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Additional Information

Crowdfunding: A Bibliometric Analysis

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Crowdfunding; Bibliometrics; network; investment.

Abstract

This paper presents a quantitative vision of the study of crowdfunding, through a bibliometric analysis of the most relevant publications. The main goal is to determine whether crowdfunding is really a subject of increasing interest, and to identify the most productive and influential sources of its scientific research. Data were collected from the general Web of Science, one of the most complete and prestigious databases. We found that the USA is where crowdfunding is most studied. The two most active authors (Brooks AC and Andreoni J) are also in the USA. Regarding the temporal evolution of publications and citations, exponential growth was observed from 2010, which together with the low numbers of citations and publications, highlight the youth of crowdfunding as a subject of study, and the high potential it has for future research. Finally, a compilation of the most relevant articles was made in

terms of the number of citations. This is the basis for starting new studies that delve deeper into the theme. With the results obtained, any researcher interested in the subject can easily analyze the most relevant articles, and find the studies of the authors, entities, and countries with the greatest influence on the subject.

Introduction

In the current competitive environment, the search for financing for entrepreneurial and innovative projects increasingly requires more innovative and creative solutions. Among these, crowdfunding is one of the most modern with a markedly increasing influence (Abu Amuna, 2019). The modern economic environment is characterized by strong diversification and globalization, which means that the search for financing sources extends beyond borders and requires a good knowledge of these sources. The current study aims to highlight the relevance of crowdfunding in the scientific research environment, and to identify the most relevant and influential sources.

Ordanini *et al.* (2011) define Crowdfunding as the collective effort by consumers who network and pool their money together, usually via internet, in order to invest in and support efforts initiated by other people or organizations. This is an emerging phenomenon that is contributing to extending the consumers role in investment. Kirby and Worner (2014) also define crowdfunding as “an umbrella term describing the use of small amounts of money, obtained from a large number of individuals or organizations to fund a project, a business or personal loan, and other needs through an online web-based platform”, and define four subcategories: Donation crowdfunding, reward crowdfunding, peer-to-peer lending and equity crowdfunding.

The present bibliometric study demonstrates that crowdfunding is indeed a concept whose youth means that it has not yet been studied or developed in depth, but that it has a very promising future as a subject of study and as a financing model. Although crowdfunding is still a new economic phenomenon, it is already one of the fastest growing economic forms (Hemer, 2011). This new form of financing is gaining relevance as a new economic engine for growth and employment. Its potential to mobilize resources through the Internet is enormous. In countries in recession, it is becoming a viable instrument to promote economic activity, labor market integration and social inclusion. However, there are also important limitations in its expansion, mostly related to the training and professional preparation necessary to administer the networks, the absence of specific legislation to protect the ideas of the creators, the investment of the funders and the predominance of small projects that could condemn crowdfunding to a kind of economic marginality (Ramos *et al.*, 2013).

In an attempt to determine the main contributions of crowdfunding, Steinber and De Maria (2012) highlight why this model is so successful:

- Total control of the idea and its application is in the hands of its creators;
- The funded projects continue to belong 100% to their creators;
- It can test the popularity and possible success of a project through prototypes that users will value in anticipation or reject its usefulness and validity;
- If the product is in close harmony with its audience, it may well exceed its financing objective;
- If a project is not successful, the creators do not waste money, only time, and have the possibility to start the project again with improvements and a new campaign;
- Pre-sale is also a distinctive and positive feature associated with Crowdfunding;
- Crowdfunding mitigates risks and obtains capital that can be applied directly to production and marketing costs;

- Project managers often receive helpful tips and ideas from funders. On the other hand, the sponsors also become part of the marketing team, helping to boost the project (Nguyen, Cox and Rich, 2019).

Another feature that gives it a high interest value is that Crowdfunding is a new financing system with a multitude of new and modern applications, for which it is nourished in turn by the development of modern information management systems (Gil-Gómez *et al.*, 2010; Nguyen, Cox and Rich, 2019) and the new technologies of digital identification of users that allow citizens to access cross-border services, including crowdfunding financial services (Guerola-Navarro *et al.*, 2019). Advances in the development of such information systems (Oltra-Badenes *et al.*, 2019a; Oltra-Badenes *et al.*, 2019b) have contributed to the growing applicability of such modern financing methods. The literature about social network analysis gives a very good idea of how the expansion and generalization of the use of social networks (Scott, 1988; Wasserman and Faust, 1994; Kim and Hastak, 2018) has favored and can be the springboard for this new financing tool as it becomes a trend and has good expectations of growth and viability.

The increasing volume of entrepreneurship projects and the need for capital by entrepreneurs has found a favorable moment in the history of technological advances, such as high-speed internet and the creation of peer-to-peer platforms (P2P). These permit the exchange of information and thanks to the advances in Financial Technology (FinTech), it is now possible to finance without borders and between strangers through an open call (Martínez-Climent, Zorio-Grima and Ribeiro-Soriano, 2018; Zhang *et al.*, 2018; Pierrakis, 2019; Yang, Bi and Liu, 2020).

Considering the types of crowdfunding that have been identified, we can name peer-to-peer lending and equity crowdfunding (P2P and EC) and crowdfunding without financial returns (Jancenelle and Javalgi, 2018; Miller, Seahill and Warren, 2019; Pierrakis, 2019; Yang, Bi and Liu, 2020). In addition, digital crowdfunding platforms are classified into three types: a) intrinsic motivation to support the project subject to resources; b) without financial returns and c) those with financial returns (Martínez-Climent, Zorio-Grima and Ribeiro-Soriano, 2018; Pierrakis, 2019).

The goal of the present bibliometric study is to assess the relative importance of crowdfunding in the field of scientific research, the result of its expansion as a source of project financing, and its ability to attract funds for entrepreneurs and emerging businesses. In the following sections, a review of the already published literature on this topic is carried out, and the study method is described, as well as the results and conclusions.

Literature Review

Bibliometric analysis studies and classifies bibliographic material quantitatively. In recent years, assessing “the state of the art” of a scientific discipline has become very popular, chiefly motivated by the development of computers and the Internet (Merigó and Yang, 2017; Vicedo *et al.*, 2018; Zhang *et al.*, 2018; Yang, Bi and Liu, 2020; Guerola-Navarro *et al.*, 2020). Merigó and Yang (2017) state that the main advantage of bibliometrics is that it provides a general picture of a research area, which is very useful in identifying the most influential research and identifying the main trends over time.

There are a lot of disciplines where bibliometrics has been used to create a picture of the current state of a multitude of research subjects. There are many published studies for such a novel research topic, as it is one of the most modern funding systems. Martínez-Climent *et al.* (2018) focus specifically on financial return crowdfunding aiming to study crowdfunding as a financial instrument for companies.

Current trends and future prospects for crowdfunding were studied by Zhang *et al.* (2018). They take crowdfunding literature as the research object, using CiteSpace to map, describe and count the related keywords and cited references in the target domain. Another relevant point about crowdfunding is the recent interest in the University field, being the object of study in several doctoral thesis, especially in Italy where there are two recent studies (Scaldferrri, 2018; Siliprandi, 2018, Zhang *et al.*, 2018; Miller, Seahill and Warren, 2019; Pierrakis, 2019; Yang, Bi and Liu, 2020). Both studies of publications on crowdfunding used a bibliometric point of view, but with different scopes, tools and methodologies to the ones we use in our study.

Methodology

The bibliometric study of Crowdfunding aims to assess where the most active and influential focus of research on this subject is. This is based on the use of the number of publications, the number of citations, and the h-index. Regarding the categorization of impact values, this study considers them for authors, institutions, and countries.

Podsakoff *et al.* (2008) consider that, despite the limitations, the values can be categorized according to the number of publications to determine the productivity of the authors, institutions, and countries. Similarly, the number of citations is considered as an indicator of their influence. The third index used is the h-index, which combines the number of citations with the number of publications (Hirsch, 2005). Finally, the five-year Impact Factor is considered to determine the relevance of the publication.

The structure of the bibliometric study follows the following scheme:

1. The choice of the subject under study, the time span under study, and the keywords that define the subject in all its length, generality, and particularities
2. The choice of the database in which the literature to be analyzed, classified, and quantified will be empirically verified based on its productivity (number of publications) and its influence (number of citations)
3. Obtaining publications that meet the chosen criteria
4. Classification of the results according to the criteria set by the bibliometric methodology recognized in the scientific research environment
5. Definition of the conclusions in terms of the identification of the most productive focuses (with the highest number of publications) and most influence (with the highest number of citations)

The current study obtains raw data from the Web of Science (WOS) database, owned by Thomson and Reuters. It is one of the most recognized databases worldwide in terms of scientific publications, both in number of publications and in number of citations and impact indices. Giving a unit to each author, institution, journal and country, for each publication

registered in the WOS, this paper aims to give an overview of the most productive and influential authors, institutions, and countries in our field of study.

Since our study focuses on Crowdfunding, this will be the search criteria that will be used in the "**Web of Science Core Collection**" database included in the **Web of Science**. As for the time criterion, the entire range available from the beginning of time to the year 2018 is considered to be closed (to avoid incomplete years and articles pending publication). We found **722** results using the string search "**TOPIC: (crowd funding)**" in the Web of Science for the "**Timespan: 1900-2018**" and the Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC.

The types of publication taken into account were Articles, Reviews, and Letters, using the refine option "**DOCUMENT TYPES: (ARTICLE OR REVIEW OR LETTER)**", a total of **521** results were thus obtained.

As this study aims to analyze the global historical of publications regarding Crowdfunding, it is not considered appropriate to refine results by eliminating the categories proposed by the WOS. In any case, the difference between the first category "Economics" with 158 publications is significant compared to the following "Management" with 50, Business Finance with 42, Business with 40, and the rest with between 1 and 21 publications.

Results

The results of the study of the most influential research sources are presented, depending on the number of publications and the number of citations. The intention is to determine which are the most productive (articles, journals, authors, entities and countries) research focuses (with the largest number of publications) and influential (with the highest number of citations).

a) Publishing journals

Analyzing the Journals in which the topic "crowdfunding" was published and looking at the WOS statistical data on their publication count and citation count, Table 1 was prepared.

Table 1. The 15 most Influential Journals on Crowdfunding

Rank	Name	h	TC	TP	TC/TP	>100	>50	>25	>10	IF (2018)	5-IF
1	JOURNAL OF PUBLIC ECONOMICS	9	416	13	32,00	1	4	5	7	1.773	2.938
2	NONPROFIT AND	5	173	7	24,71	0	1	3	5	1.925	2.901

	VOLUNTARY SECTOR QUARTERLY										
3	RESEARCH POLICY	6	389	7	55,57	2	3	4	5	5.425	7.352
4	ACADEMIC EMERGENCY MEDICINE	5	100	5	20,00	0	0	1	4	2.963	3.389
5	APPLIED ECONOMICS	3	17	5	3,40	0	0	0	0	0.968	1.095
6	MANAGEMENT SCIENCE	5	121	5	24,20	0	1	1	3	4.219	5.555
7	BUSINESS HORIZONS	4	123	4	30,75	0	1	1	3	2.828	3.436
8	DECISION SUPPORT SYSTEMS	3	81	4	20,25	0	0	1	3	3.847	4.903
9	HEALTH AFFAIRS	3	101	4	25,25	0	0	2	2	5.711	6.081
10	INTERNATIONAL PERSPECTIVES ON CROWDFUNDING POSITIVE NORMATIVE AND CRITICAL THEORY	1	1	4	0,25	0	0	0	0	-	-
11	JOURNAL OF BUSINESS VENTURING	4	282	4	70,50	2	2	3	3	6.333	10.79
12	SMALL BUSINESS ECONOMICS	3	50	4	12,50	0	0	1	2	3.555	4.452
13	SOUTHERN ECONOMIC JOURNAL	2	35	4	8,75	0	0	0	2	0.828	1.025
14	TRANSPORTATION RESEARCH RECORD	1	5	4	1,25	0	0	0	0	0.748	0.956
15	VENTURE CAPITAL	2	26	4	6,50	0	0	1	1	-	-

Abbreviations: R = Rank; Name = Name of the Journal or Source Title; h = h-index; TC = Total Citations; TP = Total Papers; TC/TP = ratio total Citations per Published Paper; >100, >50, >25, >10 = number of papers with more than 100, 50, 25, 10 citations; IF = Impact Factor 2018; 5-IF = five-year Impact Factor 2018.

It is clear that "JOURNAL OF PUBLIC ECONOMICS" was the most productive journal in the area of "crowdfunding" until 2018, with a total of 13 publications. This journal also has the highest h-index (9), with a great difference to the rest of the journals. The rest of the journals have half or even less) publications than the first in the rank, with a large number of journals that only published 4 articles.

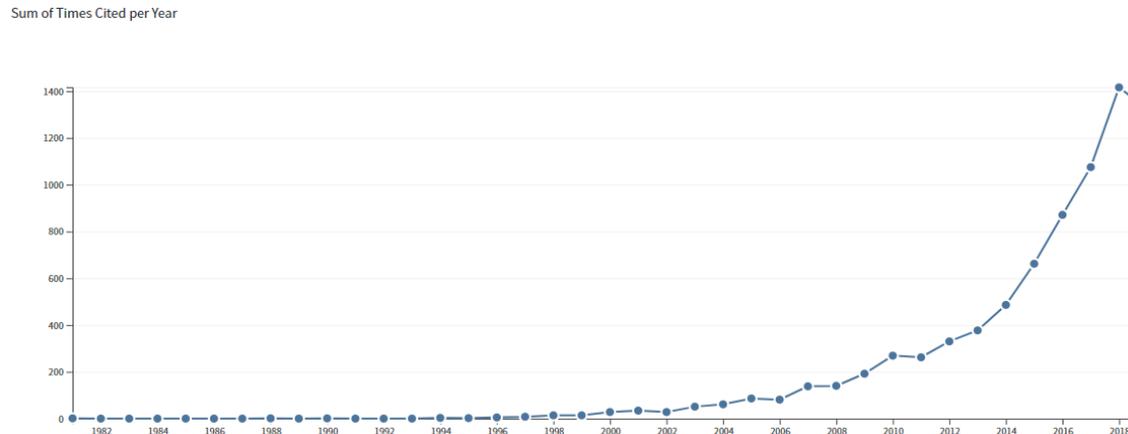
If we look at the number of citations, the first in the rank is again "JOURNAL OF PUBLIC ECONOMICS", followed closely by "RESEARCH POLICY", and followed somewhat further behind by "JOURNAL OF BUSINESS VENTURING". Therefore, these three journals can be considered to be the most influential. There are four additional columns that show how many articles in each journal had more than 100, 50, 25, and 10 citations; the results obtained are a result of the youth of the subject within the scope of research. The last two columns show the Impact Factor of each Journal in 2018, and as a more comprehensive measure the Impact Factor of five years, factors that show the relative importance of each journal in the field of research.

b) Evolution of published articles

After the first analyzes on the productivity and influence of journals in the area of crowdfunding, it is clear that the number of publications and citations is low and far from the

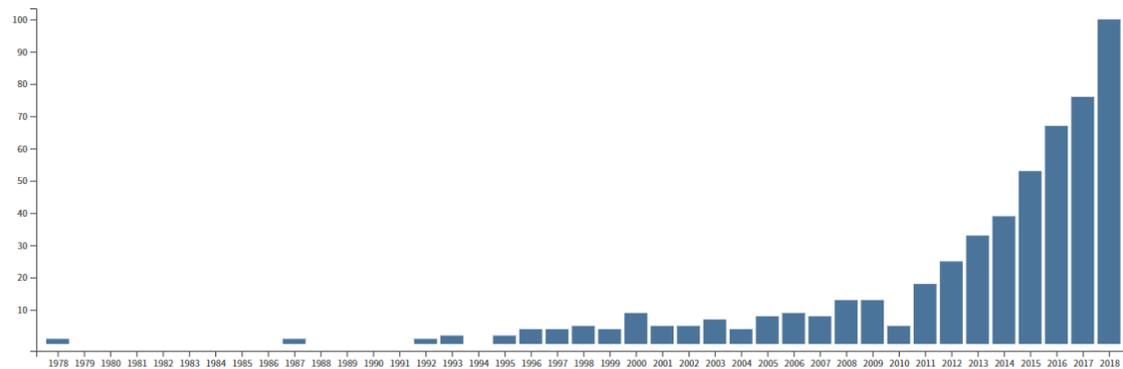
values that bibliometric studies on other topics show. A graphic study was then elaborated to verify the temporal evolution of the publications and citations. In Figure 1 we can see the annual number of citations on crowdfunding, and in Figure 2 the annual number of publications.

Figure 1. Number of annual citations in Crowdfunding in WOS



The first conclusion we obtain is that research interest in the topic "crowdfunding" has been increasing since 1982 (with its first citation), taking off from 2004 (with 61 citations in 2004) and with exponential growth from 2010 (with 269 citations) until reaching 1416 annual citations in 2018. Figure 2 on the number of annual publications, shows that the growing interest in the subject of study is verified, with a very timid beginning until 1995, a stage of slight growth (up to 13 publications in 2008 and 2009), a gentle takeoff until 18 publications in 2011, and a definitive exponential takeoff with 100 annual publications in 2018.

Figure 1. Number of Annual publications in Crowdfunding in WoS



Both graphs (Figure 1 and Figure 2) show the youth of the theme. In both cases, it is in 2010 when there is a clear takeoff and exponential growth in interest in the subject, the advances prior to 2010 being very timid. This is why in most of the tables in this study lower productivity and influence measurement values can be seen than in many other subjects of study. To verify this statement, we built Table 2, in which we checked the temporal evolution of citations for papers.

Table 2. General citation structure in Crowdfunding research in WOS

Citations	All time		2010 - 2018	
	Number of papers	% Papers	Number of papers	% Papers
> 200 citations	2	0,384	1	0,240
> 100 citations	17	3,263	5	1,202
> 50 citations	36	6,910	9	2,163
> 20 citations	95	18,234	44	10,577
<= 20 citations	371	71,209	357	85,817
Total	521	100,000	416	100,000

Table 2 shows that most citations were made in the period 2010-2018, and that most of them have less than 20 citations. Both reflections indicate and ratify the initial estimate that it is a very young study subject with still very few publications and citations if we compare it to other more mature study themes.

c) The most influential articles

As a basis for further studies on crowdfunding, it is interesting to detect the most influential articles on this subject so far. For this reason, table 3 was constructed, where the articles with the most citations are ranked, also calculating the citations per year to have a relative indicator that allows us to compare the influence of the article regardless of the year it was published. The most cited crowdfunding paper was published in 2011 by Ordanini *et al.*, followed closely (in number of citations) by the one published in 2003 by Almus and Czarnitzki. They should therefore be considered the most influential crowdfunding studies.

It is interesting, to also consider the relative number of citations per year, as a relative measure of the influence of the papers, which means the most influential paper was published in 2015 by Theobald *et al.*, Followed again by the one published in 2011 by Ordanini *et al.* Both should therefore be considered to be the most influential studies, that of Ordanini *et al.* absolutely and that of Theobald *et al.* in a relative way (being more recent and having a high number of recent appointments, it rises in the relative ranking).

Table 3. The 30 most cited papers in Crowdfunding research

Journal	R	TC	Title	Author/s	Year	C/Y
JOURNAL OF THE ACADEMY OF MARKETING SCIENCE	1	259	Crowdfunding: transforming customers into investors through innovative service platforms	Ordanani, A; Miceli, L; Pizzetti, M; Parasuraman, A	2011	28,78
JOURNAL OF MARKETING RESEARCH	2	227	The effects of public R&D subsidies on firms' innovation activities: The case of Eastern Germany	Almus, M; Czarnitzki, D	2003	13,35
JOURNAL OF MARKETING	3	175	An Empirical Examination of the Antecedents and Consequences of Contribution Patterns in Crowd-Funded Markets	Burtch, G; Ghose, A; Wattal, S	2013	25,00
JOURNAL OF MARKETING	4	172	Financialisation and capital accumulation in the non-financial corporate sector: A theoretical and empirical investigation on the US economy: 1973-2003	Orhangazi, O	2008	14,33
DATA & KNOWLEDGE ENGINEERING	5	172	AN EXPERIMENTAL TEST OF THE PUBLIC-GOODS CROWDING-OUT HYPOTHESIS	ANDREONI, J	1993	6,37
JOURNAL OF SERVICE RESEARCH	6	171	Revenue Diversification in Nonprofit Organizations: Does it Lead to Financial Stability?	Carroll, DA; Stater, KJ	2009	15,55
DECISION SUPPORT SYSTEMS	7	168	Do government grants to private charities crowd out giving or fund-raising?	Andreoni, J; Payne, AA	2003	9,88
JOURNAL OF MARKETING	8	158	Has donor prioritization of HIV/AIDS displaced aid for other health issues	Shiffman, J	2008	13,17
EXPERT SYSTEMS WITH APPLICATIONS	9	156	Global change and local solutions: Tapping the unrealized potential of citizen science for biodiversity research	Theobald, EJ; Ettinger, AK; Burgess, HK; DeBey, LB; Schmidt, NR; Froehlich, HE; Wagner, C; HilleRisLambers, J; Tewksbury, J; Harsch, MA; Parrish, JK Gonzalez, X; Jaumandreu, J; Pazo, C	2015	31,20
JOURNAL OF MARKETING	10	145	Barriers to innovation and subsidy effectiveness		2005	9,67
JOURNAL OF MARKETING	11	141	Crowd science: The organization of scientific research in open collaborative projects	Franzoni, C; Sauermann, H	2014	23,50
JOURNAL OF MARKETING	12	137	Altruistic and joy-of-giving motivations in charitable behavior	Ribar, DC; Wilhelm, MO	2002	7,61
JOURNAL OF SERVICE RESEARCH	13	129	Public versus private venture capital: seeding or crowding out? A pan-European analysis	Leleux, B; Surlemont, B	2003	7,59
JOURNAL OF BUSINESS RESEARCH	14	125	Supporting Public Health Priorities: Recommendations for Physical Education and Physical Activity Promotion in Schools		2015	25,00
JOURNAL OF OPERATIONS MANAGEMENT	15	110	Two for the price of one? Additionality effects of R&D subsidies: A comparison between Flanders and Germany	Aerts, K; Schmidt, T	2008	9,17
JOURNAL OF MARKETING	16	110	Crowding out private equity: Canadian evidence	Cumming, DJ; MacIntosh, JG	2006	7,86
INFORMATION SYSTEMS	17	107	CHARITY DONATIONS IN THE UK - NEW EVIDENCE BASED ON PANEL-DATA	KHANNA, J; POSNETT, J; SANDLER, T	1995	4,28
CALIFORNIA MANAGEMENT REVIEW	18	89	Japan's financial crisis mid economic stagnation	Hoshi, T; Kashyap, AK	2004	5,56
JOURNAL OF MARKETING	19	80	Partners in giving: The crowding-in effects of UK government grants	Khanna, J; Sandler, T	2000	4,00
HARVARD BUSINESS REVIEW	20	79	How to work a crowd: Developing crowd capital through crowdsourcing	Prpic, J; Shukla, PP; Kietzmann, JH; McCarthy, IP	2015	15,80

JOURNAL OF THE ACADEMY OF MARKETING SCIENCE	21	79	An experimental test of the crowding out hypothesis	Eckel, CC; Grossman, PJ; Johnston, RM	2005	5,27
HARVARD BUSINESS REVIEW	22	79	Is there a dark side to government support for nonprofits?	Brooks, AC	2000	3,95
JOURNAL OF MARKETING	23	75	Wisdom or Madness? Comparing Crowds with Expert Evaluation in Funding the Arts	Mollick, E; Nanda, R	2016	18,75
JOURNAL OF PRODUCT INNOVATION MANAGEMENT	24	74	Fetal alcohol spectrum disorders in Finland: Clinical delineation of 77 older children and adolescents	Autti-Ramo, I; Fagerlund, A; Ervalahti, N; Loimu, L; Korkman, M; Hoyme, HE	2006	5,29
JOURNAL OF SERVICE RESEARCH	25	72	Heart of darkness: modeling public-private funding interactions inside the R&D black box	David, PA; Hall, BH	1999	3,60
JOURNAL OF MARKETING	26	69	How Wise Are Crowds? Insights from Retail Orders and Stock Returns	Kelley, EK; Tetlock, PC	2013	9,86
DECISION SUPPORT SYSTEMS	27	65	Does government funding alter nonprofit governance? Evidence from New York city nonprofit contractors	O'Regan, K; Oster, S	2002	3,61
JOURNAL OF INTERACTIVE MARKETING	28	63	The commercialization of voluntary sport organizations in Norway	Enjolras, B	2002	3,50
MIS QUARTERLY	29	63	Public R&D policies and cost behavior of the US manufacturing industries	Mamuneas, TP; Nadiri, MI	1996	2,63
JOURNAL OF RETAILING	30	63	The market for quacks	Spiegler, Ran	2006	4,07

Abbreviations are available in Table 1 except for C/Y = Citations per Year

d) The most prolific and influential authors

The following ranking was elaborated based on the number of publications of the authors who have researched crowdfunding. Table 4 details the results of the study, not only showing the number of publications (their rank in the table) but also showing the number of citations of their articles.

Table 4. The 20 most productive and influential authors in Crowdfunding

R	Author's Name	Institution	Country	TP	TC	TC/TP	h	>= 50	>= 20	>= 10
1	BROOKS AC	Syracuse Univ	USA	4	171	42,75	4	1	3	4
2	ANDREONI J	Univ California San Diego	USA	3	349	116,33	3	2	2	2
3	BRETSCHNEIDER U	Kassel Univ	Germany	3	23	7,67	3	0	0	1
4	CZARNITZKI D	Katholieke Univ Leuven	Belgium	3	277	92,33	3	1	2	3
5	DE WIT A	Vrije Univ Amsterdam	Netherlands	3	15	5,00	2	0	0	1
6	HORNUF L	Univ Bremen	Germany	3	46	15,33	2	0	1	2
7	LEIMEISTER JM	Univ Kassel	Germany	3	23	7,67	3	0	0	1
8	MOLLIK E	Univ Penn	USA	3	121	40,33	3	2	2	2
9	SUN Y	Univ Science & Technology Beijing	Peoples R China	3	19	6,33	2	0	0	1
10	ZHANG M	Univ Science & Technology Beijing	Peoples R China	3	9	3,00	2	0	0	0
11	ZHANG N	Univ Science & Technology Beijing	Peoples R China	3	19	6,33	2	0	0	1
12	AL LILY AE	King Faisal Univ	Saudi Arabia	2	4	2,00	1	0	0	0
13	BEKKERS R	Vrije Univ	Netherlands	2	13	6,50	2	0	0	0
14	CHEN L	Hubei Univ Chinese Med	Peoples R China	2	2	1,00	1	0	0	0
15	CHEN T	Tianjin Univ	Peoples R China	2	9	4,50	1	0	0	0
16	CURS BR	Univ Missouri Columbia	USA	2	21	10,50	1	0	1	1
17	DOVE ES	Univ Edinburgh	Scotland	2	35	17,50	2	0	0	2
18	FARAJAN M	Islamic Azad Univ	Iran	2	1	0,50	1	0	0	0
19	FROSIO G	Univ Strasbourg	France	2	0	0,00	0	0	0	0
20	GLEASURE R	Univ College Cork	Ireland	2	30	15,00	2	0	1	1

Abbreviations are the same as in Table 1 and Table 3, except for Univ = University

The first conclusion is that the two authors with the highest number of citations are two researchers from the USA (Brooks AC and Andreoni J, the latter is by far the most cited author) and one from Belgium (Czarnitzki D). It is also striking that among the 15 authors with most published papers and citations, there are 5 researchers from China, and 4 from the USA, followed by 3 from Germany. However, the number of citations of the USA authors is much greater than that of the Chinese authors.

e) The most productive and influential institutions

Another ranking of interest is to compare publications and citations by Entities / Institutions. This ranking has the limitation that there are authors in each paper linked to different entities. The results of the study are shown in table 5.

Table 5. The 24 most productive and influential institutions in Crowdfunding

R	Institution	Country	TP	TC	TC/TP	h	>= 50	>= 20	>= 10	ARWU	QS
1	UNIVERSITY OF OXFORD	England	10	173	17,30	7	1	3	4	7	4
2	UNIVERSITY OF PENNSYLVANIA	USA	10	265	26,50	6	1	5	6	17	15
3	NATIONAL BUREAU OF ECONOMIC RESEARCH	USA	9	152	16,89	6	1	3	4	-	-
4	UNIVERSITY OF NORTH CAROLINA	USA	9	77	8,56	5	0	2	2	901-1000	351-400
5	HARVARD UNIVERSITY	USA	8	193	24,13	5	2	3	4	1	3
6	NEW YORK UNIVERSITY	USA	8	405	50,63	6	3	6	6	30	39
7	UNIVERSITY OF LONDON	England	8	61	7,63	5	0	0	2	901-1000	328
8	UNIVERSITY OF CALIFORNIA BERKELEY	USA	7	166	23,71	4	1	3	4	5	28
9	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS	France	6	23	3,83	3	0	0	1	-	-
10	UNIVERSITY OF ARIZONA	USA	6	159	26,50	6	1	2	5	101-150	262
11	UNIVERSITY OF MARYLAND COLLEGE PARK	USA	6	45	7,50	4	0	0	1	46	136
12	UNIVERSITY OF MINNESOTA TWIN CITIES	USA	6	362	60,33	6	2	4	4	41	-
13	UNIVERSITY OF TORONTO	USA	6	230	38,33	5	2	2	4	24	29
14	UNIVERSITY OF WASHINGTON	USA	6	293	48,83	5	1	4	5	14	68
15	DURHAM UNIVERSITY	England	5	49	9,80	4	0	0	1	201-300	78
16	JOHNS HOPKINS UNIVERSITY	USA	5	115	23,00	4	0	3	4	16	24
17	MCGILL UNIVERSITY	Canada	5	52	10,40	4	0	0	2	90	35
18	UNIVERSITY OF CALIFORNIA SAN FRANCISCO	USA	5	49	9,80	4	0	0	3	20	5
19	UNIVERSITY OF YORK UK	England	5	156	31,20	4	1	1	4	301-400	148
20	COLUMBIA UNIVERSITY	USA	4	141	35,25	4	1	2	3	8	18
21	DUKE UNIVERSITY	USA	4	64	16,00	3	0	1	2	28	25
22	ERASMUS UNIVERSITY ROTTERDAM	Netherlands	4	46	11,50	3	0	1	2	79	183
23	GEORGE WASHINGTON UNIVERSITY	USA	4	218	54,50	4	1	4	4	201-300	-
24	LONDON SCHOOL ECONOMICS POLITICAL SCIENCE	England	4	31	7,75	3	0	0	1	151-200	44

Abbreviations are the same as in Table 1 and Table 3; ARWU and QS = Ranking in the general ARWU and QS university rankings

Once again it is concluded that the youth of the subject means that the values of the variables under study have very small values compared to other more mature ones. The two universities with the largest number of publications are UNIVERSITY OF OXFORD, and UNIVERSITY OF PENNSYLVANIA, both with 10 papers, but not far ahead of the following entities. They show that there is not yet a university that clearly stands out on this issue. However, it is clear and enlightening that 16 of the first 24 entities are from the USA, which definitely focuses the study of crowdfunding so far in universities in the USA. Two columns with the ARWU and QS indicators were added, which are two rankings that indicate the potential of the entities.

5	CANADA	28	564	20,14	10	36.708,08	0,76	15,36	2	3	3
6	PEOPLES R CHINA	28	133	4,75	6	1.386.395,00	0,02	0,10	0	0	2
7	FRANCE	25	111	4,44	6	67.118,65	0,37	1,65	0	0	0
8	ITALY	22	637	28,95	9	60.551,42	0,36	10,52	2	3	6
9	NETHERLANDS	22	203	9,23	9	17.132,85	1,28	11,85	0	0	3
10	SWITZERLAND	16	281	17,56	9	8.466,02	1,89	33,19	1	1	3
11	SPAIN	15	291	19,40	7	46.572,03	0,32	6,25	1	1	3
12	INDIA	12	39	3,25	4	1.339.180,13	0,01	0,03	0	0	0
13	SWEDEN	10	216	21,60	7	10.067,74	0,99	21,45	0	0	4
14	NORWAY	9	239	26,56	7	5.282,22	1,70	45,25	0	1	5
15	RUSSIA	8	5	0,63	1	144.495,04	0,06	0,03	0	0	0

Abbreviations are the same as in Table 1 and Table 3, except for Pop = Population (thousands); TP/Pop = Studies per millions of population; TC/Pop = Citations per millions of population

Coinciding with the conclusions obtained in the study of the entities, in Table 6 the USA stands out as the country with the largest number of publications, with almost 4 times more than the following country (UK). The same happens with the number of citations, where the USA is the first with almost 8 times more than the second country (Germany). Relative measures of the number of publications and citations were obtained, depending on the population of the country, in order to compare productivity and influence per inhabitant. In this case, the Netherlands stands out, followed by Norway, in per capita publications, a value clearly influenced by the small populations of these two countries. As for citations per capita, Norway stands out again followed by Switzerland, again two countries with small populations and a long research tradition. Again, and through Figure 4, these results are graphically verified to be completely consistent with the conclusions obtained in Table 6.

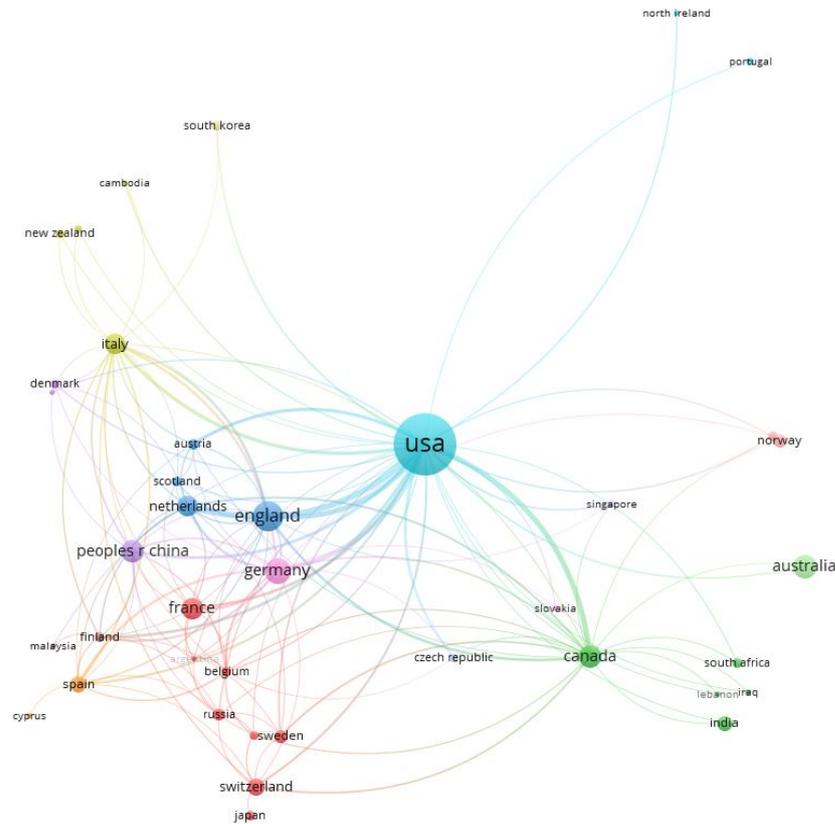


Figure 3. Countries co-citation with threshold of 3 citations.

It is clearly observed that the USA is the country with the highest productivity (the largest circle indicates the highest number of papers published), as well as with greater influence (greater number of relationships. As Figure 4 shows, reflected with the largest circle, the USA has the articles with the largest number of citations, followed by Germany, the UK and Italy.

g) General results

The study initially aimed to determine which are the most productive (with the largest number of publications) and most influential (with the largest number of citations) focuses in the area of scientific research on crowdfunding. The result meets the initial expectations, since we detected:

- the most cited articles
- the most productive and most influential authors, entities, and countries.

In the conclusions section, the findings on each of the ranks prepared from the bibliometric study are examined.

Conclusions

An exponential increase in the number of works published in the area of crowdfunding can be observed. It is a multidisciplinary field that encompasses elements of technology and finance meaning that it is studied in different fields of knowledge and that its results have a clear application to companies (Scaldaferri, 2018; Siliprandi, 2018, Zhang *et al.*, 2018; Miller, Seahill and Warren, 2019; Pierrakis, 2019; Yang, Bi and Liu, 2020). In future research we will carry out causal studies that relate the introduction of crowdfunding to other financial variables within the company.

A bibliometric study was carried out to detect and assess which are the focuses of greatest productivity (measured in number of publications) and of greatest influence (measured in number of citations). This study aims to justify the interest in "crowdfunding" as an object of study, in addition to highlighting which future lines of research should delve deeper into this issue.

After the bibliometric study of crowdfunding, having reviewed the publications and citations that appear in WOS, compared to the results obtained in other bibliometric studies on more mature topics in the field of research, one of the most important general conclusions is that it is a very young and underdeveloped subject of study, still with a low number of publications and citations, but which since 2010 has shown a growing interest that has led to relevant growth as a research topic. This gives crowdfunding the category of an emerging theme with great development opportunities.

All the particular conclusions about where more studies were published, and what is the focus of the greatest number of citations, lead to the general conclusion that currently the greatest interest is centralized in the USA as a country, in its institutions and universities, and also its authors. Some countries like China and Germany also stand out for their interest, but the main focus is still the USA.

As to limitations, it is necessary to say that this study is limited to the WOS Core Database Collection, and to the time span and searching criteria (keywords) selected by the authors. The WOS is recognized in all areas as a reference database of scientific publication, therefore the authors recognize the limitation that if another database had been used, the results and conclusions could have differed from those obtained. Therefore, we assume that this study provides a relevant and scientific report on crowdfunding but that other considerations could expand this study and make it more comprehensive.

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