New Data Show Articles by Women Are Cited Less Frequently

By Megan O'Neil
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Research papers and peer-reviewed articles written principally by women are cited less frequently than those whose dominant authors are men, compounding the underrepresentation of women in scholarly publishing, according to a new study.

The study documents a gap often described anecdotally by scientists, and expands on the data set analyzed for gender disparities in previous studies.

Five researchers based at universities in Montreal and Bloomington, Ind., analyzed 5.4 million peer-reviewed articles written by 27.3 million people and published globally from 2008 to 2012. Pulled from the Thomson Reuters Web of Science database, the data cover all academic disciplines.

Titled "Global Gender Disparities in Science" and published on Wednesday in the journal Nature, the study found that the citation gap cut across all research-prolific countries, including those in North America and Western Europe. It remained consistent when the analysis was adjusted for variables including women in the first author position, women in the last author position, single-author articles, and articles produced as part of national or international collaborations.

The gender disparity in citations received was most pronounced in STEM fields like computer science, engineering, and mathematics.

"This is the economy of reputation that works in science," said Vincent Larivière, an assistant professor of information science at the University of Montreal and one of the authors of the study. "Given the culture of evaluation that exists in academia nowadays, it means women are probably less likely to gain top positions in the hierarchy."

The researchers also found that women publish less frequently as part of international collaborations than do their male counterparts, but that alone was not enough to account for the gap in citations.
"It is often said that collaboration is one of the explanations why women are less cited," Mr. Larivière said. "We said, 'OK, we are going to break down the papers by type of collaboration to see whether it evens things out.' Actually, it does not. It is very bad news, in a sense. We cannot infer that there is some sort of mechanical effect in collaboration."

**Differences by Country**

The study does not attempt to pinpoint the cause of the disparity. Sue V. Rosser, provost and vice president for academic affairs at San Francisco State University, who has written extensively about women in science, said factors including differences in mentorship opportunities and the reach of professional networks may contribute.

"Since men dominate the more expensive fields in science, as well as the experimental fields, and have more grants, they tend to have more people in their labs, produce more results, and publish more than women with smaller grants and laboratories," Ms. Rosser wrote in an email.

The study found that women's share of total authorships was slightly less than 30 percent, a figure consistent with the findings of another body of research on the topic, made public last year. For every article published with a female first author, there are almost two published with male first authors. Women did outpublish men in fields associated with care, including education, social work, and librarianship, according to the study.

The gender disparity in scholarly publishing was less pronounced in Eastern European and South American countries, possibly a legacy of the gender parity championed by some Communist governments, the study's authors said. Women's share of total article authorship was greater than men's in nine countries. Four were eliminated from the study as statistically irrelevant, and the remaining five—Bosnia and Herzegovina, Latvia, Macedonia, Sri Lanka, and Ukraine—are countries with low scientific output.

U.S. states with the widest gender gap in terms of the proportion of authorship included New Mexico, Mississippi, and Wyoming. U.S. states and Canadian provinces with the narrowest gender gap were Vermont, Rhode Island, Maine, Manitoba, Nova Scotia, and Quebec.