

Women in Science and Higher Education

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INTRODUCTION

Women's participation in science higher education as an indicator of social and economic progress has attracted considerable attention from individual researchers and national and international organizations. A variety of initiatives have been undertaken to analyze the participation of women in this area and to promote gender equality; these have resulted in a large number of reports. In this context, the main objective of this study is to assess and map international research concerning gender in science and higher education.

To do so, three studies were designed: First, to examine the development and growth of scientific literature on women in science and higher education, Second, to map and analyze the structure and evolution of the scientific literature on gender differences in higher education and science, focusing on factors related to differences, and finally to investigate the relationship between gender, teamwork and different aspects of research funding.

METHODS

For the first study, a total of 1415 articles and reviews published between 1991 and 2012, were extracted from the Thomson Reuters Web of Science (WOS) database. For the second study, the data set comprised a corpus containing 651 documents published between 1991 and 2012, extracted from the Web of Science database. The data set for the last study comprised 1007 articles in the field of Neuroscience indexed in the WOS database between 2009 and 2013, using stratified random sampling. The methodology and procedures used for calculation in the first study included standard bibliometric indicators and laws (e.g., Price's, Lotka's, and Bradford's laws), Relative Intensity Index (RII) and the Gender Inequality Index (GII). The data set of the second

study was evaluated for different time periods (1991-2001, 2002-2007, and 2008-2012); and co-word and hierarchical cluster analysis were undertaken. For the third study, presence of women per paper and authorship positions (first author, corresponding author and last author) by gender were analyzed. Gender composition of author teams was also studied by examining whether male and female authors had the same gender collaborators in authorship teams (i.e. female-only teams, male-only teams, female-male teams). Additionally, different aspects of funding including the number of funding sources, nature of funding sources, type of funding sources and internationality of funding sources were examined.

RESULTS

The results of the first study suggest an upward trend not only in the number of papers (Figure 1) but also in the number of authors per paper (Figure 2). However, this increase in the number of authors was not accompanied by greater international collaboration.

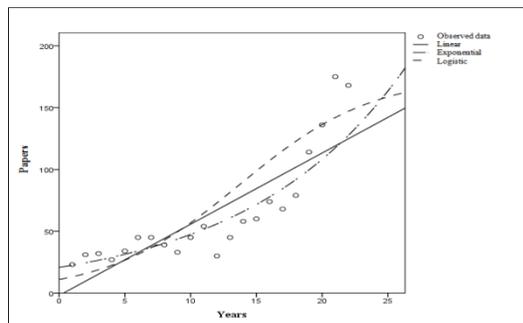


Figure 1. Growth of literature over time (1991-2012): linear, exponential and logistic regression model fit to Price's law.

The interest in gender differences in science extends to many authors ($n = 3064$), countries ($n = 67$), and research areas ($n = 86$). Finally, countries with higher levels of inequality (higher GII values) tend to present higher relative values of scientific productivity in the field.

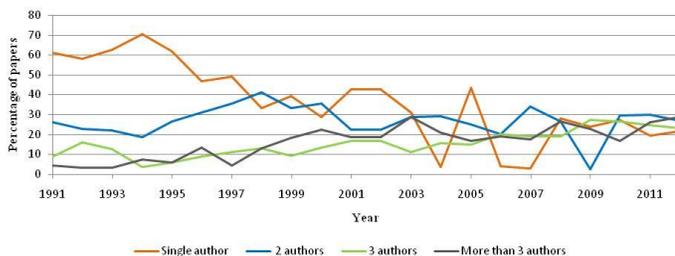


Figure 2. Changes over time (1991-2012) in the number of authors per paper.

The results of the second study showed diversity of themes over the years, ranging from four in the first period to ten in the second and sixteen in the third period (Figure 3). Only four motor-themes appeared in the upper-right quadrant of the diagrams and regarded as mature and well-developed themes. These themes in

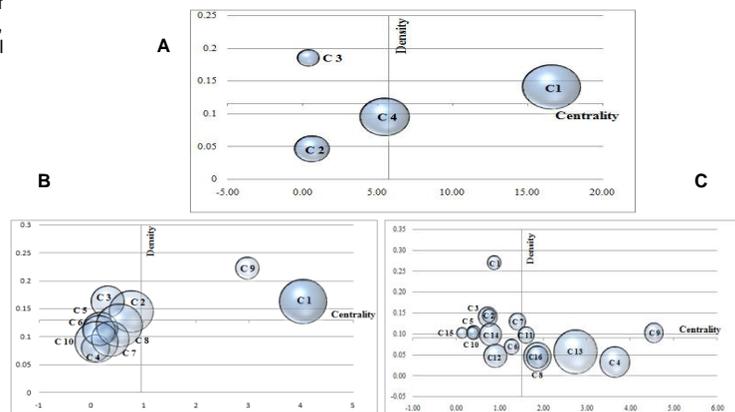


Figure 3. Strategic diagram for first (A), second (B) and third time period (C)

each period were "Gender discrimination in labor markets and universities" in the first period, "Career satisfaction in medicine" and "Academic career in sociology" in the second period, and "Advancement in academic medicine" in the third period. Only two themes, "Mobility of women academics" and Gender discrimination in labor markets and universities", were present in all three periods.

Table 1: Average proportion of women in the sample based on the gender of the first author, last author and corresponding author (2009-2013)

Author positions	Proportion of authors by gender	Mean (SD)	t-test (d.f.)	p-value
First author	Men (n=585)	0.23 (0.22)	-18.318 (979)	<.001
	Women (n=396)	0.50 (0.22)		
Last author	Men (n=736)	0.26 (0.21)	-20.162 (979)	<.001
	Women (n=245)	0.58 (0.22)		
Corresponding author	Men (n=693)	0.21 (0.21)	-19.702 (979)	<.001
	Women (n=288)	0.55 (0.23)		

SD: Standard deviation, d.f.: degrees of freedom, p: level of significance

The results of the third study showed that the percentage of women signing as first author (40.4%), last author (25.0%), or corresponding author (29.4%), was lower compared to the percentage of men in these positions. However this proportion varied depending on the gender of the first author, last author and corresponding author. That is to say, when the author in these positions was female, the average proportion of female co-authors per paper was higher, whereas when the first author was male, the average proportion of women was significantly lower (Table 1).

However, there is no effect of gender on receiving funding support (i.e. funding vs non funding, national vs international, private vs public sources).

CONCLUSIONS

- The study showed a significant increase and interest in the field of women in science and higher education over the last 21 years.
- The number of themes studied by scholars in the field of women in science and higher education has increased significantly over the years and gender differences in higher education and science have been considered by specific research disciplines.
- The percentage of women signing as first author, last author or corresponding author was lower compared to the percentage of men in these positions.
- There is a bias in the presence of women depending on the gender of the first author.
- The funding sources seem to distribute proportionally between genders.