

The Role of Mobility in Mitigating Core-Periphery Inequalities: Contribution Statements of African Scholars in International Collaboration

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This paper explores the impact of international mobility on the distribution of tasks within core-periphery scientific collaborations, particularly focusing on Africa. Utilizing a dataset with contributions statements from ScienceDirect, the study categorizes publications and author contributions from 2017-2023 involving African researchers. It finds significant disparities in task assignment, where authors from the global scientific periphery often perform menial roles. The paper highlights that mobility, especially international, potentially mitigates these inequalities by positioning periphery scholars in more substantial roles, enhancing their visibility and career progression. Initial results indicate that mobile researchers tend to secure prominent authorial positions and are more involved in conceptual and supervisory tasks. These findings suggest that increasing international mobility and integration into global networks could promote a more equitable distribution of intellectual labour and recognition in global science collaborations.

1. Introduction

Modern science is considered a collective and public endeavour (Eamon, 1985; Fyfe, 2022), characterized by the dominance of collaboration (Guimerà et al., 2005) in which research tasks are often distributed among team members (Larivière et al., 2016). This distribution of tasks also leads to a distribution of credit (Latour & Woolgar, 1979), which tends to be unequal among team members (Robinson-Garcia et al., 2020). At the same time, scientists work in national and organisational contexts (e.g., universities) that emphasize individual performance, the outcome of which serves as the basis for the distribution of reputation and resources (Taubert & Weingart 2017). The accumulation of reputation and, by implication, career advancement, is consequently becoming more dependent on metrics linked to quantity (number of publications) and quality (number of citations), with author position used as a performance metric based on the assumption that it reflects authors' level of involvement and leadership (Chinchilla-Rodríguez et al., 2019; Milojević et al., 2018).

How tasks are assigned and acknowledged remains relatively opaque. One way of demarcating the division of academic labour, is to distinguish contributions labelled as 'technical' and those that are 'conceptual.' While conceptual tasks are typically associated with authors with higher seniority, technical tasks are more often performed by younger scholars (Lariviere et al. 2016). Acknowledging the distribution of labour in science has, therefore, attracted increased attention from the field of scientometrics to assess relative contributions in the publication of scientific

knowledge. At the macro level, for example, research has shown that the world share of African-affiliated publications grew from 1.5% in 2005 to 2.8% in 2015 (Beaudry et al. 2018). The growth is explained, in part, by an increase in the participation of African scholars in international networks (Adams et al. 2014; Confraria & Godinho 2015). From 2015 to 2021, co-authorships between researchers at 16 African universities and their international counterparts ranged from a low of 43% to a high of 89% in some institutions of all articles indexed in the Web of Science (ARUA 2022).

But global science characterised nests historical inequalities, that is, asymmetries between the global scientific centre and the periphery (Collyer 2018). Kreimer and Zabala (2008) demonstrate the operation of this division of labour, where centre–periphery collaborations provide scholars from the centre with publishable knowledge, while scholars from the periphery take part only as ‘sub-contractors,’ producing knowledge that does not relate to local problems. The ‘introversion’ of American and European science further contributes to the exclusion of science from the scientific periphery (Collyer, 2018). This perpetuates ‘an unstated but real global division of intellectual labour’ (Baber, 2003: 621). Alatas (2003) is more specific, arguing that theoretical and methodological innovations are considered legitimate tasks for scholars from the scientific centre while fieldwork and data collection are the designated roles for those of the periphery. The practice of scientists from wealthy nations visiting lower-income countries, collecting samples, publishing the results with little or no involvement from local scientists, and providing no benefit for the local community is referred to as neo-colonial, helicopter, or parachute research. A 2003 study found that 70% of articles in a random sample of publications about least-developed countries did not include a local research co-author (Dahdouh-Guebas et al. 2003). Frequently, during this kind of research, local researchers might be used to provide logistical support as fixers but are not engaged for their expertise or given credit for their participation in the research. Scientific publications resulting from parachute science frequently only contribute to the careers of scientists from centre countries, thus limiting the development of local science capacity (Minasny et al. 2020).

This study analyses the contributions of individual authors in scientific publications involving multiple authors or teams. In particular, we aim to understand how authors with different access to funding and other resources contribute to core-periphery collaborations. We hypothesize that international mobility can help to reduce inequality and discrimination in the distribution of tasks within international collaborations. Previous research has shown that scientists returning from international placements can bring with them international experiences that can contribute to improving the competitiveness of their local institutions by facilitating their integration into global scientific communities (Baruffaldi and Landoni, 2012). Despite various obstacles, such integration has been largely seen as beneficial (Fontes, 2007).

This paper focuses on the division between authors' conceptual and technical contributions to scientific publications and the division of these tasks according to their contribution based on their past mobility experience. The paper aims to reveal the role international mobility may have in mitigating the prevailing asymmetries between the global centre and the scientific periphery manifest in inequities in the production of new knowledge by assigning to researchers from the periphery more menial tasks in the research process.

3. Data and methods

To fulfil our goal, we focus on the African continent. We started with a dataset of 659,578 distinct publications within the 2017-2023 period. The publication dataset was provided by the

International Centre for the Study of Research (ICSR) Laboratory¹. It includes publications listed in Scopus and ScienceDirect and authors contribution statements following the CRediT taxonomy (Allen et al., 2014). We extracted the Scopus Author ID of researchers affiliated with African institutions within this dataset and looked into their complete publication history in Scopus. We then categorized African authors as those affiliated with an African institution in their first publication, leading to 48,199 publications. This follows a process similar to that used in other mobility studies (e.g., Sugimoto et al., 2017). Finally, we filtered our publication dataset to those that are the result of an international collaboration; that is, they are authored by researchers affiliated with more than one country. This leaves us with a dataset of 14,057 publications and 62,763 distinct authors, of which 22,576 were considered African researchers.

We then created two sets of data:

(1) **At the individual level.** It considers the complete publication history of authors and is based on the overall mobility experience of African authors. We split authors into created three categories: (i) non-mobile, (ii) mobile only within Africa, and (iii) mobile out of Africa.

(2) **At the publication level.** Here, we split publications into two groups: (i) papers authored by researchers affiliated with more than one country within Africa and (ii) papers authored by researchers from and outside of Africa.

Finally, we performed a descriptive analysis comparing the cross-tabulation of publications based on these two categorisations, focusing on differences in author order and contribution statements.

4. Preliminary findings and discussion

Table 1 shows differences in the average number of publications by researcher, depending on the type of mobility experience African authors had and the type of international collaboration. The most prominent group is that of papers authored in international collaboration outside of Africa. Within this group, more than half of African researchers have not had any type of mobility experience. The next group, representing almost 40% of all African researchers involved in international collaboration beyond the African continent, have experienced at any given point in their career trajectory at least one mobility event. The smallest group, representing less than 45% of African authors, is those with past mobility experience within the African continent.

Table 1. Number of distinct researchers and publications given the type of collaboration (outside or within Africa) and type of researcher (mobile outside of Africa, non-mobile and mobile within Africa).

Type of collaboration	Mobility type	Total authors	Total pubs	Average no. papers per researcher
Collaboration outside Africa	Mobile outside of Africa	8,228	10,281	1,25
	Non mobile	11,656	7,166	0,61
	Mobile within Africa	790	879	1,11
Collaboration within African countries	Mobile outside of Africa	894	867	0,97
	Non mobile	1,273	573	0,45
	Mobile within Africa	501	439	0,88

¹ The ICSR Lab is a now discontinued research branch of Elsevier set up to establish collaboration links with the scientometric research community.

In relation to papers conducted in international collaboration within Africa, roughly 12% of all African authors have published at least one paper with at least one international co-author during the studied period. Almost half of these are researchers with no international mobility experience, followed by those with international mobility experience beyond Africa (34%) and, those with mobility experience within African countries (19%).

In terms of productivity, we observe that regardless of the type of international collaboration, mobile authors outside Africa are always more productive, followed by those mobile within Africa, ending with those with no mobility experience. Furthermore, on average, African researchers tend to publish more papers when collaborating with countries outside the continent than when collaborating with other African countries. This observation may be attributed to the overrepresentation of early career researchers in this category (Robinson-Garcia et al., 2019). In the case of more senior authors, where no mobility events are observed, it could be suggested that limited mobility may hinder researchers' ability to produce a higher volume of publications than mobile researchers.

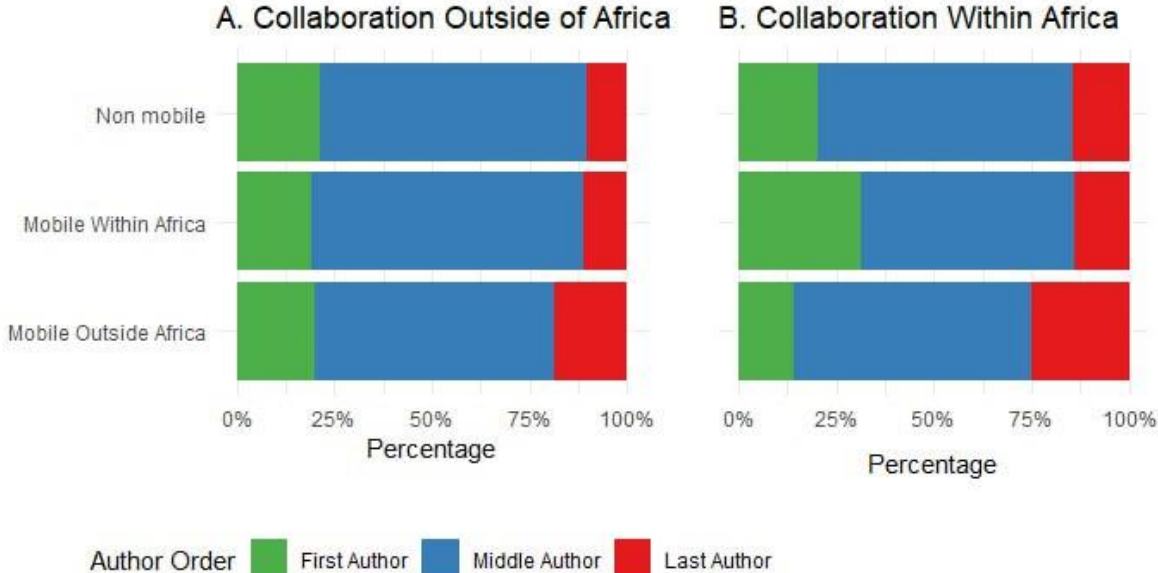


Figure 1. Distribution of authors' position in international collaborative publications by mobility type. The y-axis represents the authors' international mobility experience, while the x-axis shows the percentage of authors holding each position.

Figure 1 provides insights into general patterns of authorship positions held by researchers with a different mobility background in collaborative publications within and outside of Africa. Except for collaboration within Africa and authors with international mobility experience outside of Africa, we observe that researchers exhibiting past mobility tend to hold more prominent positions in papers (understood as first or last author) than researchers with no mobility experience. In the case of those with past mobility experience within the continent, they tend to hold more junior leadership positions (first author), especially when collaborating internationally within Africa (Fig. 1B). Both, when collaborating internationally within and

outside of Africa, authors with international experience out of the continent will hold more senior positions (last author) than their counterparts.

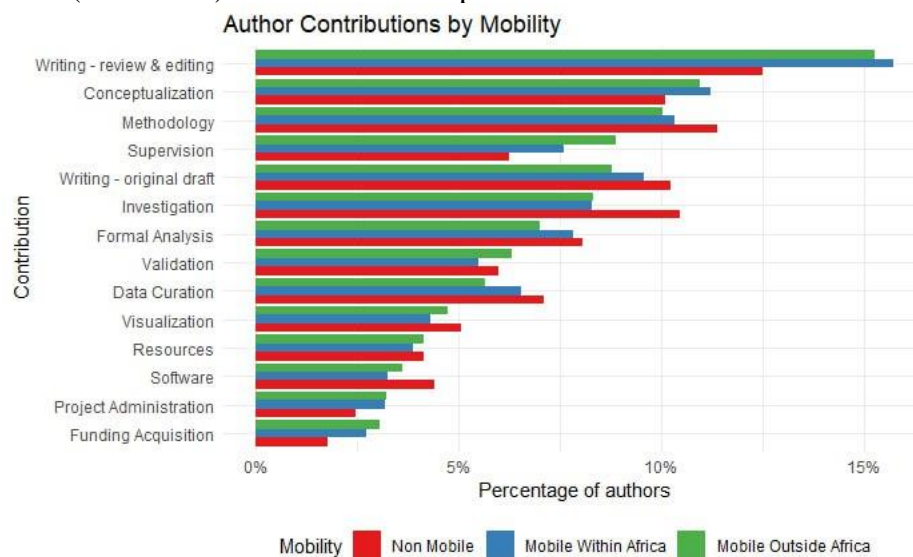


Figure 2. CRediT taxonomy contributor roles broken down by mobility type. Each contribution is split into three mobility types: non-mobile (red), mobile within Africa (blue), and mobile outside Africa (green).

Figure 2 delves into the contributions of authors as delineated by the CRediT taxonomy and the relative engagement levels across different contributor roles. Mobile researchers are most prominent in roles typically associated with conceptual and supervision tasks, such as Writing - Review & Editing, Conceptualization, Supervision, Validation, Project Administration or Funding Acquisition. Although we observe differences based on the type of mobility experience, they seem more related to seniority (i.e., Supervision, Funding Acquisition) than to being involved in conceptual tasks. In the case of non-mobile authors, while also engaged in all contribution roles, tend to be most prominent in roles requiring technical expertise such as Visualization, Software, Data Curation, Investigation, and Methodology compared to mobile researchers. This suggests that mobility beyond and within Africa can bring more opportunities to acquire resources such as research funding and access to a larger global talent pool, especially when transitioning to more economically developed research systems.

5. Concluding remarks

This paper initiates a pivotal discourse on the impact of international mobility on mitigating inequalities inherent in core-periphery collaborations, with a particular focus on the African continent. Our analysis suggests that mobility not only enhances the research capacity and visibility of African scholars but also potentially redistributes the intellectual contributions within international collaborations, thereby addressing the historical underrepresentation and marginalization of periphery scholars. These initial findings provide a strong foundation for a more nuanced investigation into the specific mechanisms through which mobility experiences might influence equity in scientific contributions and recognition. Further steps will expand on these insights by further disaggregating the data at the country level, looking into disciplinary differences and clusters of collaborating countries. This line of inquiry is essential for devising targeted policies that support equitable collaboration and foster a truly global scientific community.

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Open science practices

Data is not available in its raw form due to proprietary rights.

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Author contributions

FvS: Conceptualization, Writing – original draft

EGS: Data curation, Formal Analysis, Visualization, Writing – review & editing

MRF: Conceptualization, Formal Analysis, Supervision, Writing – review & editing

NRG: Conceptualization, Formal Analysis, Funding Acquisition, Methodology, Supervision, Writing – original draft

Competing interests

Authors declare no competing interests.

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