

Myths and Realities of Women Doing Science:

The inclusion of women scientists in a mainstream context

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Women's weak representation in science

Women's careers are slower and interrupted;
cyclical instead of lineal

Areas of problems and theoretical approaches:

- Women's personal choices
- Family commitments regarding work-life balance
- Institutional barriers hinder professional advancement
- Hostile male cultures in workplaces

Research question:

Are women developing different careers (according to their scientific fields and research environment) or, on the contrary, are they following the same male strategy?

We compare women's strategies and opinions about their research activity in the research group in which they are involved

We will evaluate the following topics:

1. Women's orientation in research work
2. To what extent their scientific results differ from their male colleagues
3. To what degree women's careers and research activity are internationalised
4. What kind of scientific production women undertake
5. The level of confidence they display about their research results

The study aims to compare men's and women's work in scientific fields through an [online survey conducted in 2010](#) from the Andalusian research community dataset (SICA)

The survey consisted of 4 sections:

1. The characterisation of the researchers' profiles
2. The composition of the research team
3. The description of professional activities developed by the researchers (scientific productivity, use of working hours, funds received, external collaborations, membership in professional networks)
4. Scientists' opinion about their scientific results

All questions were closed; subjective questions using Likert scales

We use open-source platform (Ubuntu-Linux server, LimeSurvey software and R for statistical analysis)

According to SICA, there were 23,400 researchers in 2010, which entails 22.5% of response rate (38,6% women)

We use descriptive and inferential procedures of analysis methods

Table 1. Women and their distribution in scientific fields

	Technologies and Engineering	Life Sciences	Natural Sciences	Social Sciences and Humanities	Total
Women	122 (6%)	510 (24.9%)	462 (22.6%)	953 (46.5%)	2,047 (100%)
Men	489 (15%)	655 (20.1%)	967 (29.8%)	953 (35.1%)	3,254 (100%)

Pearson's Chi-squared test p-value < 2.2e-16

Horizontal segregation of women according knowledge fields

Persistence of vertical segregation because women usually hold low positions

Only one-third of the leaders in SICA research groups were women

Despite, there is no differences about research environment of groups leading by men or women, for example, size of the research group (12 members) and years (mostly created in 1997-98)

We expected that women conduct different type of research, provide a different approach and working styles

Table 2. Main type of research conducted by research groups led by men and women

	Yes		No	
	Women	Men	Women	Men
Basic	152	479	23	57
Applied	156	470	6	40
Technological development	36	189	62	192
Experimental studies	46	198	57	158
Innovation	90	289	20	93
Technical reports	57	193	57	202

About main orientation in research activity, **women showed greater interest in social innovation studies than developing solutions (p<0.0001)**

differences vanish. Thus, survey data confirm that women are more interested in social innovation than technical solutions, which would provide new approaches to the scientific knowledge produced by women

Table 3. Percentage of men and women researchers spending more than three-quarters of their workday on teaching, research, administration and management

	Teaching	Research	Administrative	Management
Women	14.00%	35.00%	8.00%	7.00%
Men	8.00%	24.00%	5.00%	4.00%

Gender differences about master's supervision, whereas men have supervised 1.72 theses in the last three years, women 1.34 ($p < 0.0001$)

Table 4. Mean scientific productivity by sex and relevance of the journals

	Women's mean	Men's mean	p-value
First quartile	4.72	5.41	0.1
Second quartile	3.31	3.30	0.99
Third and fourth quartile	2.36	3.02	0.003*

Men and women show similar publication patterns even for books and chapters of books, although women publish more textbooks and less proceeding books than men.

Table 5. Transfer of knowledge to private sector (percentage participation by sex)

	Women	Men	p-value
Patent registrations	0.43%	0.61%	p=0.002*
Spin-offs	4.00%	9.00%	<0.001*
Start-up companies	3.00%	6.00%	<0.001*
Capital risk companies	1.00%	3.00%	<0.001*

Table 6. Resources received by research groups in the last three years (percentages)

	Women	Men
<25,000	32 (18.4%)	63 (10.2%)
25,000-50,000	24 (13.8%)	71 (11.5%)
50,001-100,000	25 (14.4%)	87 (14.1%)
100,001-250,000	40 (23%)	148 (24%)
250,001-500,000	36 (20.7%)	118 (19.1%)
500,001-1,000,000	10 (5.7%)	92 (14.9%)
>1,000,000	7 (4%)	38 (6.2%)

p=0.005*

Women reveal more critical opinions than men about the quality of their research work

Table 7. Satisfaction with their own research activity

	Above average range	More or less in average range	Below average range
Women	44.5	51.6	4
Men	48.7	46.5	4.8
p=0.002*			

Women participation in professional networks are low

Table 8. Professional networking membership

	Men	Women	p-valour
International committee board	1.35	1.02	0.002*
National committee board	1.17	1.14	0.72

Male culture in SICA fuels women's attitudes on scientific careers following traditional codes

Mainstream and confidence on "neutral" criteria of merit in academia make difficult for women change the rules

Despite horizontal segregation, women are interested in doing any type of research, except developing technical projects. Refining our analysis, we found that women are more interested in social innovation than developing technical solutions

Women spend higher percentage of time doing teaching, research, administrative and management tasks than men. It doesn't support women's low positions

Men show better and higher impact factors than women, although both men and women produce a similar number of articles in second-quartile journals, books and chapters of books

Women are poor knowledge transfer agents, patenting and collaborating with the private sector

Literature states peer reviews underestimate women's research activity which is confirmed by empirical results because although groups led by women received little money, they manage it for doing their best

Visibility of women is scarce because of their scarce participation in professional networks

Limitations

No causes of this attitudes are explored

Target population although survey is representative

New lines of research

Replication

New research environments

Long-term effect

Conclusions

Research of women are situated in a context: women adopt the scientific culture in order to achieve a place in science

Although women show significant differences with respect scientific preferences, work styles and results

