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Gender difference in publication among recent OR/MS scientific publications in top journals

Diferencia de género en publicaciones recientes en el área de OR/MS en revistas científicas de gran reputación

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ABSTRACT:

In this paper, we undertake a statistical analysis that uses Estimation Theory in order to measure the participation of women as authors (or co-authors) in top publications in the fields of Operations Research and Management Sciences in recent years. Our results are based on a survey of articles published in top international journals between 2008 and 2013. Our findings show that the participation of women is much lower than their male counterparts. Moreover, we further analyze the papers in our survey in order to obtain insights regarding other aspects such as the subjects in which women tend to focus the most. We also discuss some potential implications of our findings along with future research directions.
Keywords: Estimation Theory, Operations Research, Management Sciences

RESUMEN:

En este artículo, se lleva a cabo un análisis estadístico en el que se aplica Teoría de la Estimación con el fin de medir la participación de las mujeres como autoras (o co-autoras) en las principales publicaciones de los últimos años en los campos de Investigación de Operaciones y Ciencias de Gestión (OR/MS por sus siglas en inglés). Nuestros resultados están basados en una revisión de artículos publicados en las principales revistas internacionales entre el 2008 y el 2013. Los resultados muestran que la participación de las mujeres es mucho menor que la de sus homólogos masculinos. Además, también se analizaron los artículos con el objetivo de obtener ideas sobre otros aspectos, como los temas en los que las mujeres tienden a centrar sus esfuerzos científicos. También se discuten algunas implicaciones potenciales de nuestras conclusiones, junto con líneas de investigación futuras.
Palabras clave: Teoría de la Estimación, Investigación de Operaciones, Ciencias de Gestión

1. Introduction and literature review

In recent years, the amount of women enrolled in majors related to science and engineering

has been increasing. In this regard, in Long (2001) the author reports that since 1995, women's enrollment in doctoral programs related to science and engineering has increased in about 32%. Sonnert et al. (2007) also have reported that the percentage of women in major and bachelor degrees in science and engineering have risen steadily and in a remarkably linear fashion between 1984 to 2000. However, these fields still seems to attract a significantly higher amount of men than women. In fact, according to Long (2001), while hundreds of men graduate each year in fields such as engineering, chemistry and mathematics, we only see tens of women graduating in the same fields.

Among all of the branches of engineering, it is believed that Industrial Engineering (IE) is the one that attracts more women. According to Harrisetal et al. (2004), women's enrollment in IE has been increasing during the last 50 years. In fact, the authors conducted a pilot census at Oklahoma University, where they found that approximately 50% of the students enrolled in IE undergraduate majors were female. The authors have reported that they have found basically the same behavior at other universities. The study given by Brawner et al. (2012) also shows that IE seems to be the field of engineering that attracts more women. However, in their report they found that only about 37% of the students enrolled in IE are women. Similar results were reported by the National Science Foundation (NSF), who has found that about 25% of all IE students enrolled in graduate program in U.S. are women versus 23% when considering all of the engineering fields (available at http://www.nsf.gov/statistics/wmpd/2013/pdf/tab3-4_updated_2014_10.pdf). Similar percentages are presented in Humphreys et al. (1992).

Considering the gender differences mentioned above, we should not be surprised to find that there is a tacit consensus regarding the fact that women's participation in scientific publications of all kinds is considerably lower than men's (kyvik andTeigen, 1996; Long, 2001; Xie and Shauman, 1998). According to estimations from Cole and Zuckerman (1984) "(…) women published slightly more than half (57%) as many papers as men (…)". In a more recent research, Brawer (1994) has reported that the amount of papers published by women is approximately between 50% and 60% of men's publications of the same age.

Similar findings were reported in Xie and Shauman (1998). However, in the same paper the authors conclude that the overall gap in the amount of women and men scientific productivity has declined during recent years. According to their reports, the female-to-male ratio in productivity increased from 60 to 65 percent between 1969 and 1973, and from 75 to 80 percent between 1988 and 1993. Although the numbers still favor men, they suggest that the situation has become more equitable over the observed time period.

Some researchers argue that some of the reasons for the lower participation of women in scientific publications are related to the fact that women face more difficulties than their male counterparts when trying to publish their work (Jimenez et al., 2008). In this regard, Jimenez et al. (2008) states that evidence suggest that women tend to work on soft lines of research, and are assigned subordinate, auxiliary and temporary roles. Also, Jimenez et al. (2008) argue that it is common that research that had been undertaken by women researchers is attributed to their men colleagues. Moreover, there are some prejudices that suggest that women do not easily fit into scientific dynamics and environments, due to their family responsibilities. According to Jimenez et al. (2008) such prejudices have had a negative impact in the value that is commonly given to studies that focus on gender and women. Leaving aside prejudices, according to Uvarova, (2009), one of the reasons for the low participation of women in scientific publications is that they care more than men about spending time in family-related activities. Also, it seems that women less than men aim to the top of engineering and technology research.

The difference in the scientific productivity between men and women seem to be universal across fields and nation. In this regard, Aksnes et al. (2011) explains that we can also find lower citation rates for women than for men. However, the difference in citation rates is much lower than the one observed when considering the number of publications. According to Aksnes et al. (2011), this might suggest that scientifically active women are more worried about quality than quantity, which has resulted in a higher average citation rate per paper.

All along we have that: (1) women's enrollment in science and engineering programs is

lower than men's, (2) IE is the engineering field that most attract women, and (3) scientific production of women is much lower than men's. Additionally, we have seen that there seems to be an increasing trend regarding women's enrollment in IE and their participation in scientific publications. The main question that we would like to answer in this paper is: taking into consideration that women might be more focused on quality than on quantity, and considering the recent trend of increased participation of women in IE, do we have statistical evidence that the proportion of women's high-quality, recent publications in IE is comparable to men's? If not, how can we compare women's productivity versus men's for the specific case of IE? What is a fair estimation of the proportion of articles with at least one woman as a co-author? However, IE is a vast body of knowledge that comprises areas such as Operations Research and Management Sciences (OR/MS), Human Factors, and Production, among others. In order to keep our work within a reasonable extent, we focus only on analyzing the participation of women in publications related to OR/MS. This paper was in part inspired by the INFORM's Forum of Women in OR/MS (WORMS). Our paper is in part a recognition to the importance of their work.

We answer our proposed research questions by using Estimation Theory in order to estimate the proportion of recently published articles in top-ranked journals where women act as authors or co-authors. To do so, we have conducted a survey of papers published between 2008 and 2013 in OR/MS. All of the papers included in our survey belong to well ranked journals, since our interest is to study women's participation in high-quality, and well recognized publication sources. Additionally, we analyze the areas of OR/MS in which women have a greater participation, based on the articles in our survey. We expect that this information can help us to obtain insights regarding the type of research that motivate women the most. To our knowledge, no previous paper has addressed the research question pursued in this paper before.

The remaining of this document is organized as follows: Section 2 presents our research methodology; Section 3 offers the results obtained from applying the proposed methodology; Section 4 shows our insights regarding the findings presented in Section 3. Finally, Section 5 presents our conclusions and future research directions.

2. Methodology

In this section we describe our methodology for gathering the papers in our survey as well as our statistical analysis for estimating the proportion of papers with female authors.

2.1. Search of papers for our survey.

We used the SCOPUS database to conduct our survey. We included only journals that were published between 2008 and 2013, which considered OR/MS as one of their main fields. As mentioned before, we have considered only top-ranked journals. In order to decide whether or not to include a certain journal as top-ranked, we have used the classification scheme given by SCImago Journal & Country Rank. Such a scheme classifies journals according to their impact factor and overall prestige into quartiles, where the lower the quartile, the better the journal's classification (Scimago, 2007). For our survey, we only consider papers belonging to journals related to OR/MS that were classified into Q1 and Q2 by the SCImago Journal & Country Rank in 2014. We would like to remark that by no means we intend to judge the quality of any journal.

As a result of our search methodology, we selected a total of 28 journals in Q1 and 29 in Q2. For each journal we recorded the number of articles published between 2008 and 2013. In Table 1, we present the title of each journal included in our survey along with its International Standard Serial Number (ISSN), and the number of articles published in the selected period.

Table 1
Journals included in our survey and their corresponding quartile according to SCImago Journal & Country Rank and SCImago Journal Rank (SJR)

Journal Title	ISSN	SJR	Articles between 2008-2013
Vital and health statistics.	00832006	Q1	6
Journal of Operations Management	02726963	Q1	261
Management Science	15265501	Q1	885
Omega	03050483	Q1	517
Operations Research	15265463	Q1	693
Transp. Research, B: Methodological	01912615	Q1	553
Computers and Operations Research	03050548	Q1	1575
Manufac. and Service Oper. Management	15265498	Q1	256
Research Policy	00487333	Q1	783
European Journal of Operational Research	03772217	Q1	3780
Journal of Informetrics	17511577	Q1	386
Transp. Research. A: Policy and Practice	09658564	Q1	575
Production and Operations Management	10591478	Q1	401
Inter. Journal of Production Economics	09255273	Q1	2023
Operations- Research- Spektrum	14366304	Q1	251
Transp. Resear. E: Log. & Transp. Review	13665545	Q1	524
INFORMS Journal on Computing	15265528	Q1	310
Journal of Manag. Inform. Systems	07421222	Q1	270
Transp. Rese. Part C: Emerging Tech.	0968090X	Q1	594
Surveys in Oper. Rese. & Manag. Science	18767354	Q1	17
Journal of Business Logistics	21581592	Q1	87
Journal of Quality Technology	00224065	Q1	175
Journal of Heuristics	15729397	Q1	202
Management Decision	00251747	Q1	565
Journal of Scheduling	10946136	Q1	302

Annals of Operations Research	15729338	Q1	1133
Journal of the Opera. Research Society	14769360	Q1	1072
Intern. Journal of Production Research	1366588X	Q1	2365
Mathematics of Operations Research	15265471	Q2	282
Flexible Serv. and Manufacturing Journal	19366590	Q2	116
Journal of Eng. and Tech. Management	09234748	Q2	133
Naval Research Logistics	0894069X	Q2	318
Quality and Reliability Eng. International	10991638	Q2	597
Jour. of Loss Prevent. in the Proc. Indus.	09504230	Q2	775
Journal of Management in Engineering	0742597X	Q2	231
Journal of Manufacturing Processes	15266125	Q2	203
Central Europ. Journal of Oper. Research	1435246X	Q2	263
Journal of Optimization Theory and Applications	15732878	Q2	1058
Operations Research Letters	01676377	Q2	718
Journal of Global Optimization	15732916	Q2	909
Journal of Forecasting	1099131X	Q2	255
Personal and Ubiquitous Computing	16174909	Q2	516
Socio-Economic Planning Sciences	00380121	Q2	156
Engineering Optimization	10290273	Q2	423
Public Transport	1866749X	Q2	73
Journal of Managerial Psychology	02683946	Q2	269
Sport Management Review	14413523	Q2	196
Information Processing and Management	0306-4573	Q2	473
Production Planning and Control	13665871	Q2	431
International Journal of Shipping and Transport Logistics	17566525	Q2	107

Interfaces	1526551X	Q2	271
International Transactions in Operational Research	09696016	Q2	136
Queueing Systems	15729443	Q2	293
Foresight	1463-6689	Q2	203
Optimization	10294945	Q2	553
Probability in the Engineering and Informational Sciences	14698951	Q2	208
Research in Transportation Business and Management	22105395	Q2	119

2.2. Application of estimation theory for establishing the proportion of publications with women authors.

Let us define as the proportion of papers with at least one woman acting as author or co-author. In this section we describe our statistical methodology for estimating the value of .

We have implemented an estimation procedure for creating a confidence interval that we expect that contains the actual value of . The methodology can be summarized as follows (Walpole, 1993; Montgomery, 2010):

1. Take an initial random sample of size   to compute a preliminary sample value of , namely .
2. Set a desired level of confidence for estimation procedure , as well as the allowed maximum sample error . Such a sample error equals one half of the width of the confidence interval.
3. Use the value of   to compute the required sample size in order to guarantee the desired level of confidence and the maximum sample error allowed. If the sample size is less than , use and to build the confidence interval. Otherwise, take additional observations to complete the required sample size. Use the whole sample to compute the confidence interval for .
4. Build the confidence interval for .

In the next section we present the results obtained by applying the methodology hereby presented. Additionally, we present an extended analysis of the papers in our survey, to obtain insights regarding the ost popular OR/MS subjects among publications in our survey, specially those with at least one woman as author or co-author. Our purpose is to understand which OR/MS subjects seem to attract authors the most. Particularly, we would like to test if there are certain subjects that seem to draw women's attention.

3. Results

We first present the estimation for the proportion of articles with female authors in our survey by applying the methodology explained in the previous section. Then we offer our results regarding the most popular OR/MS subjects in our survey.

3.1. Estimated proportion of articles with female authors.

In this section we show how we have implemented the steps described in the previous section.

1. *Initial sample:* The complete list of journals in our collection is presented in Table 1. In total, we achieved a collection of 30 846 papers. Each of these papers was assigned a unique number from 1 to 30 846. For instance, the first journal in our list is "Vital and health statistics. Series 13, Data from the National Health Survey" which contained a total of 6 papers related to OR/MS that were published between 2008 and 2013. Therefore, each of the papers within this journal was assigned a unique number between 1 and 6. The next journal in our list is "Journal of Operations Management", which contains 267 papers related to OR/MS during the same period (2008 to 2013). For this second journal, we continued numbering papers from 7 to 273, and so on. Then, we generated 50 numbers from 1 to 30 846. The papers corresponding to the random numbers that we had generated were candidates to conform our initial sample. Notice that, by proceeding in this way, all of the papers have the same probability of being selected. Also, notice that journals with a greater amount of papers were more likely to appear in our initial sample. For every candidate paper, we took care of briefly reading the corresponding abstract to guarantee that the paper complied with the scope of our survey. Among the 50 papers that belonged to our initial sample, we found that 16 of them had women as authors or co-authors, which gave us a value of $\hat{p} = 0,32$.

2. *Setting level of confidence and sampling error:* The level of confidence was set at the standard value of 95%. Regarding the maximum sampling error, it was set at 0.05.

3. *Computing the required sample size:* We applied the formula for a finite population to get the corresponding sample size:

$$n = \frac{z_{\alpha/2}^2 p(1-p)}{e^2} \tag{1}$$

where e is the maximum sampling error and $z_{\alpha/2}$ is the value from the Standard Normal distribution for which the cumulative probability is equal to $1 - z_{\alpha/2}$. Since our initial sample size was lower than 334, we took additional random observations until we completed the required sample size.

4. *Establishing the confidence interval for* p: Among the 334 papers analyzed, 109 include at least one woman as author or co-author, which corresponds to 32.6% of the sample. We used the following expression to compute the limits for the confidence interval for p (Walpole, 1993; Montgomery, 2010):

$$h = \hat{p} \pm z_{\alpha/2}\sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \tag{2}$$

Finally, the confidence interval for p becomes

$$0,3263 \pm 1,96\sqrt{\frac{0,3263(1-0,3263)}{334}} \tag{3}$$

Then we have

$$0,2760 \leq p \leq 0,3766$$

As it can be seen, with a confidence of 95% we can state that the proportion of papers with at least one female author is between 27,60% and 37.66%. This suggests that the percentage of papers with women authors is significantly lower than those with male authors. Notice that we can conclude that a percentage between 62% to 73% of the papers related to OR/MS published between 2008 and 2013 had only male authors. This means that more than half of the papers are written exclusively by male authors. Moreover, out of the 32,6% of the papers that have at least one woman as co-author in our survey, 31% were papers written by women in collaboration with their male counterparts. In fact, among the 334 papers, we found a total of 884 authors, where approximately only 15% were women.

To further analyze the behavior of gender differences in our survey, we classified the papers into two categories: (1) papers written by authors of the same gender (female and male, separately), and (2) bi-gender papers, i.e. papers with both male and female authors. Figure 1 shows our results. As it can be seen, most of the women's publications also include at least one man as a co-author. On the other hand, we can infer that men usually publish their work in collaboration with other men.

Figure 1
Classification of articles by Authors' Genders

Classification by Gender

31%   2%

- ■ Only female authors
- ■ Only male authors

67%
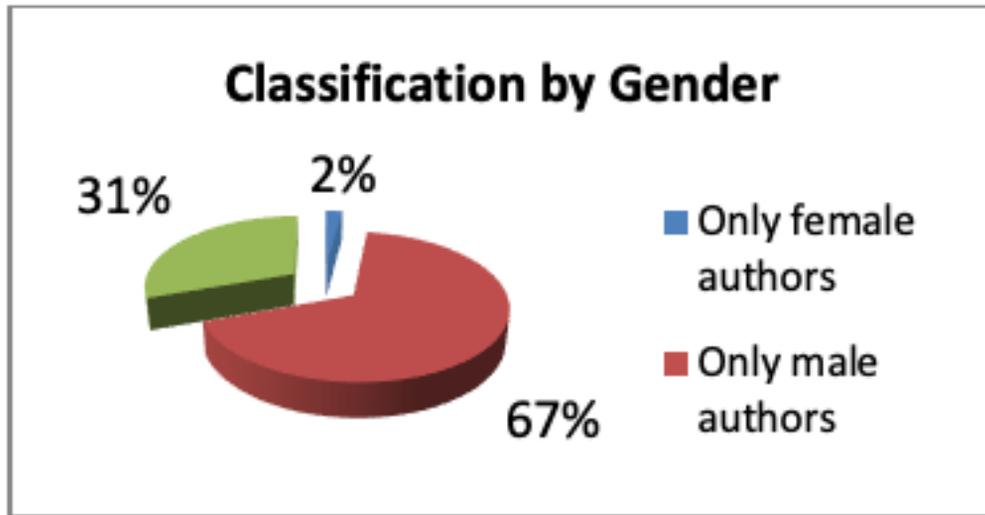
3.2. Popular OR/MS Subjects in our Survey

In this section we are interested in analyzing the main subjects that seem to draw OR/MS scientists' attention. Specially, we seek particular interests among female authors.

The definition of subjects for our analysis is based on the "Subject classification scheme for the OR/MS" (Journal of Operations Research, n.d.). According to such a taxonomy there are 24 main subjects, where each one has its own subtopics index. The main topics are organized into 10 different categories according to their similarity. The taxonomy is structured as shown in Table 2.

To perform our analysis, we proceeded as follows: we first classified all of the papers, without making any distinction between articles with male or female authors. Then, we performed the classification by considering only papers with at least one female author. We would have liked to finish our analysis by considering only those papers written exclusively by women. However this latter set is conformed only by seven papers. Therefore, it will be analyzed separately. Our results are shown in Figure 2. Note that, for each case, the percentages in Figures 2 sum up over 100%. The reason for this is that, even though that we tried to classify each paper into only one subject, there are papers that are better classified into more than one subject category. For instance, there are papers that focus on probability (Category 2 in Table 2), but also addresses marketing related issues.

Table 2
Taxonomy for OR/MS subjects

Category	Subtopics	Subject
1	1	Computers/computer science
	2	Simulation
2	3	Economics
	4	Cost analysis
	5	Finance
3	6	Dynamic programming
	7	Production/scheduling
	8	Networks/graphs

	9	programming
4	10	Games/group decisions
	11	Education systems
	12	Organizational studies
	13	Information systems
	14	Research and development
	15	Decision analysis
5	16	Probability
	17	Forecasting
	18	Statistics
6	19	Marketing
7	20	Inventory/production
	21	Manufacturing
8	22	Mathematics
9	23	Reliability
10	24	Transportation

As it can be seen, in both cases most of the articles fall into Category 3, which includes topics related to programming, mathematical models, heuristics, scheduling, and algorithms, among others. From Figure 2 it is clear that there is little scientific production in Category 6, which relates to marketing. When considering papers with at least one female author, we can notice that, again Category 3 has a high relative frequency, but so does Category 4, which relates mostly to theoretical and soft OR/MS research, such as bargaining, bidding, auctions, motivation, incentives, and leadership, among others.

Figure 2
Percentage of papers by OR/MS categories
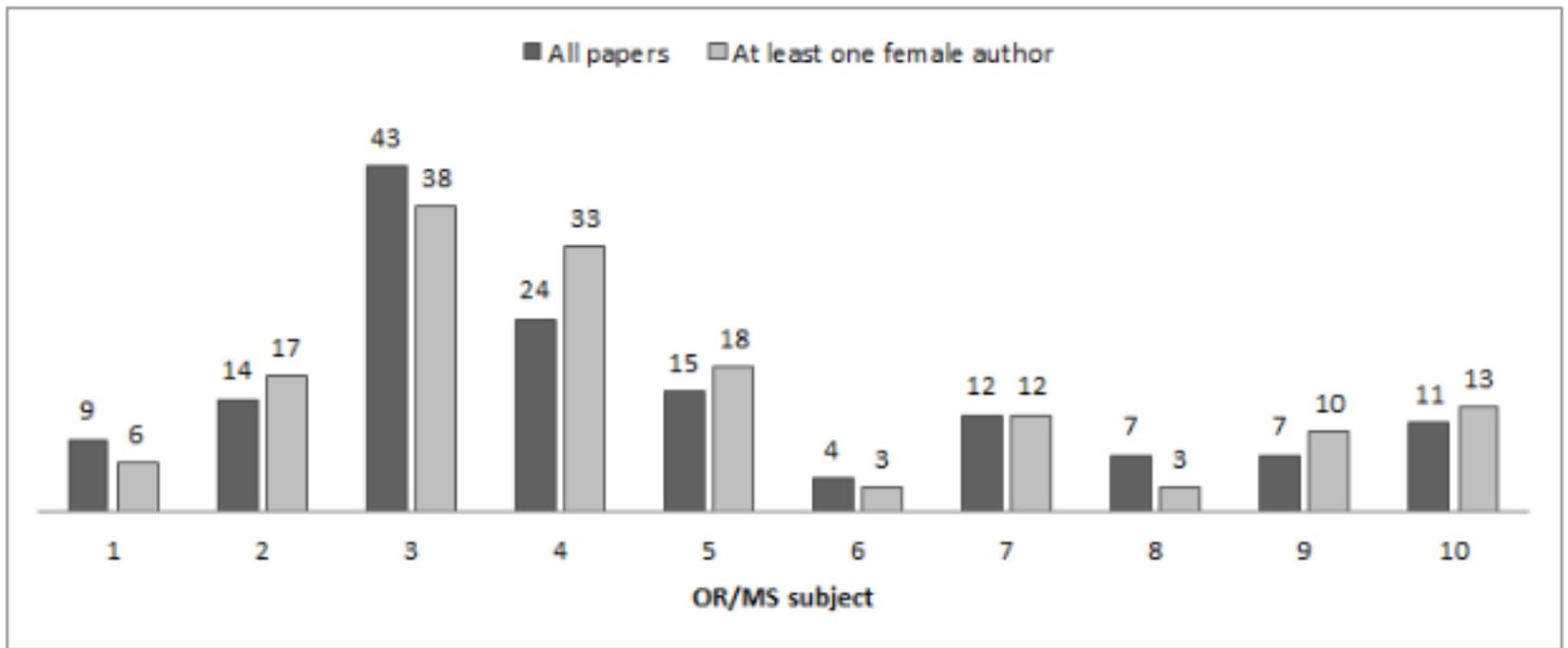
Finally, when analyzing those papers written solely by female authors, we find some dominant subjects, which are categories 2 (financial topics), 3 (programming, networks), and 10 (transportation). None of the papers written solely by female authors in our survey were classified into categories 1 (simulation and computational methods), 5 (probability, forecasting and statistics), 6 (marketing), or 8 (mathematics). Unfortunately, the sample size for this latter group is too small so that we could attempt to deliver any general conclusion.

4. Discussion

In Section 1 we posted our main research questions as:

- Do we have statistical evidence that the proportion of women's high-quality, recent publications in OR/MS is comparable to men's?

- If the answer to the previous question is negative, how can we compare women's productivity versus men's for the specific case of IE?

- What is a fair estimation of the proportion of articles with at least one woman as a co-author?

Based on the statistical analysis presented in Section 3 with a confidence of 95% we can conclude that despite the recent trend of increased participation of women in IE, their participation in OR/MS scientific publications is much lower than for men. Moreover, if we compare the percentage of papers with at least one female author, it represents between 50 and 60 percent of papers with only male authors. Notice that our statistics are more consistent with those reported by Brawer (1994) than with those reported in the more recent review given by Xie and Shauman (1998), who had found that the female-male ration in productivity was between 75 to 80 percent between 1988 and 1993. Also, recall that among the authors in our survey, only 15% were women.

Additionally, we have seen that it is extremely rare to find papers written only by female authors, whereas it is usual to find papers written only by men. In fact, Furthermore, when comparing papers with only women authors in our survey, they represent only about 3% of the percentage of papers that belong solely to male authors. This brings new questions to our analysis: do men prefer to write papers with other male authors? Or, it is a mere consequence of having more male scientists in OR/MS?

Also, in Section 1 we mentioned that some authors such as Jimenez et al. (2008) have reported that women seem to be more attracted to theoretical and soft topics. However, this is not necessarily true, since in our survey we have found that women have more publications in quantitative topics. However, the second most popular topic is indeed related to soft subjects. Another interesting finding is that, besides Category 3, the other categories with strong quantitative background (1, 5, 6 and 8) seem to be the least popular among women. These categories refer to topics such as simulation, probability and statistics, and

mathematics. Together, they account for less than 30\% of the papers. Do these findings reinforce that women tend to focus more on soft OR/MS topics? Probably not, since these categories are not so popular when considering both female and male authors. A more coherent conclusion would be that these categories seem to be less popular among OR/MS researchers despite their gender.

To end our analysis, we looked for insights regarding authors' affiliations by country. We first considered all of the authors in our survey, and then only those who were female. Our interest was to evaluate if there were differences between affiliations across the world when considering male versus female authors. Surprisingly, our findings show that there are no virtual differences in those two cases. Since results are highly similar for both contexts, we only present those obtained for the former case (Figure 3). As it can be seen, most of the papers have authors with European affiliations, followed by North American and Asian, in second and third place respectively. Papers with authors' affiliations corresponding to South America, Africa and Oceania represent less than 15% of the papers in our survey.

Figure 3
Authors' Affiliation
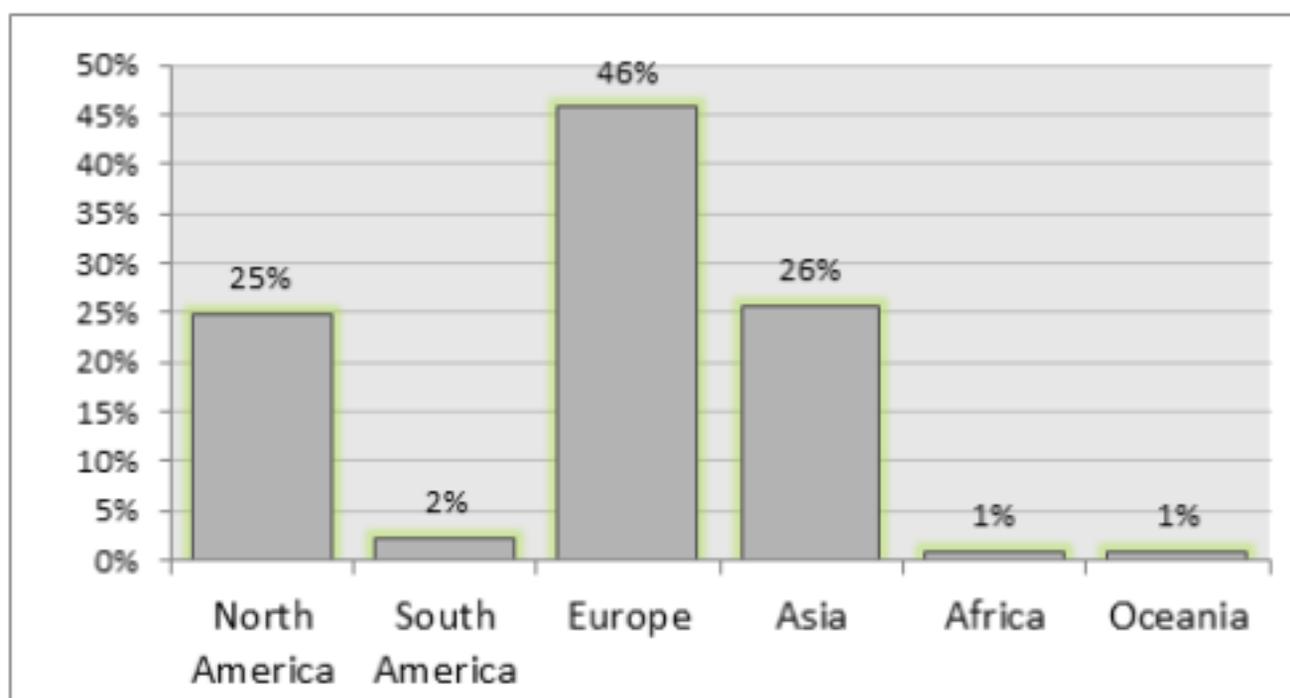
Regarding author's affiliations, it was interesting to find that most of the authors have European affiliations. This contrasts with reports from previous papers in specific areas of OR/MS such as that given Galindo and Batta (2013) who found a greater proportion of papers coming from American universities. An immediate question that arises from this behavior is: is the dominance of European affiliation a consequence of considering only papers belonging to journals in Q1 and Q2? What implications can we derive regarding quality of papers published from European universities versus American? In an attempt to answer these questions, we have further analyzed the characteristics of the OR/MS journals. In this regard, according to the 'Country Rankings' of SJR among 57 OR/MS journals indexed in Q1 and Q2, 28\% belong to the North America region and 72\% to Europe. Perhaps, this can be one of the causes for which we are finding more European affiliations in our survey.

5. Conclusions and future research directions

In this paper, we present new evidence about gender differences in scientific production in top journals in OR/MS between 2008 and 2013. We collected a representative sample of papers from the SCOPUS database. From our survey, we have found that women publish fewer papers than men. In fact, our findings show that papers with at least one female author in the quartiles analyzed (Q1-Q2) reached nearly 33%. This percentage is considerably low, despite that OR/MS is an essential field in IE and that the proportion of women enrolled in Master and Ph.D. programs in IE has increased during the last years.

Moreover, we have found that only 2% of the papers in our survey were written by women. This is not necessarily a bad symptom, since inter-gender papers might suggest a good

collaboration between men and women. However, when we compare this 2% to the 67% of papers that are written only by male authors, some questions arise. Perhaps, this gap is due to the fact that there are more male researchers in OR/MS. In fact, among the papers in our survey, we found a total of 15% of female authors versus 85% corresponding to male authors.

From our point of view, our analysis regarding the most popular subjects among women can be seen from two perspectives: one is to use the topics that seem to attract women the most to create motivation strategies in order to attempt to increase the participation of women in scientific research; the other is to try to analyze what is happening with the least popular topics, which happen to be also not so popular among men. This would be worth of investigation, since such least popular topics are highly relevant within OR/MS research and they have an important potential to contribute to theoretical, modeling and application studies in OR/MS.

Regarding affiliations, we found no significant differences when considering women alone, men alone or both. An interesting finding is that a high percentage of the papers in our survey have European affiliations. We have provided some possible reasons for this result. Another important finding in this respect is affiliations corresponding to South-America, Africa and Oceania are very scarce. These regions of the world still are well underrepresented in scientific production. Here we see an opportunity of improvement by encouraging collaboration among authors from different countries. For instance, as stated by Altay and Green (2006), OR/MS research can benefit from international cooperation among authors. For instance, let us consider cooperation among developing and developed countries: on one hand, there is lack of scientific research that directly focus on the special needs of developing countries and also, researchers from such countries might not have the same type of access to advanced technology and information when compared to researchers in developed countries.

From our findings we have identified interesting future research directions, as follows:

-It would be of value to design and implement surveys in order to obtain insights regarding the reasons that might be causing the low participation of women that we have observed in our study.

-It would also be valuable to design and implement surveys that can help us to understand why some subjects of those presented in Table 1 are not so popular among female OR/MS researchers and among OR/MS researchers in general. These surveys can also be helpful to comprehend why some categories tend to be more popular. Educational and research institutions could use this information in order to create strategies to encourage students and researchers in favor of a given topic that happen to be undervalued or understudied in OR/MS. More important, it is proper to investigate how such understudied topics can impact the future of OR/MS.

-Our findings suggest that male authors tend to work with other male. It would be relevant to further investigate if there is actually a preference of men for working with other men, or if these results are consequence of having more male OR/MS researchers.

-Finally, it would be of value to extend our analysis by considering additional characteristics of the authors, such us age, academic position (undergraduate student, graduate student, faculty, researcher, etc.), among others.

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