



Article

Research in entrepreneurship using GEM data. Approach to the state of affairs in gender studies



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ABSTRACT

This paper analyzes the situation and development of research in “entrepreneurship” from a gender perspective that has used data from the Global Entrepreneurship Monitor (GEM) in the period from 1999 to 2015 in the journals of entrepreneurship included in the Web of Science (WOS). For this purpose, a bibliometric analysis was carried out, which identified the life-cycles of GEM and GEM/gender research, the topics, level of analysis, journals, articles, the most productive authors, the most active countries and institutions and the most used statistical techniques of analysis and data. The main findings of the study show that research on GEM has advanced in recent years; however from a gender perspective by using GEM data, it is in the initial phase, requiring more researchers to be involved, filling the gaps related to topics, macro analysis, or the use of GEM data at both global and regional level.

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Introduction

Entrepreneurial activity that generates new businesses has become increasingly important in our society, not only as a key strategic means for public administrations to face economic and social development (Minniti, Bygrave, & Autio 2006; Wennekers & Thurik, 1999) and increased competitiveness of territories in an increasingly globalized economy (Porter, 1991), but also as an object of scientific research (Bygrave & Hofer, 1991; Stevenson & Harmelin, 1990), that can help understand this phenomenon.

In addition, the profound social changes that have recently been taking place in society, have allowed the incorporation of women into the entrepreneurial activity, having access to jobs which were unthinkable in past decades (Kirkwood, 2007). These are changes in which a higher number of families, their decrease in size, increased life expectancy of the population, an increase in the number of divorces and number of households with two members working, low fertility rates, etc. have played a very important role (Bliss & Garratt, 2001; McClelland & Swail, 2005; Thurik, Uhlaner, & Verheul, 2002). Therefore, time reveals that the situation of women in the business environment is an issue to be solved (Berg, 1997; Brush, 1992; Nelson & Levesque, 2007). Proof of this is that, in recent

years research on business women has aroused interest in both the academic world as in governments and institutions responsible for establishing policies for promoting and supporting female entrepreneurship.

In this context, the GEM¹ (Global Entrepreneurship Monitor) Project emerged in 1999, currently considered the largest research project on entrepreneurship, both due to its global dimension and its results and implications (Reynolds, Hay, & Camp, 2002; Reynolds et al., 2005). During 15 years, the Consortium of research teams belonging to the countries that make up this project have carried out more than two million surveys with countries that participated in GEM between 1999 and 2015; observing a growing trend in publications of articles that use GEM data (Álvarez, Urban, & Amorós, 2014). However there are very few who made a review of the literature based on journals of impact on the current situation of this project research, and even fewer used bibliometric methods. If we only pay attention to gender, we only found one article, which was conducted by Sánchez-Escobedo, Díaz-Casero, Díaz-Aunió, and Hernández-Mogollón (2012), in which key documents and their types are identified and highlighted, not only focusing on JCR articles.

Therefore, and in line with the work of Urbano, Rojas, and Díaz (2010), Amorós, Bosma, and Levie (2013), Bosma (2013) and

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¹ For further information on this project: <http://www.gemconsortium.org>.

Álvarez et al. (2014), the aim of this article is to conduct a bibliometric analysis of the situation and development of research in “entrepreneurship” from a gender perspective using GEM data from 1999 to the end of 2015, focusing on the journals included in the Web of Science (WOS).

The main contribution of this paper is of an academic nature, both from its theoretical and methodological point of view, because the results obtained may be useful to researchers in further studies, as they identify and describe the certified intellectual structure in journals included in the WOS with the issue in question. The study also makes several important contributions:

- 1) Although the article by Sánchez-Escobedo et al. (2012) made an approach to the gender issue state using GEM data by introducing “non-certified” documents, which significantly affect the weight of the results obtained, in our research we only incorporate “certified knowledge”,² due to this.
- 2) The use of bibliometric methods still represents an innovative contribution to the study of the intellectual basis of gender analysis using GEM data.
- 3) From the results, we present the following contributions: development of the research life-cycle, topics analyzed in the research conducted so far, the most relevant journals, most cited articles, most productive authors, casuistical levels analyzed, the most involved countries and institutions, as well as techniques and data used by researchers. Moreover, we cannot forget the literature review itself.

The structure of this work, after this brief introduction is as follows: a theoretical framework for analyzing gender research based on GEM is presented; the methodology used and the main results of the study are developed. Finally, the conclusions show the fundamental aspects of gender research using GEM data, as well as the limitations and future lines of research.

Theoretical framework

Entrepreneurship and gender

In the last century, a special interest in the study of female entrepreneurs arose, which emerged partly because of research conducted by Schwartz (1976) and Burr (1978). Their conclusions showed that women did not satisfy their professional expectations by doing housework, as they were not highly regarded or valued by society, so their need and desire to achieve job and/or personal satisfaction had increased (Carter, Anderson, & Shaw, 2001; Greene, Hart, Gatewood, Brush, & Carter, 2003). However, unlike their male counterparts, when they wanted to create their own businesses, they found discrimination problems related to business financing, in addition to their lack of training and expertise in business management and implementation. These problems were solved with time, in which the results of various research confirm the key role that women play today in the professional world (Chu, 2000; Jeynes, 2005; Kephart & Schumacher, 2005; Walker & Joyner, 1999).

Women are proving their own strength and development of their skills and abilities (Langowitz & Minniti, 2007; Terjesen, 2005), and also for them, creating their own company represents

an important alternative for their incorporation into the productive system (Carter et al., 2001; Greene et al., 2003).

In this sense, gender has not been considered a peculiarity that could affect business results, since men have traditionally played the business role (Berg, 1997), which has led to the measuring instruments used to be aimed only and exclusively at male samples (Moore, 1990; Stevenson, 1990). However, currently, there are numerous researchers who are proving the interest it is starting to arouse by analyzing through large samples of individuals from different countries, the differences and similarities between men and women in the implementation of a business (Arenius & Minniti, 2005; Koellinger, Minniti, & Schade, 2013; Minniti & Nardone, 2007; Verheul, Van Stel, & Thurik 2006); or trying to investigate the influence or impact that gender has on commercial property, as far as management and performance of small businesses is concerned (Cowling & Taylor, 2001; Ndemo & Wanjiku, 2007). Carter et al. (2001) also corroborate this interest when referring to the existence of more than 400 citations in which gender in entrepreneurship have a privileged place; in the same line Lamolla (2005) indicates the creation of a section related to this subject in the academic journal *Frontiers of Entrepreneurship*³ (reference journal in research in entrepreneurship).

In relation to gender, there are studies that have looked for differences in the characteristics of the enterprises, attitudes and behaviors adopted by men and women in their desire to become entrepreneurs, or in the development of their business tasks (Guzmán & Rodríguez, 2008; Rodríguez & Santos, 2009; Álvarez-Herranz, Valencia de Lara, & Martínez-Ruiz, 2011a,b). In addition, several studies suggest that the constant differences found between men and women in developing the entrepreneurial activity are due to gender characterization (Carter et al., 2001; Greene et al., 2003; Marlow, 2002), although others have studied in-depth the various factors and decision processes that drive men and women to create their own businesses (Verheul et al., 2006; Zhao, Seibert, & Hills, 2005).

What seems certain is that, under the differences that influence the intention to undertake in humans, there are underlying gender stereotypes that clearly harm women (Gupta, Turban, Wasti, & Sikdar, 2009). Stereotypes analyzed by Eagly (1987), through the theory of the social gender role, whereby the general way in which both men and women perform and assume different social status is found; and Connell (1990) with his theory of hegemonic masculinity attempts to define masculinity as an object, focusing on processes and relationships through which men and women lead lives dictated by gender.

Therefore, we can say that although signs of consolidation are seen in the research field related to the female entrepreneur, it still does not get the recognition it deserves, despite its continual progress and contribution to the economy and society (Díaz, Hernández, Sánchez, & Postigo, 2010; Minniti & Naudé, 2010; Porter, Sachs, & McArthur, 2002), contributing to it, lack of knowledge by not being able to record in a particular way and lay the theories that explain the emergence of women in the business field (Díaz et al., 2010; Greene et al., 2003). Therefore, this article aims to collaborate in this effort, especially since, as shown by data of “GEM Women’s Report” of 2012, it is estimated that 126 million women were starting a business in 67 economies around the world and 98 million were already established entrepreneurs (Kelley, Brush, Greene, & Litovsky, 2013).

² The term “certified knowledge” is commonly used to describe the knowledge of the disciplines which the scientific papers focus on, in the sense that a scientific paper published in an indexed journal has been subjected to criticism of colleagues, resisted their objections, and therefore, it has achieved its positive assessment to be published (Callon, Courtial, & Penan, 1993).

³ From 1980 to 1987, only 13 articles relating to women of a total number of 227 were published in the academic journal *Frontiers of Entrepreneurship* (regarding the study on creation of enterprises).

Research based on GEM with gender perspective

Traditional analyses of economic growth have focused mainly on the impact that large companies have had on the economy, often forgetting the contribution that small and medium-sized enterprises have made to economic development through innovation and competitiveness (Porter et al., 2002; Sternberg & Wennekers, 2005).

In contrast to other studies, the GEM model integrates both the contributions of large and small and medium enterprises in its economic growth analysis (Reynolds et al., 2005), assuming that the role of entrepreneurship is essential for economic growth (Reynolds, Hay, & Camp, 1999). It is also a model which includes a set of key elements that relate and interact with each other: attitudes, activity and entrepreneurial aspirations of the population, these elements being influenced by the level of development of each country and by its particular environmental conditions to undertake (Bosma, Wennekers, & Amorós, 2012; Kelley, Bosma, & Amorós, 2011).

In addition, GEM uses more than 600 secondary variables that allow us to understand more clearly why the entrepreneurial activity is vital to the global economy; being possible among other things, to analyze the situation of women in the entrepreneurial field, so that the studies that have been conducted regarding the relationship between women and the economy have been completed (Arenius & Ehrstedt, 2008; Minniti & Nardone, 2007; Minniti & Naudé, 2010). In this regard, GEM conducted the first study in 2004 (Minniti, Arenius, & Langowitz, 2005), becoming thereafter a periodical publication. Its results showed no significant distinctions in demographic characteristics between male and female entrepreneurs, but small differences in some factors between female entrepreneurs in countries with different economic levels (Valencia, 2011). In successive gender reports based on GEM,⁴ it was found that women engage in business activities mainly for opportunity reasons, being there few necessity reasons, which were concentrated in low-income countries. In this sense, we must point out that of those businesses which were started out of necessity in Latin America and the Caribbean, those created by women are less likely to become consolidated (Álvarez-Herranz, Valencia de Lara, Barraza, & Legato, 2010). Moreover, the perception that female entrepreneurs have on average of their activity is positive, having in common the fact that knowing and being in contact with other entrepreneurs helps to decrease their fear of failure (Terjesen & Lloyd, 2015).

Together with this research, articles that use GEM data have been developed, and which analyze the variables related to the decision to be an entrepreneur depending on gender. In this sense, Arenius and Kovalainen (2006) and Figueiredo and Oliveira (2015) explore the preferences of women for self-employment in Nordic countries and Portugal respectively; Baughn, Chua, and Neupert (2006), and Estrin and Mickiewicz (2011) evaluate the impact of specific rules to support female entrepreneurs, and Verheul et al. (2006) found that rates of entrepreneurial activity of men and women are influenced by the same factors, although some of these have a greater impact on women. In addition, Minniti and Nardone (2007), and Langowitz and Minniti (2007) suggest that perception variables explain the majority of gender differences regarding the decision to start a business, being less favorable in the woman's environment. Wagner (2007) and Burke, van Stel, Hartog, and Ichou (2014) investigate which variables are related to gender differences in the creation of enterprises, emphasizing fear of failure-greater

⁴ GEM dedicated 6 Monographic Global Reports to women and entrepreneurship in 2005, 2006, 2007, 2010, 2012 and 2015, signed by authors of world reference in this field.



Fig. 1. Methodological outline.

in women as a fundamental reason for not starting a business. Thompson, Jones-Evans, and Kwong (2009) explore the characteristics of self-employed women who manage their businesses from home.

Study methodology

We can see the historical evolution of scientific production in this context, the most productive and renowned authors who study the subject, the most represented countries and institutions, the level of analysis carried out and the most relevant journals in this subject matter by carrying out a bibliometric analysis⁵ of the scientific literature recognized on research of the gender subject using GEM data.

Articles published in journals included in the Web of Science (WOS) were taken into account for this research. The indicators used are: the article, authors' productivity rate, the most active countries and institutions, as well as types of data and techniques used.

Ramos (2004: 78), uses the journal article as a unit of analysis, considering it "*certified knowledge*" after undergoing critical review (Callon et al., 1993).

As shown in Fig. 1, in the first phase, we collected the articles included in WOS compared to GEM relating to gender descriptors. To do so, a literature search in WOS databases was conducted, by combining the descriptors, "Global Entrepreneurship Monitor" and "GEM Entrepreneurship" with each of the following: gender, man, woman, male and female using the logical OR operator.

In the second phase, firstly, we did a descriptive exploration, in which certain characteristics of the articles, research and methodologies used were extracted, which provide information on the journals, techniques and data used. Furthermore, in-depth analysis of each of the selected articles was carried out.

Finally, in the third phase, we obtained a database with all the selected articles to which the different bibliometric techniques were applied, whereby the life-cycle, authors' productivity rate, countries and institutions involved were obtained.

The review contains 40 articles published in journals indexed in WOS, which are signed by 52 different authors from 27 different countries and 37 participating institutions.

Research results in the GEM project

Life-cycle

We performed a life-cycle analysis of GEM/gender, finding 40 articles that make up the study area. The first publication on GEM/gender in the WOS took place in 2004, while the year with the highest publications was 2011, with nine. In relation to the total of

⁵ Bibliometrics has important limitations derived from the business that this science provides, as mentioned in the work by Cortés (2007), Cornnin (2005), Brown (2007), Adler et al. (2008) and Simons (2008) among others, but the reality is that even if there are opposed positions, currently the quality index with greater recognition of research quality worldwide, without doubt is the Journal Citation Report, which as part of the ISI Web of Knowledge, provides an objective and systematic means to evaluate the most important journals in the world. It offers a unique perspective for evaluation and comparison of journals, as it accumulates and tabulates the number of citations and articles of virtually all specialties in science, technology and social sciences. It is also worth noting the existence of numerous publications that have made use of GEM databases and which have not been published in the journals of JCR, which are not considered object of analysis in this review.

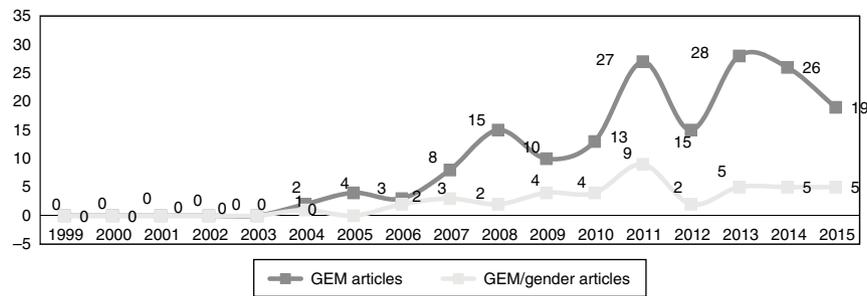


Fig. 2. Life-cycle of GEM and GEM/gender research.

170 papers, which make up the 17-year cycle since GEM emerged, gender articles represent 23.5%. Thus, when analyzing the number of documents published each year, the evolution of scientific production using GEM data or specializing in GEM in the gender subject using its data is obtained (see Fig. 2).

When analyzing the life-cycle of GEM research in general, three phases can be observed: the first phase from 1999 to 2003, without publications; the second phase from 2004 to 2008, with a total of 32 documents, and a final phase from 2009 to 2015, with a total of 138 documents; the last phase represents the period with the highest growth in publications. This article discusses this cycle and compares it with what interests us, and sees in perspective the situation of gender publications in GEM. Nevertheless, it may be the subject of future studies.

When comparing the evolution of the life-cycle of research of GEM with GEM/gender, we observe that the latter hardly grows, reaching its maximum value in 2011 with 9 articles, compared to those in other years, among which 2013, 2014 and 2015 stand out with 5 articles each year. Here, we can distinguish two periods: an initial one until 2011, with 25 articles, and another one from 2012 to 2015, in which growth is observed, and with 17 articles collected.

Research topics

Another study aspect is to analyze the gender research topics using GEM data. We will do it following the GEM model structure, which distinguishes between attitudes, activities and entrepreneurial aspirations.

As can be observed in Table 1, most of the empirical papers are related to entrepreneurial attitudes, with 62.50% of cases, highlighting the topic of “Attitudes and entrepreneurial activity (TEA)” with 10 articles, followed by the analysis of “entrepreneurial attitudes and aspirations” with 5 articles.

As for entrepreneurship, the second component associated with the entrepreneurial process, we found 7 out of 40 articles analyzed, representing 17.50% of the total. This figure is identical in the work group that analyzes all phases of the entrepreneurial process described by GEM.

And finally, in the component called aspirations, we found one paper, which is done by Escandón, González, and Murillo (2013).

Journals included in the WOS and total number of articles per year

Among the journals analyzed in the search process (see Table 2) the *Journal of the Korean Entrepreneurship Society* and *Small Business Economics* are highlighted, with 6 and 5 publications respectively, proving to be the most dynamic in publications, that use GEM/gender data, as they represent 27.5% of the total, with 11 articles published between 2007 and 2015.

The first article appeared in 2004, in the journal *Drustvena Istrazivanja*. It was followed in 2006 by *Entrepreneurship and Regional Development* and *Entrepreneurship: Theory and Practice*,

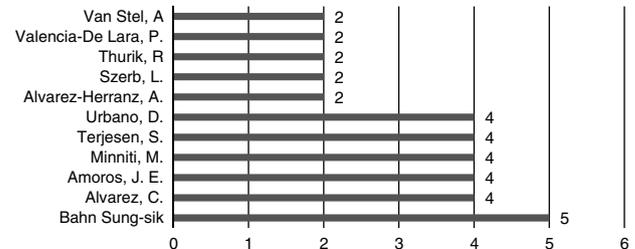


Fig. 3. Most productive authors in gender research using GEM data.

with one publication in each one respectively. During 2007 and 2010, there were a total number of 11 articles, while 2011 is the year with largest scientific production to date, with a total of 8 publications in 8 different journals. Finally, there are 17 articles published from 2012 to 2015.

To end this section, we must mention that we found 17 articles published in *Business*⁶ field journals, although only two in the main ones, as is the case of the journal *Entrepreneurship: Theory and Practice*, with an impact factor in 2014 of 3.144; and 14 in the *Management*⁷ field, being in this case the journal *Small Business Economics* the best positioned with an Impact Factor of 1.795 in 2014. These results show that there is still a long way to go, as there are hardly any publications in journals of great impact.

Author's productivity rate

Not many authors with a large contribution to this area were detected, since only 11 have more than one publication. We obtained a total of 52 authors in the 40 articles described in the study, representing in Fig. 3 those who contributed with more than one article.

Bahn stands out with five papers published, followed by Amoros, Álvarez, Minniti, Terjesen and Urbano, with four articles, which represent 50% of the total production. Nevertheless, the most cited articles, with 100 citations, are by Langowitz and Minniti (2007), titled “The Entrepreneurial Propensity of Women”. They are followed by those by Verheul et al. (2006), Minniti and Nardone (2007), and Baughn et al. (2006), with 69, 56 and 50 citations respectively.

We can find the following authors with two articles: Álvarez of the University of Castilla La Mancha (Spain), Szerb of the University of Pécs (Hungary), Thurik of the University of Erasmus of Rotterdam

⁶ The main journals in the Business field and their JCR impact factor in 2014 are: *Academy of Management Review* (7,475), *Academy of Management Journal* (6,448), *Journal of Management* (6,071), *Family Business Review* (5,528) and *Journal of Marketing* (3,938).

⁷ The main journals in the Management field and their JCR impact factor in 2014 are: *Academy of Management Annals* (7,769), *Academy of Management Review* (7,475), *Academy of Management Journal* (6,448), *Journal of Management* (6,071), and *Mis Quarterly* (5,311).

Table 1
Research topics.

Subject	Articles	JCR	%
<i>Attitudes</i>			
Attitudes	Goltz, Buche, and Pathak (2015), Noguera, Álvarez, and Urbano (2013), Sepúlveda and Bonilla (2011), Szerb, Rappai, Makra, and Terjesen (2007), Mancilla and Amorós (2015)	25	62.50%
Attitudes in consolidated enterprises	Álvarez-Herranz et al. (2011a,b)		
Attitudes and entrepreneurial aspirations	Burke et al. (2014), Estrin and Mickiewicz (2011), Koellinger et al. (2013), Langowitz and Minniti (2007), Sánchez-Escobedo, Díaz-Casero, Díaz-Aunión, and Hernández-Mogollón (2014)		
Attitudes and entrepreneurial activity (TEA)	Driga, Lafuente, and Vaillant (2009), Elam and Terjesen (2010), Figueiredo and Oliveira (2015), González-Álvarez and Solís-Rodríguez (2011), Mahadea, Ramroop, and Zewotir (2011), Minniti and Nardone (2007), Ramos-Rodríguez, Medina-Garrido, and Ruiz-Navarro (2012), Romani, Atienza, and Amorós (2012), Santiago-Castro and Pisani (2013), Tominc and Rebernik (2004)		
Attitudes and entrepreneurial activity (TEA). Consolidated enterprises	Álvarez-Herranz and Valencia-De Lara (2011), Hessels, Grilo, Thurik, and Van Der Zwan (2011), Rodríguez, Fuentes, and Rodríguez (2014), Terjesen and Szerb (2008)		
<i>Activity</i>			
Entrepreneurial activity (TEA)	Álvarez and Urbano (2013), Arenius and Ehrstedt (2008), Baughn et al. (2006), Roper and Scott (2009), Terjesen and Amorós (2010), Thompson et al. (2009), Verheul et al. (2006)	7	17.50%
<i>Aspirations</i>			
Aspirations and entrepreneurial activity (TEA)	Escandón et al. (2013)	1	2.50%
<i>Attitudes, activity and aspirations</i>			
Attitudes, entrepreneurial activity (TEA), and aspirations	Bahn, Kelley, Lee, 이현숙, 서상구 (2009), Bahn et al. (2011, 2012, 2013, 2014), Banseongsik et al. (2010), Ramadani (2015)	7	17.50%
Total		40	100%

(The Netherlands), Valencia-De Lara of the University of Castilla La Mancha (Spain) and Van Stel of Panteia (Holland).

The average number of authors per article is 3.2, indicating that researchers prefer to work in teams. Proof of this is that only one article written by one person was found, while 13 and 14 articles were found by two and three authors respectively. In the case of four or more researchers, only four papers were found.

Most active countries and institutions in gender publications using GEM data

The country with the highest number of papers (see Fig. 4) is the USA with a total number of 11 articles, followed by Spain with 10, Chile with 6, Colombia 5, United Kingdom, Germany and the Netherlands with 3, and Hungary and Belgium with two.

From 1999 to 2015, the number of countries with scientific publications on gender is very small. Also note that the high participation of European countries in the GEM Project is influencing the field as six of the countries with more publications are European, while the other three are American.

The authors belong to 37 institutions. Fig. 5 represents the institutions that have more than two publications, so we find the following with three articles: Universidad Autónoma de Barcelona (Spain), Max Planck Institute Economic (Germany),

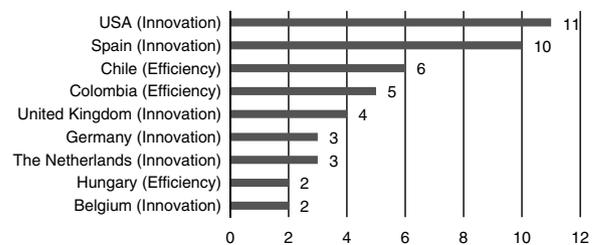


Fig. 4. Most active countries (according to type of economy) in publications of GEM/gender documents.

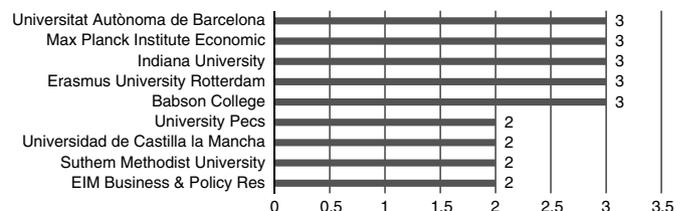


Fig. 5. Institutions involved in gender research using GEM data.

Table 2

Total number of gender articles per journal a year.

<i>Total number of gender articles per journal a year</i>																
Indexed Journals (JCR)	Position	Field	FI	Years											Total	
				04	06	07	08	09	10	11	12	13	14	15		
Academia-Revista Latinoamericana de Administración	109	Business	0,205								1				1	2
Actual Problems of Economics (2011)	317	Economics	0,039								1					1
AD-miniter		<i>Indexed in WOS but not in JCR</i>														
African Journal of Business Management	54	Business	1,105								1					1
	58	Management														
Drustvena Istrazivanja	38	Social Issues	0,101	1												1
	136	Sociology														
Entrepreneurship and Regional Development	52	Business	1,519		1											1
	16	Planning & Development														
Entrepreneurship: Theory and Practice	15	Business	3,144		1	1										2
Estudios de Economía	323	Economics	0,105				2									2
European Journal of Development Research	40	Planning & Development	0,851							2						2
Industrial Management & Data Systems	66	Computer Science, Interdisciplinary Applications	1,226								1					1
	21	Engineering, Industrial														
International Entrepreneurship and Management Journal	87	Business	0,746											1	1	2
	4	Management														
International Journal of Hospitality Management	8	Hospitality, Leisure, Sport & Tourism	1,692									1				1
International Small Business Journal	49	Business	1,469						2							2
	133	Management														
Journal Of Balkan And Near Eastern Studies	44	Area Studies	0,312												1	1
Journal of Business Economics and Management	88	Business	0,723									1				1
	191	Economics														
Journal of Evolutionary Economics	138	Economics	1,036								1					1
Journal Of Small Business Management	81	Management	1,353												1	2
Journal of the Korean Entrepreneurship Society		<i>Indexed in WOS but not in JCR</i>														
Oxford Bulletin of Economics and Statistics	82	Economics	1,368					1	1	1	1	1	1			6
	16	Social Sciences, Mathematical Methods												1		1
Pensamiento & Gestión	Out	<i>It has been deleted</i>	Out											1		1
Revista de Ciencias Sociales (2012)	104	Business	0,010											1		1
	333	Economics														
Small Business Economics	39	Business	1,795			2				1				2		5
	52	Economics														
	57	Management														
Sociología Rurales	33	Sociology	1,306					1								1
	29	Geography														
South African Journal of Economic and Management Sciences	320	Economics	0,041							1						1
	171	Management														
Tourism & Management Studies		<i>Indexed in WOS but not in JCR</i>														
															1	1
TOTAL				1	2	3	2	4	3	8	3	6	5	3	40	

Table 3
Types of data used in empirical papers on gender.

No.	Data typology	Articles	JCR	%
1	Global APS	Álvarez-Herranz et al. (2011a,b), Arenius and Ehrstedt (2008), Burke et al. (2014), Goltz et al. (2015), Hessels et al. (2011), Koellinger et al. (2013), Langowitz and Minniti (2007), Minniti and Nardone (2007), Ramos-Rodríguez et al. (2012), Sánchez-Escobedo et al. (2014), Santiago-Castro and Pisani (2013), Terjesen and Amorós (2010), Verheul et al. (2006)	13	32.50%
2	National APS	Álvarez-Herranz and Valencia-De Lara (2011), Baughn et al. (2006), Driga et al. (2009), Escandón et al. (2013), Figueiredo and Oliveira (2015), Mahadea et al. (2011), Mancilla and Amorós (2015), Noguera et al. (2013), Rodríguez et al. (2014), Romani et al. (2012), Roper and Scott (2009), Sepúlveda and Bonilla (2011), Terjesen and Szerb (2008), Thompson et al. (2009), Tominc and Rebernik (2004)	15	37.50%
3	APS and secondary sources: OECD, World Bank, US Census, Heritage Foundation, Encyclopedia Britannica, BBVA Foundation.	Álvarez and Urbano (2013), Elam and Terjesen (2010), Estrin and Mickiewicz (2011), González-Álvarez and Solís-Rodríguez (2011)	4	10.00%
4	APS and NES	Szerb et al. (2007), Bahn et al. (2009, 2011, 2012, 2013, 2014), Banseongsik et al. (2010), Ramadani (2015)	8	20.00%
Total			40	100%

Table 4
Types of analysis techniques used in empirical papers on gender.

No.	Statistical technique of analysis	Articles	JCR	%
1	Descriptive analysis	Bahn et al. (2009, 2011, 2012, 2013, 2014), Ramadani (2015), Banseongsik et al. (2010), Romani et al. (2012)	8	20.00%
2	Descriptive analyses and logistic regression (logit, probit, multinomial)	Álvarez and Urbano (2013), Burke et al. (2014), Driga et al. (2009), Elam and Terjesen (2010), Figueiredo and Oliveira (2015), Goltz et al. (2015), González-Álvarez and Solís-Rodríguez (2011), Hessels et al. (2011), Koellinger et al. (2013), Langowitz and Minniti (2007), Mahadea et al. (2011), Mancilla and Amorós (2015), Noguera et al. (2013), Ramos-Rodríguez et al. (2012), Rodríguez et al. (2014), Sánchez-Escobedo et al. (2014), Santiago-Castro and Pisani (2013), Sepúlveda and Bonilla (2011), Terjesen and Amorós (2010), Thompson et al. (2009), Tominc and Rebernik (2004)	21	52.50%
3	ANOVA and logistic regression	Álvarez-Herranz and Valencia-De Lara (2011)	1	2.50%
4	Panel data	Álvarez-Herranz et al. (2011a,b)	1	2.50%
5	Structural equations	Escandón et al. (2013)	1	2.50%
6	Descriptive analyses, MANOVA, correlations and regressions	Arenius and Ehrstedt (2008), Baughn et al. (2006), Roper and Scott (2009)	3	7.50%
7	Logistic regression, Logit, Probit	Estrin and Mickiewicz (2011), Terjesen and Szerb (2008), Verheul et al. (2006)	3	7.50%
8	Multinomial, logistic regression and cluster	Szerb et al. (2007)	1	2.50%
9	Bootstrapping	Minniti and Nardone (2007)	1	2.50%
Total			40	100%

Indiana University (USA), University of Erasmus of Rotterdam (Holland) and Babson College (USA). They are followed by two publications, University Pecs (Hungary), University of Castilla La Mancha (Spain), Suthem Methodist University (USA) and EIM Business & Policy Res (The Netherlands).

In short, these results highlight the importance of individual work in the institutions, i.e. few relationships between them. However, collective work is observed between research teams of the same universities or other institutions.

Methodology used in the papers analyzed

Data used

As for the methodology used (see Table 3), 37.50% use data from their country based on the adult population survey (APS); while 32.50% analyze the global database resulting from the participating countries for a given year, the equivalent of 13 articles.

Followed by a lower percentage, with 8 publications (20.00%), are those using both types of surveys, those conducted in the adult

Table 5
Level of analysis in empirical papers on gender.

Level of analysis	Articles	JCR	%
Micro (individuals)	Álvarez-Herranz and Valencia-De Lara (2011), Álvarez-Herranz et al. (2011a,b), Burke et al. (2014), Driga et al. (2009), Escandón et al. (2013), Figueiredo and Oliveira (2015), Goltz et al. (2015), González-Álvarez and Solís-Rodríguez (2011), Koellinger et al. (2013), Langowitz and Minniti (2007), Mahadea et al. (2011), Mancilla and Amorós (2015), Minniti and Nardone (2007), Noguera et al. (2013), Ramos-Rodríguez et al. (2012), Romaní et al. (2012), Roper and Scott (2009), Sánchez-Escobedo et al. (2014), Santiago-Castro and Pisani (2013), Sepúlveda and Bonilla (2011), Szerb et al. (2007), Terjesen and Szerb (2008), Thompson et al. (2009), Tominc and Rebernik (2004)	24	60.00%
Macro (countries)	Álvarez and Urbano (2013), Arenius and Ehrstedt (2008), Bahn et al. (2009, 2011, 2012, 2013, 2014), Banseongsik et al. (2010), Baughn et al. (2006), Elam and Terjesen (2010), Estrin and Mickiewicz (2011), Hessels et al. (2011), Rodríguez et al. (2014), Terjesen and Amorós (2010), Verheul et al. (2006), Ramadani (2015)	16	40.00%
	Total	40	100%

population (APS) and to experts (NES), thus reflecting different environmental conditions analyzed by GEM. Finally, those articles that combine the adult population survey (APS) and other secondary sources such as: OECD, World Bank, US Census, Heritage Foundation, Encyclopedia Britannica, BBVA Foundation, etc., with a total of 4 articles, which represent 10.00% of the total (see Table 3).

Analysis techniques

Taking into account the analysis level, mostly micro- and the nature of the GEM data (binary responses 1/0), in Table 4 we can see that the analysis techniques used in most articles, specifically 21, are descriptive and logistic, binomial or multinomial regression, among others, representing 52.50% of the total. They are followed to a lesser extent, by descriptive analysis with 20.00%; and those that in addition to using descriptive analysis combine their data with the processing of other types of analyses: regressions, correlations, MANOVA, etc., which represent 7.5%. It is the same percentage as that of the group that used logistic regression analysis, logit or probit (see Table 4).

Finally, the topics of which there is only one publication (10.00%) are those that use: analysis of variance (ANOVA) and logistic regression, data panel or structural equations, or multinomial logistic regression and later cluster analysis (see Table 4).

Analysis level

Regarding the level of analysis (see Table 5), and following the criteria which were once used by Sternberg and Wennekers (2005), the articles were classified into a micro level, if the empirical paper made use of individual data from GEM databases, into a meso level if it referred to regions and a macro level when it came to data related to countries. The results indicate that most of the papers, specifically 24, focus on the analysis of entrepreneurial activity from a micro perspective (60.00%), while the remaining 16 articles, do it at a macro level (40.00%); having found no evidence of the existence of articles performing analysis at regional level.

Conclusions

In fifteen years, GEM has contributed to build an understanding of the prevalence, nature and role of entrepreneurship in the economy and society in general; in addition to the consolidation

of a large team of researchers worldwide, who annually publish reports and a significant number of monographs on different topics. Among the monographs are highlighted those performed on women, whose results have shown the importance and weight of women in all world economies, including not only those who are already entrepreneurs, but those that are starting a business based on need and/or opportunity, depending on the country where they want to carry it out (Kelley et al., 2013).

Considering these aspects, this paper has carried out a bibliometric analysis of the situation and development of research in “*entrepreneurship*” from the gender perspective, based on GEM for the period 1999–2015, focusing on journals indexed in WOS. The results reveal a low scientific production in this field, based on the gender topic and with GEM data (40 articles). However, given the large volume of data and researchers of GEM, it is expected that the trend will develop at a growing pace, as it is evident that there is a significant “gap” of research to fill, due to the positioning that the discipline of entrepreneurship in academia is acquiring.

Except for the journal *Small Business Economics*, which boosts research on GEM, the few articles found are not published in the main journals of the fields of Business (*Academy of Management Review*, *Academy of Management Journal*, *Journal of Management*, *Family Business Review*, *Journal of Marketing*, *International Journal of Management Reviews*) or Management (*Academy of Management Annals*, *Academy of Management Review*, *Academy of Management Journal*, *Journal of Management and Mis Quarterly*), which shows a possible challenge to consolidate gender research based on GEM.

Regarding the life-cycle, if we compare research of GEM generally with GEM/gender, we note that it hardly increases, reaching its maximum value in 2011 with 9 articles, compared to those done the rest of years, among which are 2013, 2014 and 2015 with 5 articles per year. Here, we can distinguish two periods: an initial one until 2011, with 25 articles, and another one from 2012 to 2015, in which growth is observed, and 17 articles are collected.

As for the research topics, most of the empirical papers have focused on the study of the attitudes of respondents (62.50%), although, logically, entrepreneurial activity through its indicator (TEA) has been present in most of them. The rest did it at some stage in particular, being lower those which analyzed the component denominated “entrepreneurial aspirations”, with only one work done by Escandón et al. (2013).

Moreover, regarding the level of analysis considered, it was identified that more than half of the articles point to a micro perspective (individuals) based on logistic, binomial or multinomial regressions (60%) in contrast to a macro perspective (40%) based on descriptive techniques and linear regressions. These results indicate the limited use of information obtained from experts, together with the non-existence of qualitative work, as well as the use of regional data, which make future lines of research likely.

With regard to authors' productivity and articles, the most productive in this type of research has been Bahn with 5 articles; followed by Amorós, Álvarez, Minniti, Terjesen and Urbano, with four articles, which represent 50% of the total production. However, the most cited article, with 100 citations, is by Langowitz and Minniti (2007), titled "The Entrepreneurial Propensity of Women". It is followed by those by Verheul et al. (2006), Minniti and Nardone (2007), and Baughn et al. (2006), with 69, 56 and 50 citations respectively.

The United States and Spain are included among the most active countries in scientific journals indexed in WOS with 11 and 10 articles respectively; i.e. more than half of the production of GEM regarding gender.

The average number of authors per article is 3.2, indicating that researchers prefer to work in teams due to its complementarity, leaving aside individualism that once existed. Proof of this is that only one article written by a single author was found.

In short, we can say that although in general terms, research on GEM and the publication of articles indexed in the Web of Science (WOS) has progressed in recent years (Álvarez et al., 2014), in the case of the publication of gender studies based on GEM data, it seems not to have taken off yet, requiring more researchers from different countries and institutions to get involved to publish in journals of greater impact, in which there are many "research niches" yet to cover in terms of topics, macro analysis, with the use of global or regional APS data, and especially NES.

Finally and regarding limitations and future lines of research, we find them in the databases used for the study, since many publications were left out, that even though they can be of quality are not included in the WOS. In addition, we must assume as limitation the possibility of some documents that although they deal with the topic of gender and entrepreneurship with GEM data, could have been left out of the study because the keywords used to search could have excluded them from the results. Publications together with other quality scientific documents have been ruled out in the study, since in this research only scientific articles have been taken into account.

As for future lines, we propose a citation analysis on the same research topic in order to identify the authors and seminal works of this research field.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at [doi:10.1016/j.redleen.2016.09.002](https://doi.org/10.1016/j.redleen.2016.09.002).

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