Factors that affect scientific production in Africa: a gender analysis

Consistent research findings have reported that the scientific production of female researchers is lower than that for men. However, research on this area in Africa, especially with regards to gender, is scarce. Even after half a century of empirical research on gender differences in scientific production conducted in developed countries, no single explanation or group of explanations satisfactorily accounts for the phenomenon. **Professor Catherine Beaudry** from Polytechnique Montréal focuses her research on exploring gender differences in scientific production in Africa.

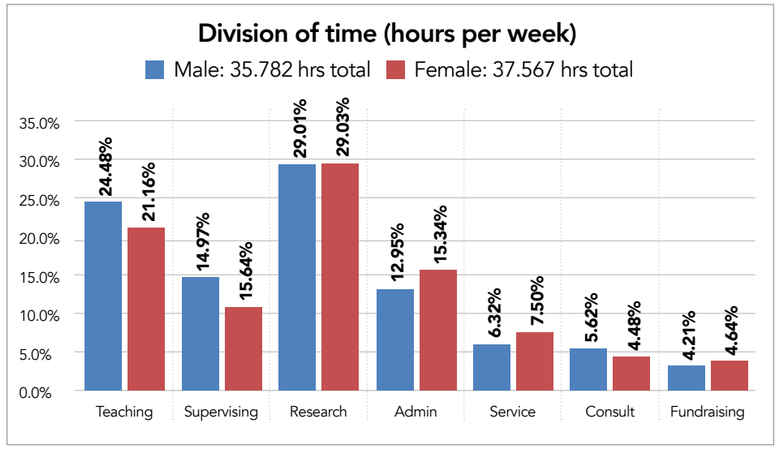
Publishing is a universal tool of measuring scientific production and remains a yardstick for academic promotion, even in academic contexts which do not always support research, such as Africa. African research currently accounts for a tiny fraction (less than 3%) of scientific publications. This is problematic for the potential contribution of Africa's researchers to be realised. Furthermore, one of the most serious gaps that African universities need to close in order to optimise their human potential is the gender gap in research participation. Globally, women account for a minority (28.8%) of the world's researchers and approximately just 24% of researchers in African countries are female. However, research on gender differences in scientific production of researchers in Africa is lacking.

POSSIBLE EXPLANATIONS FOR THE GENDER GAP

There are three primary explanations which have been offered for the gender gap in publication output, including the difference model, family-related responsibilities and the deficit model. The difference model proposes that scientific production differences between women and men originate from their deep-rooted differences in behaviour, outlook and goals. This model is pertinent in a context characterised by strong patriarchal norms whereby women are considered less knowledgeable than their male colleagues, and a deeply rooted traditional African attitude of lower expectations for women. The resulting gender differences are evident in general career motivation and aspirations, self-confidence and self-esteem in relation to research and socialised preferences for caring roles, such as teaching.

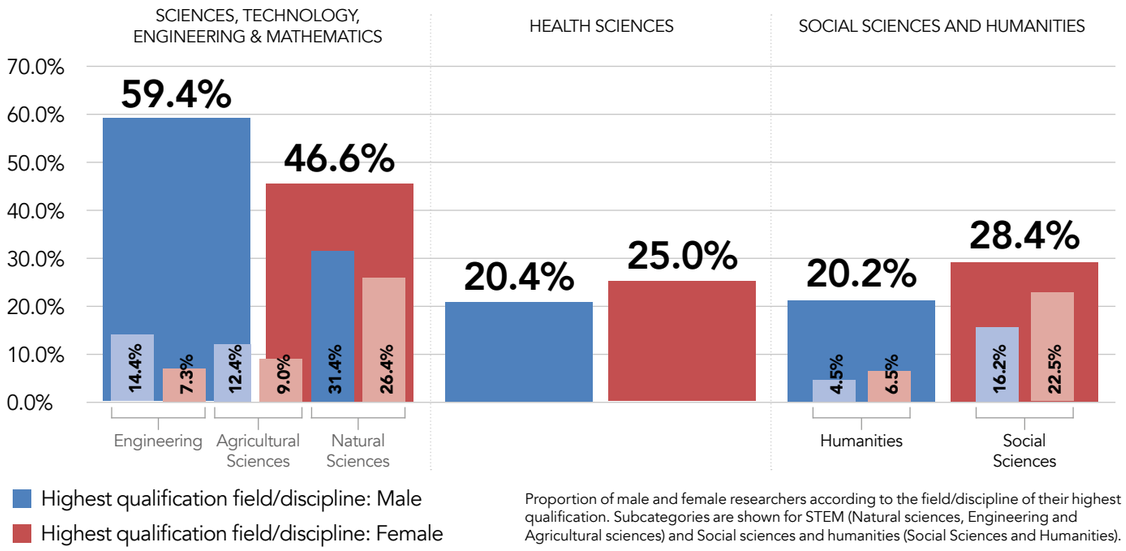
It is often argued that family-related responsibilities, such as child-rearing and home-making hamper women academics' scientific production, by reducing their time and energy for paid work as well as their geographic mobility. A number of scholars have proposed similar arguments with regards to female academic researchers in Africa, in terms of the potential negative impact of these responsibilities in women who take on traditional gender roles within the home.

The deficit model proposes that women publish less than men do because of structural deficits existing within the organisations in which they work. These deficits may limit women's access to the means of scientific production (material research resources) and/or exclude them from male-dominated networks. Women's concentration in lower academic ranks, in applied research and indigenous science characterised by relatively low levels of scientific output, in lower qualification echelons, in less-permanent positions and in employment in sectors that are not conducive to scientific production also forms part of this deficit model.



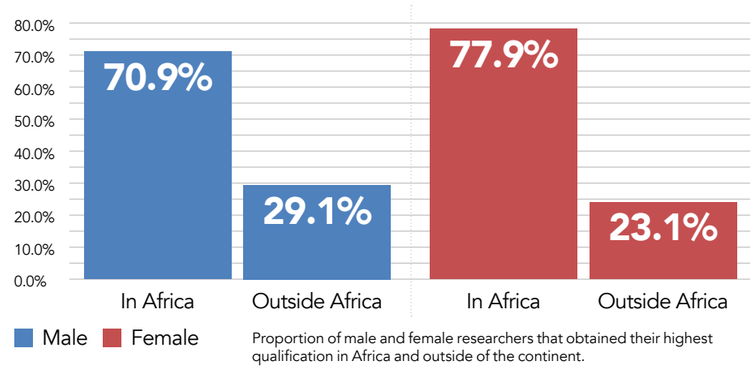
African research currently accounts for a tiny fraction (less than 3%) of scientific publications

Field/discipline of highest qualification



Proportion of male and female researchers according to the field/discipline of their highest qualification. Subcategories are shown for STEM (Natural sciences, Engineering and Agricultural sciences) and Social sciences and humanities (Social Sciences and Humanities).

Location of highest qualification



Proportion of male and female researchers that obtained their highest qualification in Africa and outside of the continent.

A SURVEY EXPLORING GENDER DIFFERENCES IN SCIENTIFIC PRODUCTION IN AFRICA

Catherine Beaudry and Heidi Prozesky conducted a survey to explore gender differences in scientific production amongst academics in Africa. The survey was completed by 7,515 scientists and scholars, 5,050 of whom provided complete questionnaires. 70% of these participants were male and 30% female. Interestingly, both genders obtained their highest qualification at roughly the same age: 35.7 for men and 35.6 for women, which suggests that maternity does not cause delays in the start of one's career. South Africa was the only region found to have a weakly significant difference: women obtained their highest qualification slightly later than their male colleagues.

29.6% of female researchers reported that balancing work and family demands had a significant negative impact on their career, compared to only 17.5% of male colleagues"

Women are usually more present in the health fields and in social sciences and humanities. While this was consistent with several regions in Africa, a greater proportion of women in natural sciences and engineering answered the survey. In South Africa, the only field in which women answered the survey in greater proportion, compared to men, was in the health fields (59.9%). In all other regions/fields, men were found to be the majority. In terms of publication output, Africa does not differ from the rest of the world, in that men were more prolific than women. Similar trends were found for books, conference proceedings papers, contributions to public policy and outreach documents.

It has often been reported that female scientists raise less research funds than males. The results of this survey, however, subverted this norm: female scientists raised slightly less than $86,700 in research funds over the past three years, whereas their male colleagues only managed to raise just over $79,700 during the same period. The gender difference in terms of funding varies widely according to the location and field of the individual. In English-speaking sub-Saharan Africa, female researchers are significantly better funded than men, while in the rest of the continent, the opposite applies. In general, women did nearly two hours more paid work per week than their male colleagues. Surprisingly, men devoted one hour more per week to teaching than their female colleagues, which contradicts the literature. Except for hours per week devoted to consulting and research which were roughly equal for men and women, all academic tasks were more time-consuming for female academics.

Another important career obstacle for women is the difficulty of balancing work and family demands: 29.6% of female researchers reported that balancing work and family demands had a significant negative impact on their career, compared to only 17.5% of male colleagues. These results highlight the important impact of family-related activities on women relative to men. Lack of collaboration and mobility are also often mentioned as factors that restrict women's scientific production. In the survey, 36.6% of men studied or worked abroad during the past three years, compared to 28.8% of the women. Although relatively small, the gender differences in collaboration in Africa are all significant in favour of men, while international collaboration is not.

CONCLUSIONS

Catherine Beaudry's work has highlighted that childbearing and the ensuing care-work hinders women's scientific productivity, which corresponds with the existing literature on women in Africa. Furthermore, family-related responsibilities have an indirect effect on mobility and collaboration, which offsets the effect of gender on publication productivity. Whilst scientific production is measured and rewarded in ways that ignore such gender differences, women scientists in Africa will continue to be judged and treated as the "less productive" gender.

Q&A

What stimulated your interest into gender differences in scientific production in Africa?

A combination of factors led to this study. First, I have had an ongoing interest in showing that women, when provided with equal opportunities (funding for instance), are equally prolific as men. Second, after the Global State of Young Scientist (GloSYS) study which I directed for the Global Young Academy, and the follow-up study in ASEAN countries (GloSYS-ASEAN), I realised how understudied the African continent was.

What has the reception been to your work by fellow academics (both males and females)?

The results of the African study have raised an interest amongst scholars who specialise in science and technology (S&T) in the so-called Global South because it is a region that is systematically understudied and for which very little evidence exists. In addition, the international and philanthropic organisations that fund research in Africa are eager to measure the impact of their investments. We have had numerous discussions about our results and to identify relevant research questions.

Have any of your research findings been surprising to you?

The fact that women seem to teach less than their male colleagues in Africa is rather surprising. The literature suggests that because women teach more and perform more administrative duties, they devote less time to research and to publishing, and hence are less prolific. Maybe only the women who had the time to answer our survey, because they teach less, did. We are in the process of validating our sample in terms of publication output to ensure it is representative

Where do you see the focus of your research being within the next 5 years?

I will continue to examine the impact of science and technology on innovation, as well as the public policy mechanisms that facilitate the success of innovation, i.e. wealth and wellbeing creation. How firms, governments, universities and other stakeholders collaborate within innovation ecosystems to generate new products or services, for instance, shall be my main focus.

Detail

RESEARCH OBJECTIVES

Professor Beaudry's work focuses on gender differences in African science.

FUNDING

- IDRC
- The Robert Bosch Stiftung

COLLABORATORS

- Heidi Prozesky (Stellenbosch University)
- Carl St-Pierre (Polytechnique Montréal)
- Pauline Huet (Polytechnique Montréal)

BIO

Catherine Beaudry, Rhodes Scholar, has a PhD in economics from the University of Oxford and a bachelor's degree in electrical engineering specialised in satellite technology from Polytechnique Montréal. She is a professor at Polytechnique Montréal and holds a Tier I Canada Research Chair on the Creation, development and commercialisation of innovation.

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