



The influence of collaboration in research priorities: The SADC Case

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This study was aimed at providing evidence of the effects of collaboration among unequal partners on their research priorities. Co-authorship patterns were investigated among South African authors publishing with authors of other countries in the region, with and without other non-African co-authors. It was identified that the non-African collaborators have a high impact on the quantity of co-authored publications and on the research disciplines in which co-authored research is undertaken. The findings raise a number of policy questions.

Significance:

- The findings make profound that African countries should prioritise and engage their limited resources in areas of national priorities.

Introduction

Research collaboration is on an ascending path and receives particular attention from governments and researchers internationally.¹ Researchers investigate the modes, effects and motives of collaborating researchers, while governments attempt to utilise research collaboration as an instrument for technology transfer from universities and science councils to industry (intra-collaboration); for know-how transfer from abroad (inter-collaboration); and as a means of improving diplomatic relations with other governments by creating goodwill and political capital²; among other reasons.

The literature identifies that researchers collaborate with each other for a number of reasons. Reasons for collaboration include improving their visibility and recognition³, utilising expensive equipment and facilities which are not under their control⁴; and acquiring expertise and new ideas needed for their research⁵. Other reasons include historical ties; linguistic preferences; geographical proximity; and specific problem issues (e.g. disease control or natural disaster mitigation).

In the domain of policy, research collaboration has become an important component of science, technology and innovation internationally and substantial resources are allocated by governments (e.g. South Africa, the European Commission and the USA) for this objective.

There are several articles that report on the investigation of collaboration on the African continent. Sooryamoorthy⁶ investigated the collaboration patterns of researchers in South Africa and Boshoff⁷ investigated the collaborative patterns of authors in the Southern African Development Community (SADC). Boshoff identified that 'only 3% of SADC papers during 2005–2008 were jointly authored by researchers from two or more SADC countries (intra-regional collaboration), and only 5% of SADC papers were jointly authored with researchers from African countries outside the SADC (continental collaboration)¹⁷(p.481)'. Similarly, Onyanha and Maluleka⁸ identified that knowledge production through co-authored research among researchers from sub-Saharan African countries is minimal.

More recently, Pouris and Ho⁹ identified the status of research co-authorship on the African continent during the period 2007–2011. The results are based on the analysis of more than 111 000 articles which had at least one author with a corporate address within the African continent. Estimation of the activity indices of various scientific fields shows the emphasis or under emphasis of the various fields. The activity index is defined as a country's share in the world's publication output in the particular field divided by the country or region's share in the world's publication output in all disciplinary fields.

The most emphasised scientific disciplines are: Tropical Medicine (12.5 times higher than what should be expected from the research size of Africa); Parasitology (6.5 times higher) and Infectious Diseases (4.6 times higher). It is apparent that the emphasised research areas are dominated by medical and natural resources fields (Biodiversity; Water Resources; Entomology; Mining, etc.). Furthermore, the individual African countries were identified to exhibit higher collaboration patterns than countries of other continents. Nigeria was estimated to be the only country with a co-authorship rate lower than 50%. A total of 29 African countries were identified to publish more than 90% of their articles in collaboration with authors from other countries. The authors argued that this pattern is indicative of dependency on foreign resources.⁹

The main countries co-authoring research with Africa were identified as the USA, France and the UK. The authors emphasise that these countries are the most collaborative countries in the world.⁹ These three countries – USA, France and the UK – are also the largest funders of research in biosciences, with more emphasis on medicine and agricultural sciences, in Africa. Furthermore, collaboration with non-African countries exceeds that of inter-African collaboration. The authors state: 'It is logical to argue that African collaboration is not driven by local researchers searching for collaborators, but by the availability of resources and interests outside the continent.' As an anonymous reviewer stated: 'Non-African research funding often steers how African scientists choose research partners and topics.'

The above is of particular importance as they indicate that research conditions on the continent are amenable to direction from outside interests.

Pouris¹⁰ investigated the research performance of the 15 countries in the SADC region. It was estimated that South Africa – with 19% of the population of the region – is responsible for 60% of the GDP in the region and produces 79% of the region's publications. All SADC countries appear to have the same focus in their research priorities and underemphasise disciplines such as engineering, materials science and molecular biology. The author¹⁰ expressed concern that the current research structures are inadequate to assist in reaching the objectives developed in the Regional Indicative Strategic Development Plan of the Community.

Zdravkovic et al.¹¹, through interviews in four SADC countries, identified that the interviewed scientists working with scientists in the North enjoyed better funding, more organised research and access to different knowledge than those without Northern collaboration. However, South–South collaboration meant easier contact, working under equal conditions, and solving relevant problems for Africa.

Sooryamoorthy¹² investigated the interplay of collaboration and citations in the social sciences in South Africa and other authors^{13,14} have examined collaboration in particular scientific disciplines.

In summary, the majority of the African-related investigations have been focused on the effects of collaborations on impact, as it is manifested in citations, and the meagre size of inter-African collaboration. However, a critical issue in terms of policy is the possible effects of collaboration on the priorities and direction of the innovation system. This study aimed to identify whether international collaborators influence the size and research disciplines in the South African–SADC collaboration. The issue is of particular importance when scientifically large countries collaborate with scientifically small countries. This short communication further aims to make a contribution in this domain investigating collaboration and priorities in the SADC region.

Methodology

The scientometric analysis was facilitated by Clarivate Analytics' (formerly Thomson Reuters) Web of Science databases. The Web of Science covers comprehensively the most important journals in the world and most importantly provides information about all authors in an article. The latter is particularly advantageous when the objective of the effort is to investigate collaborative efforts.

The database was interrogated in order to identify the collaborative patterns of South African researchers. All publications with at least one South African address were identified and were analysed. Using the field tag 'country' we identified the SADC countries collaborating with South Africa. Subsequently, the collaborative disciplines between South Africa and the other SADC countries were identified (using the field tag 'research areas'). This list of scientific disciplines was compared with the same list after excluding all articles with non-African collaborators.

The 3-year period 2012–2014 was chosen to be investigated as it is the period after the completion of the 7th Framework Programme (FP7). FP7 was a powerful European instrument which promoted collaborative research and development (among others).

Results

During the 2012–2014 period, South African researchers produced 45 343 publications. The majority of these publications were articles (85.7%). Other outputs were meeting abstracts (79); review articles (64); book chapters (51); editorial material (38); proceedings papers (27) and others.

Of the research articles, 23 581 (52%) were co-authored with at least one author from another country. Among the co-authored publications 1505 (6.4%) had at least one co-author from the SADC region. The main collaborating countries were Zimbabwe (406 articles), Malawi (237 articles) and Namibia (221).

In order to identify the influence of non-African countries in the regional co-authorship effort, the articles that had non-African co-authors were excluded. Hence, only 563 publications were identified to be co-authored between South African and SADC co-authors (without non-African co-authors) – only 2.4% of the South African co-authored publications.

Table 1 shows the research areas in which South Africa and SADC countries collaborate with all collaborators. It becomes apparent that medical and health issues dominate the co-authorship list.

Table 2 shows the most prolific research areas in the cooperation efforts when there are no non-African participants. Agriculture and Environmental Sciences Ecology are top of the list. It is interesting to note that Infectious Diseases and Immunology that were on top of the list in Table 1, fall lower in the list of Table 2. When there is no non-African influence, the co-authorship priorities appear to change. Infectious Diseases and Immunology appear to be led by foreign researchers. It is emphasised that even though these figures are relatively small, they are the total populations of articles with the particular characteristics.

Table 1: Research areas of collaborative research: South African authors with SADC and other co-authors

| Research area | Number of publications out of 1505 |
|--|------------------------------------|
| Infectious Diseases | 214 (14.2%) |
| Immunology | 160 (10.6%) |
| Public Environmental Occupational Health | 131 (8.7%) |
| Environmental Sciences Ecology | 130 (8.6%) |
| Science Technology other topics | 109 (7.2%) |
| Agriculture | 68 (4.5%) |
| Virology | 64 (4.2%) |
| General Internal Medicine | 62 (4.1%) |
| Geology | 56 (3.7%) |
| Microbiology | 49 (3.2%) |
| Plant Sciences | 44 (2.9%) |
| Zoology | 44 (2.9%) |
| Veterinary Sciences | 43 (2.8%) |
| Tropical Medicine | 41 (2.7%) |
| Astronomy Astrophysics | 40 (2.6%) |
| Water Resources | 40 (2.6%) |
| Chemistry | 39 (2.5%) |

Table 2: Research areas of collaborative research: South African authors with no non-African co-authors, 2012–2014

| Research area | Number of publications out of 563 |
|--|-----------------------------------|
| Agriculture | 56 (9.9%) |
| Environmental Sciences Ecology | 44 (7.8%) |
| Public Environmental Occupational Health | 31 (5.5%) |
| Plant Sciences | 30 (5.3%) |
| Mathematics | 25 (4.4%) |
| Engineering | 24 (4.2%) |
| Physics | 24 (4.2%) |
| Water Resources | 24 (4.2%) |
| Chemistry | 22 (3.9%) |
| Geology | 22 (3.9%) |
| Infectious Diseases | 22 (3.9%) |

Discussion

The aim was to create awareness of the influence of non-African collaborators in the SADC's research priorities. The choice of the groups has been made so that scientifically big countries (non-African countries) collaborate with a relatively small scientific community. The findings are suggestive: the majority (almost two thirds) of South African–SADC collaboration includes non-African participants. While it is difficult to surmise what would have happened if non-African collaborators were not available, it may be argued that these collaborations were initiated by the non-African participants. What is probably more important is the fact that the collaborations with no non-Africans occurred in disciplines different from those in which non-Africans participated. This finding confirms the assertion of other researchers¹⁵ that most African science collaboration flows through international gates.

A number of policy relevant questions can be raised. Are the collaborative disciplines also induced by the non-African participants? If so, are they in the interest of the local regional system of innovation? What would happen if the non-African participants lose interest in the region? How can local collaboration be improved? There are others.

Further research, including surveys and comparisons in other regions in the world, may confirm the validity of the argument that scientifically big countries have the power to dictate priorities in small regions.

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