CHAPTER
5

Gender diversity and the transformation of research excellence

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Introduction

Female scientists and researchers play an essential role in contributing to development and transformative change. Gender equality, sustainability and development are highly interconnected (Leach et al. 2015). In fact, it has been argued that achieving the Sustainable Development Goals (SDGs) inescapably requires considering a gender dimension in research (Waldman et al. 2018).

The gender scientific gap has narrowed over the last decades, and women have had significant gains in terms of university enrolments worldwide. However, despite recent progress, the gender gap appears to persist, as women continue to experience numerous disadvantages that manifest in their academic careers: they are promoted more slowly than men, remain persistently under-represented in leadership research positions and agenda-setting roles, earn less than their male counterparts, tend to receive lower amounts of research funding, publish significantly less and are less cited, to mention a few examples.

Many studies have demonstrated the value of diversity in any type of organisation. For instance, studies on the business community have shown that having more female board members in firms has a positive

effect on sales and returns of invested capital (Hunt et al. 2015), and firms with higher gender diversity display higher levels of innovation (Garba and Kraemer-Mbula 2018).

Greater diversity leads to better collective performance; this applies to research too. However, certain fields of science continue to have a strikingly low participation of women – for instance in engineering, physics and computer science there is less than 30% participation in most countries, with declining figures (WISAT 2012). Persistent gender imbalances in science, both in the Global South and globally, as well as insufficient progress in gender equality raise important questions for research excellence.

Gender disparities in research performance

Although there are more female than male undergraduate and graduate students in many countries around the world, women still represent a small percentage of researchers worldwide. The UNESCO Science Report (2015) indicates that women account for 53% of the world's bachelors and masters graduates and 43% of PhDs, but they only constitute 28% of researchers. Women also remain vastly under-represented at senior levels in scientific institutions. There are relatively few female full professors, and gender inequalities persist in hiring, earnings, funding and patenting (Lariviere et al. 2013).

Meritocracy in connection with research excellence builds on the basis that researchers should be rewarded on an objective basis, using clear and quantifiable criteria that enable distinguishing outstanding researchers from the average. Such 'objective' parameters commonly used to measure research excellence are based on quantitative indicators (mostly number of publications and citations). However, meritocracy applied as the sole basis to measure excellence seems to contribute to the reproduction of gender inequalities in academia.

Numerous large-scale studies continue to show that men publish more papers on average than women (Larivière et al. 2013; West et al. 2013; Bendels et al. 2018). Over and above total numbers, female authors are far less likely to publish single-authored papers, and in

co-authored publications they are much less likely to be listed in a key position in a paper (usually considered as first author) (Bendels et al. 2018). Women are also less likely to publish in top-rated journals; this applies to all disciplines. Many studies across various disciplines confirm that female authors attract fewer citations than their male counterparts, and this applies also to high-impact science papers. Moreover, studies by Larivière et al (2013) and Bendels et al (2018) show that papers with female authors in key positions are cited less than those with male authors in key positions.

So what explains these differences in research performance? There is no consensus on the reasons for these gender differences in research outputs; however, the literature provides a range of explanations.

One of the underlying reasons often mentioned relates to widely held social stereotypes of gender and science. There is a general tendency to associate men with science and career, and women with liberal arts and family. Large-scale studies have found that 70% of men and women across 34 countries view science as more male than female (Nosek et al. 2009). It is difficult to assess how these social stereotypes may shape decision-making in various aspects of the research activity, from career choices among females to assessments of competence when hiring and promoting researchers.

Related to this argument is the difference across disciplines, whereby in terms of career preferences, women are conventionally associated with a preference towards careers focused on people, which would manifest an inclination for social sciences and humanities. Moreover, natural sciences, engineering, technology and mathematics are not typically portrayed as career-appropriate choices for women (Dugan et al. 2013). While studies indicate that there is a higher presence of female authors in disciplines in the social sciences, humanities is still dominated by men (Larivière et al. 2013).

Another explanation has to do with women's life-cycles, family, maternity and child care. This argument builds on the overlap between the critical years of research performance and women's fertility years, which leaves many women with the choice of either bearing children or gaining tenure (Jacobs and Winslow 2004; Ceci and Williams 2010).

This argument has been associated with the higher rate of withdrawal of women from scientific careers (Ceci and Williams 2011) or the tendency of women scientists to choose to work in lower-ranked universities, or end up in part-time, seasonal academic jobs, or administrative roles in universities (Wolfinger et al. 2009).

Women often interrupt their research careers due to childbirth and these gaps are often not taken into account in considerations for tenure. In this respect, a study by Hunter and Leahey (2010) calculates the effect of childbirth on publications, estimating it at two years of lost publications. The effect of having young children (under ten years old) on the productivity of men and women has not been clearly established. However, it is known that women tend to acquire most of the caregiving responsibilities in the early years of childcare.

Ceci and Williams (2011) argue that the critical variable that explains the lower research performance of women may not be related to gender directly, but to access to resources which correlates with gender since women are more likely to work in positions or institutions with limited resources. In certain fields of science, women generally lead smaller labs and draw fewer resources, leading to fewer opportunities for career advancement (Murray and Graham 2007).

An important aspect of excellence has to do with recognition by peer scientists. In this respect, it has also been argued that women are less integrated in professional networks than men. Academic institutions have predominantly male professional cultures, which often make female scientists feel isolated and excluded from social circles in science where resources, knowledge and reputation are exchanged and developed (Etzkowitz et al. 2000). Having lower levels of social capital also translates into less participation in international research projects, less international collaborative publications, and less citations. Krefting (2003), in a study of USA universities, explains that while women and other minorities have entered universities, they are still outsiders to the academic game. In this respect these groups may find it relatively harder to make sense of the organisational structures and of the values of the universities that employ them.

Women in research in the Global South: Perspectives from African countries

Countries in the Global South experience pressing economic, social and political problems. In order to address these persistent and emerging challenges, the SDGs have embarked on a collective journey of progress in which 'no one is left behind'. Currently, most of those that are left behind are on the African continent, so it has been acknowledged that for the SDGs to succeed, they have to succeed in Africa.

African universities must play their part in solving these problems. Proponents of the 'developmental university' highlight the commitment that universities in the Global South must have towards achieving sustainable development by means of the interconnected practice of their three missions: (1) teaching, (2) research, and (3) fostering socially valuable knowledge (Arocena et al. 2018). Such commitment means that developmental universities must actively engage and cooperate with external actors in performing all these three missions (Kraemer-Mbula 2014). The extent to which universities become development agents is directly linked to the nature of the knowledge developmental universities produce in Africa (Mohamedbhai et al. 2014). In turn, the nature of knowledge produced is intrinsically linked to who produces that knowledge. Therefore, in developmental universities, the nature of knowledge production and gender diversity is closely interconnected, particularly in the Global South.

African universities have undergone rapid changes in the last two decades. The massification of universities has led to a relatively fast growth of enrolments, although universities are still burdened with poor infrastructure, inadequately resourced libraries and laboratories and poor academic remuneration. Massification of universities has also translated into heavy teaching loads, which affects the ability of African scholars to dedicate time to research. In a survey of African researchers, Tijssen and Kraemer-Mbula (2018) found that heavy teaching loads were reported as one of the top challenges to achieve research excellence by African scholars. Studies of universities in South Africa suggest that for females, young and black academics, teaching

loads take up most of their time, whereas most research positions were predominantly occupied by white males, particularly researchers that are highly visible or cited (Gwele 1998; Joubert and Guenther 2017). Bezuidenhout and Cilliers (2010), in a study of female academics in a South African university, concluded that heavy workloads and working in conditions of limited resources is linked to female academics' physical, emotional and mental exhaustion, associated with feelings of being tired, 'drained' and 'used up'. This again reinforces the feeling of isolation that female academics may encounter in male-dominated work cultures. Another study by Rothmann and Barkhuizen (2008) also noted increased levels of exhaustion in their study of burnout in academics in South Africa, linked to a range of factors such as a decrease in resources, unfair rewards, poor management, poor social support and lack of participation. The authors also found significant differences between the burnout levels of gender groups.

The changing higher education landscape in the African context, including the influence on female academics of mergers, forced transfers and redundancies also deserves scholarly attention (Bezuidenhout & Cilliers 2010). In this respect, the changing nature of academic work worldwide also has resulted in increased levels of stress and burnouts, since academics, besides fulfilling traditional roles of teaching, research and service, are also expected to fulfil additional roles, particularly placed on attracting external funding through research grants or research consultancies. These pressures are particularly present in universities in the Global South, where limited financial resources for research push scholars to seek externals funding. This misfit between research skills and what the job of a researcher actually entails has been identified as a contributor to burnout (Maslach and Leiter, 1997).

In a study of career challenges of African scientists, based on a survey of about 5 000 African scientists in 30 countries, Prozesky and Mouton (2019) confirm that most African female scientists do experience difficulties in their careers when trying to balance work and family demands. The study also highlights interesting regional differences within the continent with regard to funding – with female scientists in North Africa receiving substantially less funding on average than their counterparts in other African regions. Other

challenges in the careers of African female scientists relate to lack of mentoring and lack of mobility and training opportunities.

Adding to these factors, the internationalisation of academic careers in the Global South also plays an important part in creating a context of intense competition, with the promotion of 'excellence' as the central criterion in academic promotions, particularly in professorial ranks. Although the number of females eligible to apply for promotions has increased considerably due to the growth in the participation of women in higher education, gender disparities persist in the scientific workforce. Female scientists remain concentrated in posts with lower responsibility and decision-making and limited leadership opportunities. For instance, data from the Higher Education Management Information System in South Africa in 2016 show that 58% of higher education students were women. However, there is a drop in the number of women along the career trajectory in scientific research. While at junior lecturer and lecturer levels, women make up 53% of total posts, at senior lecturer level the number decreases to 45%, and only 27% of professors in South African institutions are female. In Cameroon, enrolment in tertiary education was estimated at 15% for women in 2017, while women constituted only 7% of academics at the rank of full professor (UNESCO 2018). As expressed by Huyer (2015: 86): 'Each step up the ladder of the scientific research system sees a drop in female participation until, at the highest echelons of scientific research and decision-making, there are very few women left'.

However, the under-representation of women in research and leadership positions in universities in the Global South is, at the same time, subject to other (global) imbalances. In this respect, it is important to be reminded that gender is deeply interwoven with other dimensions that shape power relations in research activities and processes, such as race, class, ability, sexuality, location, etc. (Cornwall and Sardenberg 2014). Therefore, considerations of research excellence cannot be seen as separate from broader geopolitical forms of dominance, in which perspectives of Southern researchers remain marginalised. In exploring the inclusion of scholars in the South in global knowledge production, a recent study by Medie and Kang (2018) analysed the institutional affiliation of authors published in journals related to women, gender

and politics and found that South-based scholars constituted less than 3% of the articles in four leading European and North American journals between 2008 and 2017. The authors argue that such under-representation of scholars in the Global South 'demonstrates the hegemony of Western gender politics scholarship and reinforces the power disparity in knowledge production between the North and South' (Medie and Kang 2018: 38).

Considerations of gender equality in research excellence in the Global South must therefore address unequal power relations on a range of social and political dimensions at multiple scales from the personal to the global.

Moving towards diversity thinking in research excellence

This chapter has identified the various dimensions where gender bias can be identified in relation to academic performance and research excellence. In addition to gender bias, systematic constraints built into academic institutions have played an important role in impeding the careers of women scientists throughout modern history.

Some authors, inspired by practices in large private firms, have proposed a framework that incorporates three phases in the evolution of diversity, from 1.0 to 2.0 and 3.0 (Nivet 2011; Sepulveda et al. 2018).

The goal for the Diversity 1.0 phase is to alleviate institutionalised discrimination to seek fairness and equality with respect to gender and ethnic differences. The actions under Diversity 1.0 tend to be isolated efforts and programmes aimed at removing social and legal barriers to access and equality. Diversity 2.0 actions are often geared towards raised awareness about how increasing diversity benefits everyone, expanding the programmes initiated under Diversity 1.0, but still keeping diversity on the periphery rather than becoming part of the core mission of institutions. The next paradigm, Diversity 3.0, is fueled by the understanding that diversity and excellence are not only complementary, but also intricately linked. Under Diversity 3.0, diversity and inclusion become central to the institutional mission and integral for achieving excellence.

Table 1: Phases in the evolution of diversity thinking

Diversity 1.0	Isolated efforts aimed at removing social and legal barriers to access and equality, with institutional excellence and diversity as competing ends.
Diversity 2.0	Diversity kept on the periphery but raised awareness about how increasing diversity benefits everyone, allowing excellence and diversity to exist as parallel ends.
Diversity 3.0	Diversity and inclusion integrated into the core workings of the institution and framed as integral for achieving excellence.

Source: Nivet (2011)

In line with Diversity 1.0, universities in the Global South have generally developed anti-discrimination laws to remedy conditions that differentially affect women's entry into and promotion in academic scientific and research careers. These laws often accompany broader national and regional recognition of the importance of women's right to development, such as the 2015 declaration by the African Union as the 'Year of Women's Empowerment and Development'. However, the existence of institutional and legislative frameworks, designed to transform academic institutions around the principles of non-sexism and non-racialism, does not always translate into the realisation of equality. There is a lack of mechanisms to enforce anti-discriminatory legal frameworks, for example monitoring and evaluation systems. For instance, while legal trends recognise that stereotyping is a form of discrimination, the extent to which stereotyping practices continue to limit women's advancement remains largely undocumented. Other steps needed to remove barriers include documenting the status and progress of under-represented groups and establishing a work environment that is explicitly inclusive.

Second-generation gender bias can be found under Diversity 2.0, where legal frameworks may exist at the institutional level, and even in isolated programmes that promote inclusion and equality; however, subtle barriers for the advancement of women persist, including cultural assumptions, organisational structures, and practices and patterns of interaction that inadvertently benefit men. For instance, when more men are in leadership positions in a research environment, this can potentially result in weaker networks for women. By

supporting male-led networks at the top, even without discriminatory intent, such practices can obstruct leadership in women scientists. Another example is the current model of a scientific career, which is still built on an outdated model of a male life course. Under prevailing career models, researchers in high positions are expected to have unlimited commitment to their academic careers throughout their working life. This model, which depends on having a spouse who takes care of the household, family and community, is increasingly unfitting to not only most women but also men. These examples serve to illustrate that under Diversity 2.0, education and awareness actions about the collective benefits of gender diversity and equality coexist, with seemingly 'neutral' approaches towards valuing and supporting excellence that continue to limit the advancement of women.

Recognising the importance of supporting women scientists, universities, research funders and scientific and professional associations have developed a range of programmes and mechanisms designed to assist women scientists at the early stages of their career, as well as those already in posts, often providing mentorship and training. However, these efforts often remain isolated efforts and are not fully embedded in institutional practices.

Under Diversity 3.0, diversity and inclusion would be integrated into the institution's core functions and into the framework for achieving excellence. Judging by the results, this is far from a reality in the research environment in the Global South. Gender diversity remains a challenge for academic and research organisations not only in the Global South, but globally. In order to achieve the broad aspirations of diversity, equality and empowerment, diversity must become integral to achieving excellence.

Some important initiatives have been recently captured in a report led by the Gender Working Group at the Global Research Council (GRC 2019), showing the efforts that research councils around the world are making towards promoting a research environment which more fully supports the equality and status of women in research.

Creating a research culture that is respectful, diverse and inclusive fosters academic excellence and broadens perspectives. Our current global challenges are daunting and demand multifaceted knowledge.

Besides the moral imperative of embracing diversity and inclusion, fostering diversity in institutions such as research councils and universities adds to building inclusive systems and enhances systemic creativity, innovation and problem-solving.

Concluding remarks

The academic research environment is characterised by the under-representation of women, persistence of a masculine culture and the model of an excellent scientist reflects an outdated male life-cycle, restricting recognition of work done outside academia. Therefore, looking at excellence from the lens of conventional 'neutral' indicators continues to suggest that research excellence is largely a male territory. Excellence may not be intentionally a masculine construct but its application in the academic system is. In connection to this argument, a study by Feller (2004) explores the difference between bias present in the system and bias present in the indicator. It is therefore important to both question the indicators used to measure excellence – perhaps thinking around measurements of 'collective excellence', as well as explore the persistent exclusion mechanisms for women in the academic system.

In addition to the global imbalances, women in the Global South experience specific challenges that relate to the context in which they operate. It is thus important to explore gender as one of the several dimensions that shape power relations in academic environments in the Global South. These aspects continue to receive little attention and need to be unpacked.

Finally, although there is a long way to go, there are ongoing efforts that research councils, research funders and research organisations are already undertaking in order to move towards a more equitable future in scientific research. This chapter presents diversity 3.0, namely the integration of diversity into institutional frameworks in order to achieve excellence, as an essential step forward in building inclusive research systems.

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