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# Insiders and Outsiders in International Scientific Collaboration: Distinguishing between Investigating and Investigated Countries

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## Abstract

This study focuses on patterns of international collaboration in cases where teams of scientists collaborate to conduct research aimed at solving problems pertinent to certain countries or regions. We employ Merton's insider-outsider theory to categorize authors from the countries under study as insiders and those from outside the studied countries as outsiders. We identify five collaboration patterns (CPs) based on different types of shared perspectives of co-authors – *Internal Perspective* (CP1), *Combined Perspective* (CP2), *Expanded perspective* (CP3), *Partially Overlapping Perspective* (CP4) and *External Perspective* (CP5). An empirical analysis of research related to "Sustainable Development Goal 1: No Poverty" reveals that CP1 is the most prevalent perspective. Whereas CP5 has seen a gradual decline, CP2 has risen over the years. A case study on the involvement of international scholars in poverty research in African countries reveals significant benefits from outsider participation, with substantial funding from developed countries. While this support has enhanced the quantity of research outputs, it also poses challenges. It may shape the perspectives and research agendas of insiders, thereby complicating internal efforts to develop research topics rooted in the local context and addressing domestic development needs.

## Introduction

Research collaboration is a longstanding topic of interest in the field of science of science. Collaborators bring specialized knowledge and skills, each offering unique perspectives on research questions. By harnessing these strengths and fostering consensus among partners, collaboration often enhances efficiency and improves outcomes in scientific research. In the contemporary world, marked by pressing

challenges such as public health crises, climate change and energy sustainability, collaboration has become increasingly indispensable for tackling complex global problems. Investigating different ways to conduct scientific collaboration to figure out the effective collaboration patterns has thus emerged as a crucial topic of discussion among scholars.

Existing studies on research collaboration patterns predominantly emphasize the author aspect of collaborations. These studies typically categorize collaborations based on factors such as team size (e.g. large vs. small (Wu et al., 2019)), geographical scope (e.g. intra- vs. inter-institutional (Savić et al., 2017), domestic vs. international (Gök & Karaulova, 2024)), demographic attributes (e.g. gender (Love et al., 2022), ethnicity (AlShebli et al., 2018), professional status (Liu et al., 2019)), organizational structure (e.g. flat vs. hierarchical (Xu et al., 2022)), disciplinary backgrounds (e.g. disciplinary vs. interdisciplinary (Liu et al., 2024)) or the relational dynamics among collaborators (Feng & Kirkley, 2020). However, there remains a gap in addressing how these characteristics of authors correspond to the specific issues they aim to solve.

In response to this gap, the theory of insiders and outsiders (Merton, 1972) may offer a novel perspective for analyzing collaboration patterns. This theory posits that individuals can be classified as insiders or outsiders based on their alignment with societal norms, values and established rules within a specific context. Applied to research collaboration, it allows for the categorization of authors based on their alignment with the issues they study. This categorization may encompass various perspectives. For example, from a disciplinary perspective, authors can be classified as insiders or outsiders according to the degree of expertise in the field that the research problem belongs to. A typical research topic related to this perspective is interdisciplinarity, an area that has already been extensively explored in existing literature. However, this study adopts a geographical perspective by linking the origins of authors to the geographical focus of their research. This perspective corresponds to the growing emphasis on diverse contributions and practical solutions in scientific research evaluation (CoARA, 2022), which has led the research to increasingly address local issues to meet societal needs. Simultaneously, the complexity and integration of scientific problems make research collaboration a prevailing trend. In this context, how can different kinds of expertise and background contribute to solving specific problems that arise in local contexts? The insider-outsider theory provides valuable guidance for answering such questions. By exploring these dynamics, we move beyond traditional author-centric analyses to examine how diverse compositions of authors from different geographical backgrounds contribute to addressing geographically targeted problems.

On the background discussed above, this study addresses three main questions: (1) What collaboration patterns can be identified when viewed through the lens of insiders and outsiders? (2) Does the distribution of different collaboration patterns vary over time? (3) How do the topics of research vary across these collaboration patterns? We construct a new framework for identifying international scientific collaboration patterns, and utilize data from research related to the theme of

"Sustainable Development Goal 1: No Poverty" for the empirical analysis. The primary objectives are to elucidate evolutional trends and thematic features of outputs across various collaboration patterns. Furthermore, this study examines international academic activities aimed at poverty alleviation, with a particular focus on the engagement of Global North in the poverty research of Global South. It aims to offer insights to enhance collaborative research efforts and drive local solutions.

## Theoretical framework

### *Theory of insiders and outsiders*

In 1972, the American sociologist of science Robert Merton adopted a structural conception of insider/outsider status, defining insiders as "the members of specified groups and collectivities or occupants of specified social statuses" and outsiders as "the nonmembers" (Merton, 1972). The insider doctrine holds that "you have to be one in order to understand one". It posits that an individual has monopolistic or privileged access to knowledge, or is wholly excluded from it, by virtue of one's group membership or social position. According to this doctrine, the outsider has a structurally imposed incapacity to comprehend alien groups, statuses, cultures and societies. On the contrary, the outsider doctrine holds that "one need not to be Caesar in order to understand Caesar". It posits that individuals who are not bound by commitments to a specific group can readily assume the role of relatively objective investigators. In the fields of history and sociology, external perspectives can often provide profound insights and enhanced understanding. However, Merton holds the belief that achieving a transition from social conflict to intellectual controversy, wherein the perspectives of each group are taken seriously enough to be carefully examined rather than rejected out of hand, can facilitate a constructive interplay between the distinctive strengths and limitations of insider and outsider perspectives. This interplay, in turn, may enhance the potential for a more nuanced and comprehensive understanding of social life.

The theory of insiders and outsiders provides a proper perspective to revisit scientific collaboration in which authors with different affiliations and distinct characteristics work together to address specific scientific problems and co-publish their research findings. When the research problem pertains to a particular group, an author's status as an insider or outsider can be determined by his or her affiliation with that group. Insiders and outsiders may be contributing to the research target in different ways – insiders by possessing pre-existing membership within the group prior to the commencement of the research, and outsiders by entering the targeted context solely during the research process. Insiders and outsiders also may exhibit various research focuses. Insiders tend to prioritize the specific context and develop practical knowledge, whereas outsiders are more inclined to seek knowledge that can be generalized across various situations (Louis & Bartunek, 1992). Previous research has found that collaborative research has advantages for both insiders and outsiders, and for the nature of the research itself (Liu & Burnett, 2022). For outsiders, it allows easy access and achieves trust and acceptance by the local community. For insiders,

who may have some pre-formed biases that may influence their objectivity, they can be assisted by the outsider member of the team to retain a critical distance from the subject. This study adopts the structural conception of insider/outsider status and seeks to deepen the existing research by defining different collaboration patterns and delineating their distinctive characteristics.

*Collaboration patterns from the insider-outsider perspective*

In Merton's theory, the distinction between insider and outsider groups can be determined by various attributes such as gender, race, culture and region. This study provides an operational definition of insiders and outsiders in collaborative science from a geographical perspective. It categorizes authors from the countries under study as insiders and those from outside the studied countries as outsiders. Given that the typological classification is an effective means of understanding and interpreting phenomena (Bailey, 1994), this study categorizes different collaboration patterns (CPs) from the insider-outsider perspective. Specifically, we compare the ensemble of author countries (referred to as "investigating countries") and the ensemble of countries under study (referred to as "investigated countries") to define five CPs, as illustrated in Figure 1.

In this context, "author countries" refer to the nations of the institutions with which the authors are affiliated at the time of publishing the collaborative research. Conversely, "countries under study" pertain to the nations that are the focus of the research, such as the countries whose issues are being addressed or used as a research sample. For example, if scholars from the United Kingdom conduct research on economic development issues in South Africa, the investigating country would be the United Kingdom, while the investigated country would be South Africa.

The specific connotations of the five CPs are elucidated as follows.

- *CP1: Internal Perspective*
  Under this pattern, the investigating and investigated countries entirely coincide, indicating that researchers from specific countries focus on issues pertinent to their own nations. Such research typically embodies a distinct native perspective.

- *CP2: Combined Perspective*
  Under this pattern, the investigating countries encompass the investigated countries, indicating that domestic researchers engage in collaborative research with international counterparts to address domestic issues. Such research typically incorporates both internal and external perspectives to tackle local challenges.

- *CP3: Expanded perspective*
  Under this pattern, the investigated countries encompass the investigating countries, indicating that researchers from particular nations investigate issues relevant to both their own countries and other countries. Such research allows

for the examination of geographically extensive problems from specific perspectives.

- *CP4: Partially Overlapping Perspective*
  Under this pattern, the investigating and investigated countries exhibit intersections but do not completely overlap. The problems to be addressed and researchers' perspectives on problem-solving become more complicated.

- *CP5: External Perspective*
  Under this pattern, the investigating and investigated countries are entirely disjoint, indicating that researchers from particular nations investigate issues pertaining to other countries. Such research is often characterized by a completely external perspective.

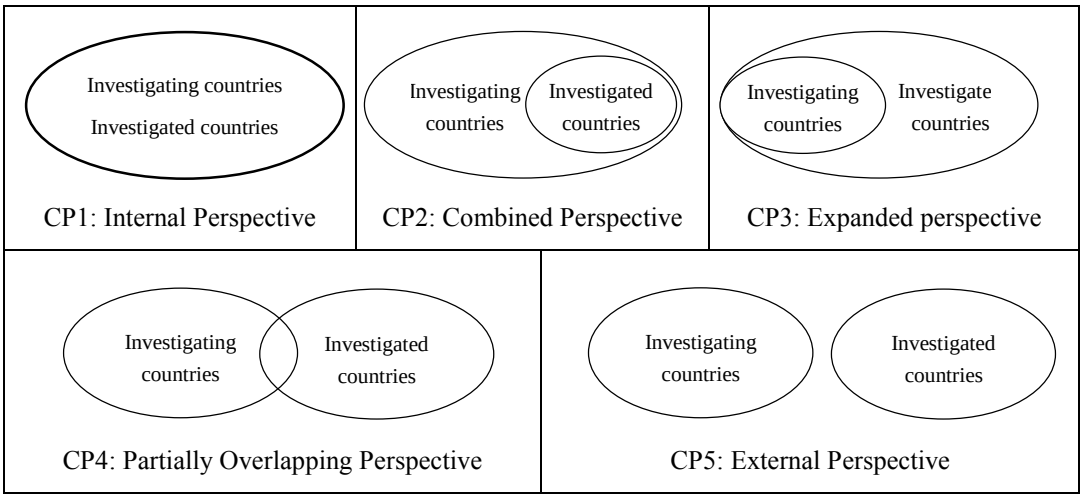


**Figure 1. Five collaboration patterns from the insider-outsider perspective.**

It should be noted that these five patterns do not encompass all types of scholarly papers. This study only analyzes papers that are identifiable to the author countries and focus on issues pertaining to certain countries. Actually, the framework for categorizing collaboration patterns proposed in this study is topic-dependent and therefore particularly well-suited for research addressing issues within health, environment, humanities and social sciences, where the emphasis is more on studying problems in geographical contexts. In contrast, its applicability is relatively constrained in many physical science fields that prioritize the identification of universal scientific laws.

## Data and method

### *Data*

This study takes academic papers related to Sustainable Development Goal 1 as cases to conduct empirical analysis. The Sustainable Development Goals (SDGs) were adopted by the United Nations in 2015 as a universal call to action to end poverty, protect the planet and ensure that by 2030 all people enjoy peace and prosperity. Among 17 goals in this 15-year plan, the first goal "SDG1 No Poverty" aims to end poverty in all its forms everywhere. Scholarly investigations pertaining to SDG1 are more likely to focus on country-specific contexts, thereby closely aligning with the requisites of this study.

At the operational level, Elsevier has generated SDG search queries to help researchers and institutions track and demonstrate progress toward the SDG targets since 2018 (Scopus, 2023). These queries, along with the university's own data and evidence supporting progress and contributions to the particular SDG outside of research-based metrics, have been used for the THE Impact Rankings. The latest 2023 SDG queries are a result of Elsevier data science teams building extensive keyword queries, supplemented with a predictive machine learning element, to map documents to SDGs with very high precision (Bedard-Vallee et al., 2023). Employing the newest version of queries provided by Elsevier, this study downloaded 223,816 papers (including the document types of Article and Review) related to SDG1 from Scopus (https://www.scopus.com/). The data was retrieved in May 2024.

In addition to the bibliographic data obtained from the Scopus database, this study also incorporates extensive metrics from the SciVal platform (https://www.scival.com/), an analytical tool developed by Elsevier based on Scopus data. Detailed descriptions of the application of these metrics will be presented in the subsequent sections where they are used in our analysis.

### *Method*

From a technical perspective, the challenging aspect of this study lies in the identification of the investigating countries and the investigated countries. For the former, the country entities are extracted from the structured list of author affiliations provided in the bibliographic information of papers using regular expressions. For the latter, the country entities are extracted from the titles, author keywords and abstracts provided in the bibliographic information of papers using the *spaCy*, a free open-source library for natural language processing in Python. Subsequently, the country names are standardized using the *pycountry* library. Once the investigating countries and the investigated countries are determined, the collaboration pattern of each paper can be identified.

Here, two issues require clarification. Firstly, regarding the identification of the investigating countries, the institutions to which the authors are affiliated may not always accurately reflect their native cultural groups. For instance, some authors studying or visiting abroad may be affiliated with institutions from both their home

and host countries. Nonetheless, considering that these transnational authors possess a certain degree of cultural perspective from the host country, identifying the investigating countries through the authors' affiliations is still deemed reasonable.
Secondly, concerning the identification of the investigated countries, the mention of a country in the title, keywords or abstract – especially when only mentioned in the abstract – does not necessarily imply that the research focuses on issues specific to that country or is based on its real-world conditions. It may merely use the country as a research context. Moreover, sometimes only a city or region within a country or a country group is mentioned without referencing the country itself. However, after manually checking 200 pieces of abstracts, it was found that less than 5% of cases resulted in erroneous collaboration pattern identification due to the aforementioned reasons. Thereby, the method used in this study for determining the collaboration pattern is considered to be fairly precise.
In the overall sample, 209,570 papers (93.6%) contain information of author affiliation and include at least one field among the title, author keywords and the abstract. Since not all studies center around specific research subjects, 112,110 papers (53.5%) with identifiable collaboration patterns from the insider-outsider perspective are selected for the following analysis in this study.

## Results

### *Panoramic view: Distribution and features of five collaboration patterns*

This study commences with an extensive data analysis of the sample to reveal the collaborative characteristics of research on poverty issues. The key findings in this section are as follows: *Internal Perspective* is the most prevalent collaboration pattern overall; research under the pattern of *External Perspective* has gradually decreased over time, while that of *Combined Perspective* has increased. A general finding is also that research incorporating an outsider perspective focuses on more cutting-edge topics.

### *Overview*

Among five collaboration patterns, *Internal Perspective* (CP1) is the most commonly-observed one, with 57,687 (51.5%) pieces of papers in total. Patterns of *External Perspective* (CP5) and *Combined Perspective* (CP2) are also prevalent, with 25,936 (23.1%) and 20,371 (18.2%) pieces of papers respectively. Patterns of *Expanded perspective* (CP3) and *Partially Overlapping Perspective* (CP4) are relatively rare, with 6,236 (5.6%) and 1,880 (1.7%) pieces of papers respectively.
Considering the specific distribution across countries, certain differences can be observed across different collaboration patterns in terms of the investigating countries and the investigated countries (see Table 1). The primary finding is that, in addressing the issue of poverty, developed countries are more inclined to act as

initiators of research, while developing countries are more frequently the focuses of these studies[1].

**Table 1. Numbers and proportions of representative country combinations in five collaboration patterns[2].**

| *CP1: Internal Perspective* | | | *CP2: Combined Perspective* | | | | *CP3: Expanded perspective* | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **A/B** | **N** | **P** | **B** | **A-B** | **N** | **P** | **A** | **B-A** | **N** | **P** |
| US | 7175 | 12.4% | CN (2532, 12.4%) | US | 855 | 33.8% | US (996, 16.0%) | IN | 186 | 18.7% |
| CN | 6052 | 10.5% | | GB | 294 | 11.6% | | MX | 131 | 13.2% |
| IN | 4043 | 7.0% | | AU | 274 | 10.8% | | CA | 65 | 6.5% |
| GB | 3877 | 6.7% | | CA | 115 | 4.5% | | others | 614 | 61.6% |
| ZA | 3084 | 5.3% | | others | 994 | 39.3% | GB (536, 8.6%) | US | 113 | 21.1% |
| AU | 2173 | 3.8% | IN (1184, 5.8%) | US | 292 | 24.7% | | DE | 25 | 4.7% |
| BR | 2108 | 3.7% | | GB | 163 | 13.8% | | others | 398 | 74.3% |
| CA | 1849 | 3.2% | | AU | 86 | 7.3% | CN (270, 4.3%) | US | 33 | 12.2% |
| DE | 1624 | 2.8% | | NL | 38 | 3.2% | | JP | 25 | 9.3% |
| ES | 1488 | 2.6% | | others | 605 | 51.1% | | SG | 16 | 5.9% |
| ID | 1218 | 2.1% | ZA (933, 4.6%) | GB | 214 | 22.9% | | others | 196 | 72.6% |
| NG | 1192 | 2.1% | | US | 177 | 19.0% | ZA (253, 4.1%) | ZW | 23 | 9.1% |
| IT | 1052 | 1.8% | | NL | 37 | 4.0% | | IN | 18 | 7.1% |
| SE | 985 | 1.7% | | NG | 35 | 3.8% | | US | 12 | 4.7% |
| MX | 909 | 1.6% | | others | 470 | 50.4% | | others | 200 | 79.1% |
| others | 18858 | 32.7% | others (15722, 77.2%) | | | | others (4181, 67.0%) | | | |

| *CP4: Partially Overlapping Perspective* | | | | | | | | | *CP5: External Perspective* | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **A&B** | **N** | **P** | **A-B** | **N** | **P** | **B-A** | **N** | **P** | **A** | **B** | **N** | **P** |
| CN | 109 | 5.8% | US | 307 | 16.3% | US | 104 | 5.5% | US | IN | 591 | 2.3% |
| US | 86 | 4.6% | GB | 209 | 11.1% | IN | 77 | 4.1% | US | CN | 557 | 2.1% |
| ZA | 80 | 4.3% | CA | 73 | 3.9% | CN | 64 | 3.4% | US | MX | 423 | 1.6% |
| GB | 77 | 4.1% | AU | 70 | 3.7% | GB | 51 | 2.7% | GB | IN | 311 | 1.2% |
| IN | 68 | 3.6% | NL | 66 | 3.5% | DE | 37 | 2.0% | US | ES | 258 | 1.0% |
| DE | 53 | 2.8% | DE | 53 | 2.8% | ES | 33 | 1.8% | GB | CN | 219 | 0.8% |
| BR | 46 | 2.4% | FR | 36 | 1.9% | CA | 24 | 1.3% | US | BR | 202 | 0.8% |
| KE | 41 | 2.2% | GB, US | 34 | 1.8% | FR | 23 | 1.2% | US | ZA | 191 | 0.7% |
| PK | 41 | 2.2% | ZA | 29 | 1.5% | AU | 21 | 1.1% | GB | US | 157 | 0.6% |
| ES | 36 | 1.9% | IT | 28 | 1.5% | JP | 21 | 1.1% | US | GE | 156 | 0.6% |
| BD | 34 | 1.8% | ES | 27 | 1.4% | KE | 21 | 1.1% | GB | ZA | 153 | 0.6% |
| IT | 33 | 1.8% | CH | 23 | 1.2% | SE | 21 | 1.1% | ZA | ZW | 151 | 0.6% |
| AU | 32 | 1.7% | CN | 23 | 1.2% | PT | 20 | 1.1% | US | BD | 146 | 0.6% |
| GH | 32 | 1.7% | SE | 23 | 1.2% | BR | 18 | 1.0% | AU | CN | 143 | 0.6% |
| MX | 32 | 1.7% | BE | 21 | 1.1% | GH | 17 | 0.9% | US | KE | 134 | 0.5% |
| others | 1080 | 57.4% | others | 858 | 45.6% | others | 1328 | 70.6% | others | | 22144 | 85.4% |

*** A: investigating country ensemble; B: investigated country ensemble; N: number; P: proportion; /: or; &: and; -: except.**

[1] As of 2023, there are 37 globally recognized developed countries acknowledged by institutions such as the World Bank, the International Monetary Fund, the United Nations Development Programme, and the Central Intelligence Agency of the United States. These countries include the United Kingdom, France, Germany, Italy, the Netherlands, Norway, Sweden, Finland, Denmark, Iceland, Switzerland, Belgium, Luxembourg, Ireland, Spain, Portugal, Austria, the Czech Republic, Slovakia, Hungary, Greece, Slovenia, Poland, Estonia, Latvia, Lithuania, Malta, San Marino, Cyprus, Japan, South Korea, Singapore, Israel, the United States, Canada, Australia, and New Zealand.

[2] To save the space, the binary codes of countries are employed in this study. The binary codes and the corresponding full names are detailed in Table 5 in the appendix.

Regarding each specific pattern, 98.4% CP1 papers only cover one investigating and investigated country, which means that the authors are mostly from a single country and they study issues related to their own country. The countries with the highest numbers of CP1 papers are the United States (7,175, 12.4%), China (6,052, 10.5%), India (4,043, 7.0%), the United Kingdom (3,877, 6.7%) and South Africa (3,084, 5.3%). CP2 papers feature the collaboration between developing and developed countries in studying issues pertinent to developing countries. Among these papers, 97.4% only have one investigated country, with three most focused countries being China (2,532, 12.4%), India (1,184, 5.8%) and South Africa (933, 4.6%). CP3 papers feature diverse investigating and investigated countries. Among these papers, 95.6% only have one investigating country, with two most active countries being the United States (996, 16.0%) and the United Kingdom (536, 8.6%). China (270, 4.3%) and South Africa (253, 4.1%) are also important investigating countries. The countries under study are diverse, exhibiting various characteristics such as cultural similarity, geographical proximity and comparable levels of development. CP4 papers involve three types of countries – intersections of the ensembles of investigating countries and investigated countries, countries only in the investigating country ensembles, and countries only in the investigated country ensembles. Notably, the developing countries appear more in the intersections. Among CP5 papers, the pairs of investigating countries and investigated countries, which indicate who study whom, are worth the attention. Although the distribution of country pairs is relatively dispersed, a clear pattern emerges: authors mostly come from developed countries, while the research primarily focuses on issues pertaining to developing countries.

*Temporal trend*

By further examining the trends over the years (see Figure 2), it is evident that the proportion of CP1 papers has remained stable over the past two decades. The most significant change is the shift from studying issues in other countries from an outsider's perspective to engaging in collaborative research between insiders and outsiders. The proportion of CP2 papers has increased from 7.6% in 2000 to 22.2% in 2023, while the proportion of CP5 papers has decreased from 31.4% in 2000 to 16.5% in 2023. When combined with country-level information, this trend suggests a growing collaboration between the global North and South in addressing poverty-related issues.

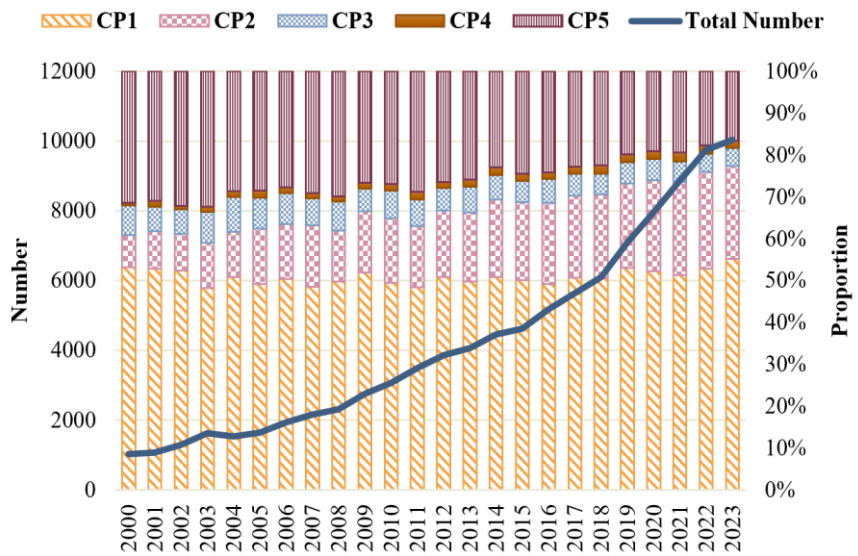


**Figure 2. Annual trend of the total number of papers and the proportion of papers under five collaboration patterns.**

Note: Due to the relatively low number of papers in certain years, to ensure the clarity and aesthetic quality of the figure, only papers published within 2000~2023 are displayed, covering over 90% of the overall samples.

*Thematic feature*

In terms of thematic features (see Figure 3), this study examines two indicators based on the topics annotated for individual papers by the SciVal platform – the *Topic Prominence Percentile*, a metric provided by SciVal reflecting the momentum of the topic; and the *Topic Diversity*, a self-developed indicator that calculates the diversity of topics using the Simpson index (Simpson, 1949).

Regarding the topic prominence, collaboration patterns integrating external perspectives or involving partial engagement exhibit relatively high average levels of topic prominence, while collaboration patterns that mainly rely on internal perspectives show relatively lower average levels of topic prominence. Regarding the thematic diversity, the pattern with insiders self-looking demonstrates the highest indicator level all the time. In contrast, other collaboration patterns incorporating external perspectives initially exhibit relatively low topic diversity, which increases over time.

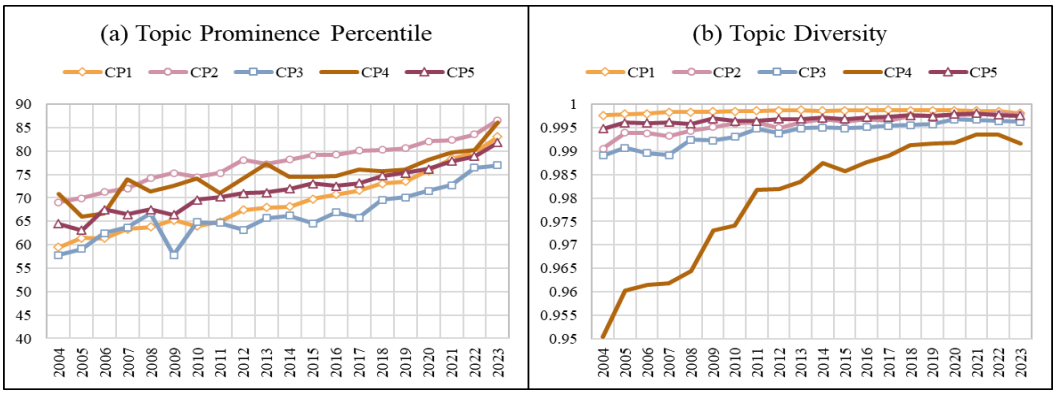


**Figure 3. Indicator level of thematic features for five collaboration patterns.**

*Case study: International engagement in poverty research in Africa*

Africa represents the youngest per person and fastest-growing population in the world, with the oldest and most diverse genome (Marincola & Kariuki, 2020). However, poverty has long been a central issue in African development due to factors such as inadequate economic growth, poor governance, cultural challenges, conflict and disease (Omomowo, 2018). Until now, Africa remains "the core of the world's poverty problem" (Bigman, 2011). Historically, the interaction among African countries is relatively limited, which is particularly pronounced when compared to partnerships with more developed regions such as Europe, Asia and America (Dine et al., 2024). Instead, research in African countries has largely been conducted by scholars from the Global North (Vieira, 2022). However, to study Africa effectively, it is essential to develop a comprehensive understanding of the region (Dine et al., 2024). As African countries are experiencing a shift towards more equitable and sustained research partnerships (Eduan & Yuanqun, 2019; Vieira, 2022), it is crucial to examine the contributions of both internal and external actors in the poverty research in Africa. This section zooms into 19,437 research articles with poverty in African countries as the topic.

*Who are the insiders? Who are the outsiders?*

At the outset of this case study, it is essential to clarify again the definitions of "insiders" and "outsiders". In the prior analysis, different collaboration patterns were distinguished with nations as the basis for the units. However, our framework can be applied to any geographical unit, and a regional perspective covering groups of countries is adopted in this section. According to the five regions in Africa[3] – Eastern Africa, Southern Africa, Western Africa, Northern Africa and Central Africa, authors from within a specific region will be considered as insiders, while those from outside the region are regarded as outsiders. This is based on the assumption that people from the same African region may share relatively similar cultural backgrounds and research environments.

[3] The regional division of African countries is detailed in Table 6 of the Appendix.

When considering the five regions as investigated units, Eastern Africa is the most investigated (7,581, 39%), followed by Southern Africa (5,615, 28.89%) and Western Africa (5,608, 28.85%). Northern Africa (994, 5.11%) and Middle Africa (600, 3.09%) have been investigated relatively less from the same perspective of poverty. In Eastern Africa, countries including Ethiopia (1,802, 23.77%), Kenya (1,642, 21.66%), Tanzania (1,235, 16.29%), Uganda (1,188, 15.67%) and Zimbabwe (809, 10.67%) have received considerable attention; in Western Africa, relevant research is mostly concentrated on Nigeria (2,405, 42.83%) and Ghana (2,160, 38.47%); in Southern Africa, South Africa (5,058, 90.19%) stands out prominently; in Northern Africa and Central Africa, Egypt (400, 40.24%) and Cameroon (355, 59.17%) are respectively the most investigated country in their areas.

For all five regions, the United States and the United Kingdom are the main outsiders investigating into their poverty issues. As shown in Table 2, these two countries have participated in the highest share of papers outside of the region itself. Countries such as Canada, Germany, the Netherlands and Australia are also among those that have conducted extensive research on poverty in Africa. In particular, France demonstrates a relatively high level of attention towards issues pertaining to Northern and Central Africa.

**Table 2. Top 10 investigating countries (regions) for five African regions and the share of their papers.**

| Overall (19,437) | | Eastern Africa (7,581) | | Western Africa (5,615) | |
|---|---|---|---|---|---|
| Investigator | Share | Investigator | Share | Investigator | Share |
| Southern Africa | 26.02% | Eastern Africa | 57.62% | Western Africa | 65.95% |
| Eastern Africa | 12.37% | US | 23.86% | US | 16.46% |
| Western Africa | 11.11% | GB | 18.61% | GB | 13.96% |
| US | 9.27% | Southern Africa | 11.23% | Southern Africa | 6.95% |
| GB | 8.45% | DE | 5.37% | CA | 6.27% |
| CA | 6.35% | NL | 4.99% | Eastern Africa | 4.93% |
| DE | 6.11% | CA | 4.21% | AU | 4.26% |
| NL | 4.16% | NO | 3.39% | DE | 3.60% |
| Northern Africa | 2.34% | SE | 3.22% | NL | 3.26% |
| AU | 2.06% | Western Africa | 2.95% | FR | 3.08% |
| Southern Africa (5,608) | | Northern Africa (994) | | Central Africa (600) | |
| Investigator | Share | Investigator | Share | Investigator | Share |
| Southern Africa | 82.28% | Northern Africa | 57.04% | Central Africa | 47.17% |
| GB | 11.82% | US | 15.90% | US | 16.67% |
| US | 11.00% | GB | 11.27% | GB | 13.50% |
| Eastern Africa | 2.92% | FR | 9.56% | Southern Africa | 10.33% |
| CA | 2.91% | CA | 3.72% | Eastern Africa | 10.00% |
| Western Africa | 2.64% | IT | 3.52% | FR | 9.17% |
| NL | 2.41% | DE | 3.42% | Western Africa | 8.83% |
| AU | 2.19% | Western Africa | 3.12% | CA | 7.33% |
| DE | 2.07% | Eastern Africa | 2.82% | DE | 7.17% |
| SE | 1.59% | SA | 2.82% | BE | 6.00% |

*To what extent do outsiders engage in insiders?*

Figure 4 illustrates the temporal changes in the number of papers focused on countries in different African regions over the past two decades, as well as the proportion of papers under different collaboration patterns. The main observation of this subsection is that the poverty research in Africa is highly dependent on outsiders, with a growing trend toward collaborative research between insiders and outsiders.

For all papers addressing African poverty issues, it is consistent with the overall trend shown in Figure 2 that the proportion of papers under CP5 has decreased, while those under CP2 have risen. Different from the results shown in the overall sample, papers under CP1 are relatively scarce in African poverty research, particularly in the earlier years, with studies involving outsiders accounting for over 60% of the total.

Focusing on different African regions, the dependence on external scientific research forces is particularly prominent in Eastern and Central Africa, whereas Southern Africa exhibits stronger autonomy in conducting related research, with the proportion of CP1 papers exceeding 60%. Notably, in contrast to the prominent trend of other regions engaging in collaborative or independent research, the proportion of CP1 papers in Central Africa exhibits a declining trend, with an increasing reliance on outsider contributions instead.


**Figure 4. Annual trend of the number of papers investigating different African regions and the distribution of five collaboration patterns.**

*How do the outsiders shape the research topics?*

Given the substantial involvement of outsiders in the study of poverty in African regions, we will now analyze whether the research topics vary depending on whether the study is conducted by insiders alone (CP1), outsiders alone (CP5), or through collaboration between insiders and outsiders (CP2). Table 3 presents a comparison of the most frequently occurring topic keywords across three patterns for five African regions. These topic keywords are derived from the topic cluster names provided by the SciVal platform for each paper.

Generally, themes related to finance, industry, health and climate are the most investigated. Research conducted independently by insiders and outsiders demonstrates relatively consistent topic preferences, with a tendency to focus on economic and climate-related issues. In contrast, research jointly conducted by insiders and outsiders shows a clear focus on topics in the field of healthcare and medicine. Among these themes, finance is intrinsically and obviously linked to poverty; industrial development can alleviate poverty by promoting economic growth; the existence of health problems can be attributed to the pernicious cycle between disease and poverty; and environmental issues exacerbate poverty, because the impacts of climate change on food insecurity, forced migration, disease and mortality may bring African countries that are already vulnerable with increasingly severe and inequitable disasters.

A notable distinction is that CP1 and CP5 papers focused on Southern African countries tends to emphasize political and historical topics, such as democracy and colonialism. Meanwhile, CP5 papers focused on Northern African countries shows greater attention to religious and cultural issues, such as Islam and Arab culture, although the proportion of these papers is declining. Moreover, CP2 papers focused on Central African countries predominantly addresses environmental protection topics, such as natural resources, deforestation and environmental policies. These locally distinctive issues merit attention, which may offer unique insights for the international community.

**Table 3. Proportion of papers with high-frequency topic keywords under different collaboration patterns.**

| Investigated region | CP1 | | CP2 | | CP5 | |
|---|---|---|---|---|---|---|
| | Topic keyword | Share | Topic keyword | Share | Topic keyword | Share |
| Overall | Finance | 9.5% | Health Service | 14.5% | Finance | 11.4% |
| | Climate Change | 9.1% | Climate Change | 11.8% | Climate Change | 9.6% |
| | Income Inequality / Wealth | 7.5% | Neonatal Infant | 8.8% | Democracy | 8.5% |
| | | | Finance | 6.6% | Income Inequality / Wealth | 8.5% |
| | Industry | 7.2% | Mental Health | 5.7% | | |
| Eastern Africa | Climate Change | 12.9% | Health Service | 23.1% | Finance | 11.9% |
| | Health Service | 9.6% | Climate Change | 19.1% | Climate Change | 10.9% |
| | Neonatal Infant | 7.9% | Neonatal Infant | 15.5% | Income Inequality | 8.6% |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Finance | 7.7% | Natural Resource | 10.5% | Wealth | 8.6% |
| | Industry | 6.7% | Toddlers | 9.1% | Democracy | 6.6% |
| Western Africa | Finance | 10.2% | Health Service | 18.9% | Finance | 10.9% |
| | Health Service | 9.6% | Climate Change | 11.9% | Health Service | 9.2% |
| | Climate Change | 9.4% | Neonatal Infant | 9.8% | Climate Change | 9.0% |
| | Industry | 9.2% | Delivery of Health Care | 9.7% | Income Inequality / Industry / Wealth | 7.9% |
| | Income Inequality / Wealth | 7.3% | Household | 9.3% | | |
| Southern Africa | Democracy | 9.3% | Health Service | 10.3% | Democracy | 16.1% |
| | Finance | 9.2% | Finance | 8.8% | Colonialism | 11.8% |
| | Income Inequality / Wealth | 8.3% | Income Inequality / Wealth | 8.3% | Finance | 11.5% |
| | Welfare | 7.5% | Climate Change | 8.2% | Income Inequality / Wealth | 10.5% |
| Northern Africa | Finance | 16.3% | Climate Change | 19.4% | Islam | 15.0% |
| | Income Inequality / Wealth | 12.5% | Finance | 8.8% | Democracy | 14.4% |
| | Industry | 10.3% | Income Inequality / Irrigation / Water Management / Wealth | 7.4% | Finance | 11.1% |
| | Democracy / Health Service / Social Media | 7.2% | | | Industry | 10.3% |
| | | | | | Arab World / Climate Change | 9.5% |
| Central Africa | Finance | 16.0% | Natural Resource | 15.5% | Finance | 10.6% |
| | Industry | 11.0% | Climate Change | 11.3% | Democracy / Industry | 9.9% |
| | Income Inequality / Wealth | 10.0% | Deforestation | 10.7% | | |
| | | | Health Service | 10.1% | Climate Change / Natural Resource | 8.0% |
| | Climate Change | 8.0% | Environmental Policy | 9.5% | | |

*Collaboration patterns and sources of funding*

In actual, the advancement of scientific research relies heavily on science funding, especially for research fields with substantial expenditures on instruments, materials, etc. To a certain extent, the choice of research topics is significantly influenced by the funding agencies. In particular, research funding plays an important role in shaping scientific collaborations between the North and the South (Skupien & Rüffin, 2019). Therefore, the second part of analysis in this subsection examines the participation of outsiders in poverty research in African regions from the perspective of science funding.

According to data provided by Scopus, among the 19,437 research articles with African countries as investigated countries, 6,852 (35%) of them are labeled with funding information. This proportion aligns with the overall sample, as only 38,096 out of 112,110 papers (34%) have funding information. Table 4 showcases the funding agencies with the highest number of associated publications in the overall case sample and papers investigating different African regions.

Generally, indigenous funding institutions in African countries are relatively limited, whose effects are only manifested in studies that exclusively include insiders. In contrast, grants from foundations in the United Kingdom, the United States, and other countries have played a significant role in advancing research on poverty in Africa. On the regional side, the National Research Foundation (NRF) of South Africa is the primary source of funding for research in Africa, while the Economic Research Forum (ERF) in Egypt, the African Development Bank, and universities in several African countries have also played a significant role in the production of CP1 papers. On the international side, international funding sources generally fall into three categories – institutions focused on international development, e.g., the UK Department for International Development (DFID), the US Agency for International Development (USAID) and the Canadian International Development Research Centre (IDRC); those concentrating on economic and social issues, e.g., the UK Economic and Social Research Council (ESRC) and the World Bank Group (WBG); and those specializing in medical research, e.g., the US National Institutes of Health (NIH). Such distribution of funding sources aligns with the thematic focus on finance, climate and health-related issues to a certain extent.

It should be noted that the absolute values presented in Table 4 reflect the primary institutions funding research on poverty in Africa but fail to adequately capture the level of attention these institutions devote to the issue of poverty in Africa. We have conducted a search in the Scopus database for the major funding agencies supporting global research under "SDG1 No Poverty". It has been found that, while institutions such as the ESRC, NSF, and NIH fund a considerable proportion of research on poverty in Africa, their contributions account for only 14.6%, 4.9% and 4.8%, respectively, of their total funding for global poverty research. In contrast, agencies like DFID, USAID and IDRC have 56.9%, 42.4% and 42.2% of their poverty research focused on African countries, respectively, demonstrating a distinctive focus on Africa by these agencies.

**Table 4. Proportion of papers with high-frequency funding agencies under different collaboration patterns.**

| Investigated region | CP1 | | CP2 | | CP5 | |
|---|---|---|---|---|---|---|
| | Funding agency | Share | Funding agency | Share | Funding agency | Share |
| Overall | NRF, ZA* | 13.6% | DFID, UK | 7.6% | ESRC, UK | 7.3% |
| | DFID, UK | 3.2% | EC | 6.7% | DFID, UK | 6.3% |
| | IDRC, CA | 3.2% | USAID, US | 6.0% | USAID, US | 5.4% |
| | USAID, US | 3.1% | NIH, US | 5.6% | EC | 4.9% |
| | Sida, SE | 2.7% | BMGF, US | 5.6% | WBG | 4.8% |
| Eastern Africa | USAID, US | 6.2% | DFID, UK | 8.0% | ESRC, UK | 8.6% |
| | Sida, SE | 6.0% | BMGF, US | 7.3% | DFID, UK | 8.5% |
| | AAU, ET* | 5.8% | USAID, US | 7.0% | USAID, US | 6.2% |
| | CREA* | 4.3% | NIH, US | 6.1% | WBG | 5.1% |

| | | | | | | |
|---|---|---|---|---|---|---|
| | DFID, UK | 4.1% | EC | 6.0% | EC | 4.4% |
| Western Africa | CoU, NG* | 6.9% | USAID, US | 7.2% | USAID, US | 6.2% |
| | IDRC, CA | 6.9% | DFID, UK | 7.1% | WBG | 5.6% |
| | WBG | 5.5% | BMGF, US | 7.0% | ESRC, UK | 4.9% |
| | DFID, UK | 5.2% | EC | 4.5% | DFID, UK | 4.1% |
| | USAID, US / UCC, GH* | 2.9% | IDRC, CA | 4.1% | IDRC, CA | 4.0% |
| Southern Africa | NRF, ZA* | 29.6% | NRF, ZA | 16.8% | ESRC, UK | 10.5% |
| | WRC, ZA* | 5.1% | ESRC, UK | 11.7% | EC | 6.6% |
| | UCT, ZA* | 4.7% | EC | 10.7% | DFID, UK | 5.6% |
| | SAMRC, ZA* | 3.8% | NIH, US | 9.4% | SSHRC, CA | 4.3% |
| | UJ, ZA* | 3.0% | WT, UK | 8.7% | NSF, US | 3.9% |
| Northern Africa | ERF, EG* | 11.5% | EC | 13.5% | EC | 8.4% |
| | IDB | 7.7% | ERF, EG* | 4.5% | ESRC, UK | 4.7% |
| | CaU, EG* | 5.8% | DFID, UK | 3.4% | USAID, US | 4.7% |
| | UNICEF | 5.8% | MHESR, EG* | 3.4% | ANR, FR | 3.7% |
| Central Africa | IDRC, CA | 15.0% | EC | 12.3% | EC | 11.7% |
| | ADBG* / CIFOR / WBG / WRI | 10.0% | DFID, UK | 11.0% | USAID, US | 5.3% |
| | | | IDRC, CA | 8.2% | ESRC, UK | 4.3% |
| | | | USAID, US | 6.9% | WBG | 4.3% |

Note: (1) * indicates African institutions. (2) The full names of the funding institutions can be found in Table 7 of the appendix.

## Conclusion and discussion

This study introduces the sociological theory of insiders and outsiders into the context of scientific collaboration, and proposes five distinct collaboration patterns based on different types of shared perspectives of co-authors – *Internal Perspective* (CP1), *Combined Perspective* (CP2), *Expanded perspective* (CP3), *Partially Overlapping Perspective* (CP4) and *External Perspective* (CP5). It adopts academic papers related to "Sustainable Development Goal 1: No poverty", a topic characterized by significant contextual features, to conduct empirical analysis. The findings reveal that, the *Internal Perspective* has been the predominant collaboration pattern. However, in recent years, there has been a noticeable increase in research under the pattern of *Combined Perspective*. Research incorporating the outsider perspective tends to address more emerging topics. Collaborating on poverty research in specific countries or regions is becoming a prevailing trend. This approach serves as a crucial means for insiders to enhance their research capabilities, while it also offers outsiders an opportunity to gain in-depth contextual understanding and make substantial contributions. Theoretically, this study deepens and extends the research perspectives on scientific collaboration by looking more deeply into how different constellations are related to different topics.

More importantly, our case study focuses on the involvement of international scholars in poverty research within African countries, thus endowing the research

with significant practical relevance. The findings reveal that, with the exception of Southern Africa, with the National Research Foundation of South Africa serving as an essential funding source, the majority of poverty research in African regions largely depends on international contributions of competences and resources. While the engagement of outsiders can significantly expand the topics of the research, it is important to recognize that the lack of local leadership may dilute the local relevance of the research topics, shifting them towards more internationalized issues. This situation is partly attributable to insufficient domestic funding for scientific research, particularly from government sources. In contrast, countries such as the United Kingdom, the United States, and Canada have established dedicated government funding agencies targeting on international development and private institutions in specialized fields like medicine, which have played a crucial role in supporting research and solutions for poverty in the Global South. This reflects the positive contributions of external researchers, but it also highlights the need for local researchers to be aware of the potential loss of local discourse authority due to over-reliance on external support. It might be crucial for African countries to increase investment in scientific research and achieving technological self-reliance.

It should be recognized that while our sources of data can provide insights into the outcomes of collaborations between insiders and outsiders, they offering only limited understanding of the motivations behind the research collaborations. Given our focus on developing a new framework for categorizing and analyzing collaboration patterns from the insider-outsider perspective, deeper issues will warrant further examination. For instance, how do the research perspectives of insiders and outsiders mutually shape one another? What are the underlying mechanisms through which scientific funding impacts research topics? What are the similarities and differences in the academic impact and societal value of research outcomes produced by different collaboration patterns? These questions represent important areas for future investigation.

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## Appendix

**Table 5. Country (region) information.**

| Country full name | Country code | If African country (region) | Country full name | Country code | If African country (region) |
|---|---|---|---|---|---|
| Afghanistan | AF | | Lesotho | LS | √ |
| Aland Islands | AX | | Liberia | LR | √ |
| Albania | AL | | Libyan Arab Jamahiriya (the) | LY | √ |
| Algeria | DZ | √ | Liechtenstein | LI | |
| American Samoa | AS | | Lithuania | LT | |
| Andorra | AD | | Luxembourg | LU | |
| Angola | AO | √ | Macao | MO | |
| Anguilla | AI | | Macedonia (the former Yugoslav Republic of) | MK | |
| Antarctica | AQ | | Madagascar | MG | √ |
| Antigua and Barbuda | AG | | Malawi | MW | √ |
| Argentina | AR | | Malaysia | MY | |
| Armenia | AM | | Maldives | MV | |
| Aruba | AW | | Mali | ML | √ |
| Australia | AU | | Malta | MT | |
| Austria | AT | | Marshall Islands (the) | MH | |
| Azerbaijan | AZ | | Martinique | MQ | |
| Bahamas (The) | BS | | Mauritania | MR | √ |
| Bahrain | BH | | Mauritius | MU | √ |
| Bangladesh | BD | | Mayotte | YT | √ |
| Barbados | BB | | Mexico | MX | |
| Belarus | BY | | Micronesia (the Federated States of) | FM | |
| Belgium | BE | | Moldova (the Republic of) | MD | |
| Belize | BZ | | Monaco | MC | |
| Benin | BJ | √ | Mongolia | MN | |
| Bermuda | BM | | Montenegro | ME | |
| Bhutan | BT | | Montserrat | MS | |
| Bolivia | BO | | Morocco | MA | √ |
| Bosnia and Herzegovina | BA | | Mozambique | MZ | √ |
| Botswana | BW | √ | Myanmar | MM | |
| Bouvet Island | BV | | Namibia | NA | √ |
| Brazil | BR | | Nauru | NR | |
| British Indian Ocean Territory (the) | IO | | Nepal | NP | |
| Brunei Darussalam | BN | | Netherlands (the) | NL | |

| | | | | | |
|---|---|---|---|---|---|
| Bulgaria | BG | | Netherlands Antilles (the) | AN | |
| Burkina Faso | BF | √ | New Caledonia | NC | |
| Burundi | BI | √ | New Zealand | NZ | |
| Cambodia | KH | | Nicaragua | NI | |
| Cameroon | CM | √ | Niger (the) | NE | √ |
| Canada | CA | | Nigeria | NG | √ |
| Cape Verde | CV | √ | Niue | NU | |
| Cayman Islands (the) | KY | | Norfolk Island | NF | |
| Central African Republic (the) | CF | √ | Northern Mariana Islands (the) | MP | |
| Chad | TD | √ | Norway | NO | |
| Chile | CL | | Oman | OM | |
| China | CN | | Pakistan | PK | |
| Christmas Island | CX | | Palau | PW | |
| Cocos (Keeling) Islands (the) | CC | | Palestinian Territory (the Occupied) | PS | |
| Colombia | CO | | Panama | PA | |
| Comoros | KM | √ | Papua New Guinea | PG | |
| Congo | CG | √ | Paraguay | PY | |
| Congo (the Democratic Republic of the) | CD | √ | Peru | PE | |
| Cook Islands (the) | CK | | Philippines (the) | PH | |
| Costa Rica | CR | | Pitcairn | PN | |
| Côte d'Ivoire | CI | √ | Poland | PL | |
| Croatia | HR | | Portugal | PT | |
| Cuba | CU | | Puerto Rico | PR | |
| Cyprus | CY | | Qatar | QA | |
| Czech Republic (the) | CZ | | Réunion | RE | √ |
| Denmark | DK | | Romania | RO | |
| Djibouti | DJ | √ | Russian Federation (the) | RU | |
| Dominica | DM | | Rwanda | RW | √ |
| Dominican Republic (the) | DO | | Saint Helena | SH | √ |
| Ecuador | EC | | Saint Kitts and Nevis | KN | |
| Egypt | EG | √ | Saint Lucia | LC | |
| El Salvador | SV | | Saint Pierre and Miquelon | PM | |
| Equatorial Guinea | GQ | √ | Saint Vincent and the Grenadines | VC | |
| Eritrea | ER | √ | Samoa | WS | |
| Estonia | EE | | San Marino | SM | |
| Ethiopia | ET | √ | Sao Tome and Principe | ST | √ |
| Falkland Islands (the) [Malvinas] | FK | | Saudi Arabia | SA | |
| Faroe Islands (the) | FO | | Senegal | SN | √ |

| | | | | | |
|---|---|---|---|---|---|
| Fiji | FJ | | Serbia | RS | |
| Finland | FI | | Seychelles | SC | √ |
| France | FR | | Sierra Leone | SL | √ |
| French Guiana | GF | | Singapore | SG | |
| French Polynesia | PF | | Slovakia | SK | |
| French Southern Territories (the) | TF | | Slovenia | SI | |
| Gabon | GA | √ | Solomon Islands (the) | SB | |
| Gambia (The) | GM | √ | Somalia | SO | √ |
| Georgia | GE | | South Africa | ZA | √ |
| Germany | DE | | South Georgia and the South Sandwich Islands | GS | |
| Ghana | GH | √ | Spain | ES | |
| Gibraltar | GI | | Sri Lanka | LK | |
| Greece | GR | | Sudan (the) | SD | √ |
| Greenland | GL | | Suriname | SR | |
| Grenada | GD | | Svalbard and Jan Mayen | SJ | |
| Guadeloupe | GP | | Swaziland | SZ | √ |
| Guam | GU | | Sweden | SE | |
| Guatemala | GT | | Switzerland | CH | |
| Guernsey | GG | | Syrian Arab Republic (the) | SY | |
| Guinea | GN | √ | Taiwan (Province of China) | TW | |
| Guinea-Bissau | GW | √ | Tajikistan | TJ | |
| Guyana | GY | | Tanzania, United Republic of | TZ | √ |
| Haiti | HT | | Thailand | TH | |
| Heard Island and McDonald Islands | HM | | Timor-Leste | TL | |
| Holy See (the) [Vatican City State] | VA | | Togo | TG | √ |
| Honduras | HN | | Tokelau | TK | |
| Hong Kong | HK | | Tonga | TO | |
| Hungary | HU | | Trinidad and Tobago | TT | |
| Iceland | IS | | Tunisia | TN | √ |
| India | IN | | Turkey | TR | |
| Indonesia | ID | | Turkmenistan | TM | |
| Iran (the Islamic Republic of) | IR | | Turks and Caicos Islands (the) | TC | |
| Iraq | IQ | | Tuvalu | TV | |
| Ireland | IE | | Uganda | UG | √ |
| Isle of Man | IM | | Ukraine | UA | |
| Israel | IL | | United Arab Emirates (the) | AE | |
| Italy | IT | | United Kingdom (the) | GB | |

| | | | | | |
|---|---|---|---|---|---|
| Jamaica | JM | | United States (the) | US | |
| Japan | JP | | United States Minor Outlying Islands (the) | UM | |
| Jersey | JE | | Uruguay | UY | |
| Jordan | JO | | Uzbekistan | UZ | |
| Kazakhstan | KZ | | Vanuatu | VU | |
| Kenya | KE | √ | Venezuela | VE | |
| Kiribati | KI | | Viet Nam | VN | |
| Korea (the Democratic People's Republic of) | KP | | Virgin Islands (British) | VG | |
| Korea (the Republic of) | KR | | Virgin Islands (U.S.) | VI | |
| Kuwait | KW | | Wallis and Futuna | WF | |
| Kyrgyzstan | KG | | Western Sahara | EH | √ |
| Lao People's Democratic Republic (the) | LA | | Yemen | YE | |
| Latvia | LV | | Zambia | ZM | √ |
| Lebanon | LB | | Zimbabwe | ZW | √ |

**Table 6. Grouping of African countries.**

| Region | Country full name | Country code | Region | Country full name | Country code |
|---|---|---|---|---|---|
| Northern Africa | Algeria | DZ | Middle Africa | Angola | AO |
| | Egypt | EG | | Cameroon | CM |
| | Libya | LY | | Central African Republic | CF |
| | Morocco | MA | | Chad | TD |
| | Sudan | SD | | Congo | CG |
| | Tunisia | TN | | Democratic Republic of the Congo | CD |
| | Western Sahara | EH | | Equatorial Guinea | GQ |
| Eastern Africa | British Indian Ocean Territory | IO | | Gabon | GA |
| | Burundi | BI | | Sao Tome and Principe | ST |
| | Comoros | KM | Southern Africa | Botswana | BW |
| | Djibouti | DJ | | Eswatini | SZ |
| | Eritrea | ER | | Lesotho | LS |
| | Ethiopia | ET | | Namibia | NA |
| | French Southern Territories | TF | | South Africa | ZA |
| | Kenya | KE | Western Africa | Benin | BJ |
| | Madagascar | MG | | Burkina Faso | BF |
| | Malawi | MW | | Cabo Verde | CV |
| | Mauritius | MU | | Côte d'Ivoire | CI |
| | Mayotte | YT | | Gambia | GM |
| | Mozambique | MZ | | Ghana | GH |
| | Réunion | RE | | Guinea | GN |

| | | | | | |
|---|---|---|---|---|---|
| | Rwanda | RW | | Guinea-Bissau | GW |
| | Seychelles | SC | | Liberia | LR |
| | Somalia | SO | | Mali | ML |
| | South Sudan | SS | | Mauritania | MR |
| | Uganda | UG | | Niger | NE |
| | United Republic of Tanzania | TZ | | Nigeria | NG |
| | Zambia | ZM | | Saint Helena | SH |
| | Zimbabwe | ZW | | Senegal | SN |
| | | | | Sierra Leone | SL |
| | | | | Togo | TG |

**Table 7. Major funding institutions.**

| Full name | Abbreviation | Affiliated country |
|---|---|---|
| National Research Foundation | NRF | South Africa |
| Department for International Development | DFID | United Kindom |
| International Development Research Centre | IDRC | Canada |
| United States Agency for International Development | USAID | United States |
| Styrelsen för Internationellt Utvecklingssamarbete | Sida | Sweden |
| European Commission | EC | / |
| National Institutes of Health | NIH | United States |
| Bill and Melinda Gates Foundation | BMGF | United States |
| Economic and Social Research Council | ESRC | United Kingdom |
| World Bank Group | WBG | / |
| Addis Ababa University | AAU | Ethiopia |
| Consortium pour la recherche économique en Afrique | CREA | / |
| Covenant University | CoU | Nigeria |
| University of Cape Coast | UCC | Ghana |
| Water Research Commission | WRC | South Africa |
| University of Cape Town | UCT | South Africa |
| South African Medical Research Council | SAMRC | South Africa |
| University of Johannesburg | UJ | South Africa |
| Wellcome Trust | WT | United Kingdom |
| Social Sciences and Humanities Research Council of Canada | SSHRC | Canada |
| National Science Foundation | NSF | United States |
| Economic Research Forum | ERF | Egypt |
| Islamic Development Bank | IDB | / |
| Cairo University | CaU | Egypt |
| United Nations International Children's Emergency Fund | UNICEF | / |
| Ministry of Higher Education and Scientific Research | MHESR | Egypt |
| Agence Nationale de la Recherche | ANR | France |
| African Development Bank Group | ADBG | / |
| Centre for International Forestry Research | CIFOR | / |
| World Resources Institute | WRI | / |