"Signs of fragmentation and specialization, reflected in the emergency of a number of subject specialties, namely those related with family businesses and innovation, technology and policy."</p> <p>"A growing tendency within the field to cease to be a mere sub-discipline of management or economics was observed, revealing its greater legitimacy as a valid academic research."</p> <p>"A reasonably dense network of informal relations is evident."</p> <p>"Highly cited entrepreneurship research is concentrated in very few countries (US, UK, Canada, The Netherlands, Sweden and Australia), with indisputable US hegemony."</p> <p>Zahra, Gartner, Reynolds, Covin, Busenitz, Hitt, and Westhead—perform a truly critical gatekeeper and bridging role within the field</p>	Not indicated.
17	"We advance a citation-based model to determine, at least in part, the relative influences of entrepreneurship journals."	"Our analysis with the influence model found that the journals with the greatest influence on current entrepreneurship research are, alphabetically, ASQ, ETP, JBV, OSC, and SMJ."	"First, there is the issue of which journals to include in constructing the dataset. Ideally, the journals studied should include all of those devoted to entrepreneurship research. Some are missing from our study. Which of their articles should be treated as entrepreneurship research and which should be dropped from consideration? Our analysis examines references from only one journal year (2008) to articles published over the prior 8 years (2000–2007)."
18	"This paper aims on research entrepreneurship output performance from 1992 to 2009."	"Points on research performance throughout the period from 1992 to 2009. There were a total of 656 journals listed in the 93 subject category. Subject categories for mainstream research on entrepreneurship included seven domains of business, management, economics, planning and development, sociology, environment studies and geography, while increasing attention was invested of the research entrepreneurship field in the 21st century. The USA notably contributed the most independent and..."	Not indicated.
19	"This paper examines the growth of academic research in entrepreneurship through the lens of <i>Frontiers of Entrepreneurship Research</i> "	"The results show that entrepreneurship is a highly collaborative, interdisciplinary field with an increasingly international focus. The results offer an understanding of the demographic, institutional, and topical trends within the field."	Not indicated.

Article	Main Research items	Main Conclusions	Main Limitations
20	"In order to develop our knowledge of the phenomenon of entrepreneurship..."	"A group of core knowledge producers seem to emerge over time. Still the field relies on old theoretical frameworks imported from mainstream disciplines. However, over the last decade sign could be seen of a stronger knowledge-base of its own in entrepreneurship research is emerging. Our analysis of the knowledge users in entrepreneurship research shows that the field is heavily anchored in „business“ and „management“. On the other hand, the core works in entrepreneurship are included in a large number of studies within many different fields of research – creating a „long tail“ of users..."	"We have to bear in mind that bibliometric analysis is based on the assumption that research is essentially cumulative – new research is built on and cites earlier high quality foundations – i.e. a „normal science approach“ (Kuhn, 1970), but we know that this is not the only way to communicate and organize research, particularly in new and evolving fields, for example, fields that are organized and communicated through „negotiations“ between actors (Knorr Cetina, 1999; Åström and Sándor, 2009). Second, it can also be argued that it is sometimes difficult to know how citations are used in articles, for example, there might be a bias in favour of „popular“ authors, and citations can be used in a negative rather than a confirmative way. Finally, concerns can be raised regarding the databases used for bibliometric analysis (Watkins, 2005). Most often bibliometric analysis is based on generally available databases, such as the Social Science Citation Index (SSCI) using Web of Science. However, although the SSCI is a great resource for citation analysis, it has some limitations. For example, the database is biased in favour of journals of US origin, books are only covered to a limited extent (even though important works in the social sciences tend to be published in books) as are the total number of available journals in many fields of research. Thus, generally available databases have some limitations when it comes to new and evolving fields of research such as entrepreneurship."
21	"Evaluate existing entrepreneurship research to learn whether it has kept pace with the development of the entrepreneurship paradigm."	"The results indicate that entrepreneurship research published in these forums is characterized by varied themes that are not necessarily connected. Rather, they reflect the disciplinary training and lens of their authors; and considerable dynamism and change in key research themes over time."	"Evidence presented above is bound by its reliance on two sources of articles, articles published in FER and JBV. The validity of the findings would be increased if conducted systematic comparisons with other sources of entrepreneurship articles."
22	"In this study, we perform a two-stage analysis to identify invisible colleges in the field of entrepreneurship using three core journals: Entrepreneurship Theory and Practice (ETP); Journal of Business Venturing (JBV), and Small Business Economics (SBE). in order to map the informal links between the most-cited authors..."	"Based on over 90 thousand citations from these 3 journals two invisible colleges emerged: ETP and JBV have similar intellectual groundings, targeting especially corporate and entrepreneurship venturing, while SBE gives emphasis to more economics-oriented research, namely innovation, growth and policy, and industrial dynamics."	"First, only one research area was imputed to each top cited author, which narrows down the academic scope of the researchers. Second, the analysis although involving a rather long time span is quite static. Third, the subjective nature of the key element, „informal communication relations“, underlying the concept of invisible colleges, raises some concern."
23	"This study utilized the visual analytic method to depict literature characteristics of entrepreneurship research, including publication countries, subject area, most cited references and so on."	"(1) The research in entrepreneurship is increasing rapidly in this century. (2) This study listed the key references (most co-citation references) to show the overall picture in entrepreneurship research."	Not indicated.

Article	Main Research items	Main Conclusions	Main Limitations
24	"The aim of this article is to develop a method combining calculation, visualization and intuitive analysis, which will help social scientists to study the history of a theory in a particular discipline."	"Using an alternative method, our map shows the three prominent researchers in the entrepreneurship field as well as three stages: the first from approximately 1920 to 1960, the second from 1960 to 2000, and the third beginning in 2000."	"One obvious drawback of this work is that no direct evidence is given to justify the methodological choices. In fact, according to Chen ⁷ , the validity of such studies may be obtained through comments from experts in the field."
25	"In order to identify shifts and trends in the entrepreneurship literature over the past 25 years, we conduct a bibliometric study involving new data from the 2000–2009."	"Our findings indicate that entrepreneurship articles now have a significant presence in the mainline "A" journals. Furthermore, we contend that this presence signals legitimacy and, more importantly, a growing exchange among researchers studying entrepreneurship. The area of entrepreneurial opportunities and nascent ventures is showing signs of growth and in our view represents an area where entrepreneurship is contributing back to the broader research conversation in organizational studies."	Not indicated.
26	"This paper seeks to map out the emergence and evolution of entrepreneurship as an independent field in the social science literature."	"Our analysis indicates that entrepreneurship has grown steadily during the 1990's but has truly emerged as a legitimate academic discipline in the latter part of the 00's. The field has been dominated by researchers from Anglo-Saxon countries over the past twenty years, with particularly strong representations from the US, UK, and Canada. The results from our structural analysis, which is based on a core document approach, point to five large knowledge clusters and further 16 sub-clusters. We characterize the clusters from their cognitive structure and assess the strength of the relationships between these clusters."	Not indicated.
27	"An effort to gauge trends in and contributions to the broad field of "entrepreneur/ entrepreneurship,"	"The authors conclude that scholars are more likely to conduct research on entrepreneurship when more developed countries are present in a particular area. Second, a number of major journals published the most number of entrepreneurship research articles. These journals include the Journal of Business Venturing and Small Business Economics Third, several main contributors have contributed to the field from 1996 to June 2012, and their scholarship has had a significant influence on those who classify themselves as "entrepreneur" researchers. An up-trend slope is noted, which indicates that the influence of entrepreneurship is still on the rise."	"This work does not consider non-SCI/SSCI journals. Articles not cited in the ISI WOS database and published before 1996 were not considered in this study. The reported citation counts in this study might underestimate the total number of citations of an article in the academic literature. The method by which we ranked the most cited articles or calculated the credit of cited times for authors may be inappropriate."

Article	Main Research items	Main Conclusions	Main Limitations
28	"Aims to understand the international picture of entrepreneurship research by focusing on the US, Europe and emerging economies around East Asia. We attempt to address the following questions: What characterizes entrepreneurship research in different regions? What are the similarities and differences among entrepreneurship research in different regions? How can the similarities and differences be explained?"	<p>"We offer evidence that in the process of internationalization of entrepreneurship field, knowledge diffusion has contributed substantially to homogeneity in all the examined regions as common interests in certain research topics can be identified.</p> <p>It should be pointed out that most of these common focuses tend to be theoretical-driven topics</p> <p>Differences in contexts slowed the move towards convergence and enriched entrepreneurship knowledge."</p>	"However, bibliometric analysis is not without limitations. For example, we have to bear in mind that bibliometric analysis is based on the assumption that research is essentially cumulative – new research is built on and cites earlier high quality foundations – i.e. a "normal science approach" (Kuhn, 1970). However, we know that this is not the only way to communicate and organize research, particularly in new and evolving fields (Knorr Cetina, 1999). In addition, there are concerns about the databases typically used for bibliometric analysis (Watkins, 2005). Although the SSCI database is a wonderful resource for citation analysis, it has some limitations with regards, for example, the database consists primarily of scholarly journals (less of books and conference papers), and the coverage of journals varies greatly depending on the research field, the language and origin of the publication, and the age of the journals. Thus, citation databases such as SSCI have limitations when it comes to relatively new and evolving research fields such as entrepreneurship."
29	"This study aim at entrepreneurship research dynamics in 1992-2013."	"The results conclude four issues and nineteen sub-themes these issues included as entrepreneur, innovative, corporative, and business operations these is core issues of entrepreneurship."	Not indicated.
30	"The increasing internationalization of the field also raises three major questions: How has the field of entrepreneurship developed in different regions such as the USA, Europe and not least China? What are the similarities and differences in the development process in different regions? And what are the reasons for these similarities and differences?"	<p>"It appears that the development of entrepreneurship as a research field in China has followed a different path compared to the USA and Europe, where "contextual force" was the main driver in the early stage, but during the development process the external influence became weaker and that of "internal force" becomes stronger. In China, the main driver of entrepreneurship research is "internal force" while the "contextual force" has been downplayed. Similarities and differences in the development process across regions have also been identified."</p>	"SSCI and CSSCI, which are utilized in this study, are criticized for their little coverage of books and conference proceedings and not indexing journals in languages other than English. Citations are biased in favour of certain authors, namely those "popular" authors who enjoy a "halo effect", authors with "older" publications and those whose articles are methodological or are in established fields with many researchers. Besides, in this research, if one article is co-authored by US and European authors, this article would be included in both US and European datasets. In the final US dataset, 10.55 % was co-authored and in European dataset, 12.68 % was co-authored. Although the number is small, still, to some extent that this kind of articles cannot purely reflect US or European perspective. Last but not least, we have to admit that the resulting maps are objective, but our interpretation of these maps is subjective."

Article	Main Research items	Main Conclusions	Main Limitations
31	"This article analyses the evolution of the small business management and entrepreneurship fields as reflected in articles published in its premier journal, the International Small Business Journal. It investigates the evolution of the fields."	"While small business management has remained the main focus of the journal, there has been a significant growth in the number of articles focusing specifically on entrepreneurship. Also identified in this analysis are the rise of theoretical studies and the relative decline of descriptive work. Parallel to a clear improvement in the rigour of the articles published, the field of small business and entrepreneurship has relied on a multidisciplinary foundation which offers a diverse and multifaceted engagement. Despite this increasing diversity, it appears that small business and entrepreneurship have unique characteristics that distinguish this field from the broader economics and or management discipline."	"This study has a number of limitations. While we feel that the analysis presented here has followed a robust method, the large number of articles published in the last 30 years of the ISBJ naturally means that not all the concepts present in the articles themselves could be discussed. Analysing full articles undoubtedly would have elevated some terms that do not feature in this study's counts and maps."
32	"In this paper we conduct a large scale survey of the literature beyond a subjective perspective on what entrepreneurship research has comprised. We investigate what have been the intellectual structure and the knowledge base underlying published entrepreneurship research."	"Results provide evidence of the increasing interest in entrepreneurship as a field of study, but also of its interdisciplinary nature, with infusions of concepts and theories from a wide array of management disciplines."	"ISI Web of Knowledge but while ISI is a good resource, it comprises only a small subset of all existing journals and leaves out other source documents such as books and dissertations. We only included a subset of all journals in ISI, which further limits the scope of the analysis especially in an emerging field such as entrepreneurship. An additional limitation is that ISI includes almost exclusively articles written in English which may generate some bias. Other limitation pertains to the use of citation and co-citation data. Relying on citation and co-citation data is well established in bibliometric studies to scrutinize the intellectual structure and knowledge base of a field, but it may tend to favor older, more established, works over new contributions. Some older works have gained the status of "mandatory" references and may be cited for ceremonial reasons. Co-citation metrics are used to infer conceptual proximity but analyzing the ties says little about the context."
33	"Carries out a comprehensive and systematic review of academic research on entrepreneurship in family firms applying bibliometric indicators. Review the literature published..."	"Is a relatively new area of study We have identified two periods: the first (1992-2002) with low output and a second (2003-present) of clear growth, coinciding with the start of the corporate entrepreneurship cluster in the field of entrepreneurship. The analysis verifies compliance with Lotka's Law, which means that there is a higher concentration of items in few productive authors compared with other disciplines. The most productive authors and journals do not necessarily coincide with those most cited. The most notable result in this sense is the fact that this field is highly interconnected with high co-citation between authors. The field is structured around widely developed themes—Risk Taking and Entrepreneurship—and underdeveloped peripheral themes—Gender, Governance and Family Firm—without clusters in either peripheral or emerging quadrants."	Not indicated.

Article	Main Research items	Main Conclusions	Main Limitations
34	"Updating and analysing the current state of scientific production in the field of entrepreneurship..."	"The results are rankings of journals and authors based on the weights given by both databases' H-index for citation frequency."	"Many of this study's limitations are inherent in the specific problems present in bibliometric analyses in general. These can include the motivations behind the citations on which analyses are based, since many citations are not always due to the quality of the cited texts but instead to other aspects such as previous familiarity with the cited authors. Others issues in this study can be considered both weaknesses or strengths, since different databases were used that, while they contribute texts not included in other studies thus far, also incorporate citation patterns calculated in distinct ways, which undoubtedly affects the results."
35	"Seeks to understand the scientific structure of entrepreneurship research and how entrepreneurship scholarship is organized. Cocitation data and quantitative approach were used to identify scientific publications, intellectual structures, and research trends interrelated with theories of innovative entrepreneurship."	"Based on our bibliometric and respective literature review which maintains that this field contains a diverse range of concepts, six underlying theories of entrepreneurship could be discovered. This demonstrates that entrepreneurial-related phenomena and everything encapsulated therein are far from attaining a consensus. Despite this, these "sub-theories" clearly display strong interconnections with the market, companies, and now even historical concepts such as innovation and change, verifying the plurality and multi-disciplinarity of the field. The six underlying theories that our study identified are indicative of the heterogeneity that the field of entrepreneurship presents."	"So careful consideration should be given to the ways in which the data were obtained (the data were collected from citation and co-citations from the ISI Web of Science database and involved articles published in journals exclusively dealing with the categories of management, business, and economics). This should be kept in mind as an important limitation. After all, if we had used a different database and/or included books, proceedings, and other published material, the results could have been different."
36	"Will try to take the analysis of the field of entrepreneurship to a deeper level, visualizing the characteristics of the classics of entrepreneurship as well as the knowledge base on which they are founded..."	"Following the scientific method, the sources were isolated which made it possible to determine the works that might constitute the discipline and, more importantly, to understand which ones have a higher likelihood of showing those paradigms required to do so."	"As for the limitations of this study, in large part they are the result of the limitations of the chosen database. On the one hand, there is no specific category available at Web of Science where studies in entrepreneurship are listed. This means that a combination of categories was required in order to find subject-related knowledge. The results depended on a correct normalisation of the units which were the subject of the study. At the same time it is necessary to keep in mind the time lag between the publication of an article and the moment when its influence can be felt in the form of citations. On the other hand the search strategy based on the generic root "entrep*" can leave out terms related to the discipline such as intrapreneurship, small firms, small enterprises, entry firms, etc. risk of including highly cited texts that are not strictly in the area, given the multidisciplinary nature of the phenomenon. Finally, a considerable limitation is the fact that it is impossible to determine how the quantity of citations received correlates to a document's quality or usefulness. The loss in effectiveness of this measure is largely the result of bad practices, which can reach extremes where certain authors follow deliberate strategies to make sure their studies are published. Citing other articles published in the same journal where they intend to publish, or citing their own work are just two examples of such practices."

Article	Main Research items	Main Conclusions	Main Limitations
37	<p>"To understand the recent development of entrepreneurship and its correspondence with distinguished theories, we use a citation-based analysis to examine underlying forces behind entrepreneurship research, such as the method of scientific research, contributing institutions and scholars, and global forces.</p> <p>We have three specific research objectives. First, we investigate the effect of geographic diversity, international collaboration, leading scholars, and leading institutions on the quality of entrepreneurship research, which is measured by the number of citations per article. Second, we identify the contributing institution and scholars in entrepreneurship research by documenting the institutional and scholar rankings of entrepreneurship research based on the citations in articles published in the leading entrepreneurship journals. In addition, we provide an exploratory analysis on how an institution is able to move forward its entrepreneurship program. Third, we compare empirical and conceptual research in entrepreneurship in the context of their impact on the research quality."</p>	<p>"Contributing Force: Collaboration, Scholars, and Institutions. We show that when an article has a top scholar or has an author affiliated with a top institution, it is a better quality piece of research. Our measures of top scholars or top institutions capture the impact of resource dependence on entrepreneurship research.</p> <p>Contributing Force: Institutions and Programs. this study provides an exploratory analysis on how an entrepreneurship program can become notable and increase its rating. Our exploratory regression results suggest that an entrepreneurship Ph.D. program, an entrepreneurship bachelor program, and an entrepreneurship center can improve a program's research quality.</p> <p>Contributing Force: Leading Scholars</p> <p>This study further provides evidence that leading entrepreneurship authors are dispersed in a wide range of institutions, and few institutions have affiliation of more than one leading author. The absence of scholars clustered in selected star programs presents a unique opportunity for a wider range of institutions to develop leadership and specialty in entrepreneurship research. Leading scholars, with little doubt, are the driving force for their institutions to be ranked highly in entrepreneurship research."</p>	<p>"First, we examine entrepreneurship publications in a set of primarily entrepreneurship journals, and our coverage of potential outlets may not be comprehensive. Some researchers may have published their works in leading journals of other disciplines, such as accounting, finance, or marketing. We did not account for these research works. This study uses a top-journal approach to capture the quality of publications, which assumes the remaining entrepreneurship journals carry a zero weight. Third, this study uses citation count in Google Scholar to measure the quality of an article while others may choose other citation measures such as Social Science Citation Index and Scopus or use opinion surveys to reveal research quality."</p>
38	<p>"The scope of this paper is to analyze the scientific literature on entrepreneurship and its influences on regional development and to help researchers and practitioners develop responses to the current socio-spatial and economic crisis."</p>	<p>"Through the bibliometric analysis we found out that entrepreneurship and regional development are important research topics..."</p>	<p>"The limits of this paper consists mainly in the restricted access to scientific databases and implicitly the incapacity to choose from a more diverse list of scientific articles."</p>
39	<p>"To study the evolution of the field of entrepreneurship..."</p>	<p>"The analyses revealed patterns of convergence and divergence and the diversity of topics, specialization, and interdisciplinary engagement in entrepreneurship research, thus offering the latest insights on the state of the art of the field."</p>	<p>Not indicated.</p>
40	<p>"How can we understand the evolution and success of entrepreneurship as a scholarly field? In particular, we focus on the social structure of entrepreneurship scholars to explain (1) how they are becoming integrated into larger scholarly communities and (2) how they differ from the way scholars integrate within the field of innovation studies."</p>	<p>"A scholarly community embedded in the Entrepreneurship Conference clusters, linked to the "ICSB sphere". This rather eclectic group of scholars have a diversity of approaches, theoretical frameworks, as well as different definitions of what constitutes entrepreneurial activities (see e.g., Audretsch et al., 2015); and (2) a scholarly community related to the Entrepreneurship Journals and Entrepreneurship Economics clusters, characterized by a stronger domain-orientation</p> <p>The relationship between innovation and entrepreneurship is complicated."</p>	<p>"The representativeness of the database is a critical issue. As we have no information about the population of entrepreneurship scholars around the world, we cannot assess the representativeness of the database. When creating our database we were aware of the problem and for that reason used a broad range of international conferences to compile the data. However, the fact that we have used conference participant lists to identify our respondents might in itself potentially bias our results. In addition, there may be country biases in the results. We tried to reach scholars who identify themselves as entrepreneurship scholars. However, in countries with a strong theoretical disciplinary focus (compared to a phenomena-driven field such as entrepreneurship), as well as countries in Asia, Africa and South America where entrepreneurship has not yet become an established and legitimate field of research, scholars might place themselves within existing disciplinary contexts and not identify themselves with entrepreneurship."</p>