Dynamics of South–South cooperation in health biotechnology

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1 Context

South–South cooperation (SSC), or cooperation between low- and middle-income countries, has been high on the development agenda for decades, but there is now increased expectation that such cooperation will involve research that provides solutions to regional and global challenges. Multilateral fora, such as the United Nations, are calling for increased SSC as a strategy to implement the Sustainable Development Goals. With the growing economic might of emerging economies, there are expanded opportunities to work together in a wide spectrum of areas ranging from education, to social development, to science intensive endeavours. These countries have become emerging donors and are shaping a new frontier of development cooperation. Despite the increased recognition that SSC is playing a growing role in promoting social and economic development, the evidence is still sparse on the dynamics of SSC and what strategies are needed for this cooperation to have impacts. Many climate induced problems, health problems, and other modern challenges demand concerted international research efforts to address them in an efficient manner and to use limited resources effectively.

Cooperation between low- and middle-income countries started to grow after World War II, when many countries obtained their independence and wanted to decrease their trade reliance on Northern markets. Although Southern countries are vastly different in size and economic development, they share many common environmental, health, and climate-induced problems. SSC affords the possibility of learning from one another to address these challenges. Although SSC constitutes a promising venue for low- and middle-income countries to strengthen their scientific and economic status, there is a need to evaluate its potential to address shared challenges.

A number of key principles and objectives of SSC have been identified since the 1950s : strengthen national and collective self-reliance ; reap mutual benefits ; do not interfere in the domestic affairs of cooperating countries ; be demand driven ; increasingly involve the private sector ; and promote sustainable development. Although these principles define the parameters of SSC, the question that still remains is : how can science-intensive cooperation be an effective agent of change and development ? For science-intensive cooperation to be effective, it cannot be perceived to be only between individuals, firms, or institutions. Instead, for innovation to take place, it must be aligned with, and involve, interactions among the larger set of institutions that contribute directly to new arrangements and innovation.

Innovation systems include formal institutions such as universities, research centres, health centres and clinics, firms, and government, including state policies and regulations such as biosafety and intellectual property (IP) laws. They also include informal institutions such as social and cultural norms. Interaction among these institutions contributes to a process of innovation that is non-linear and multidirectional. Learning and problem solving are central concepts of innovation systems. Learning-by-doing, by-using, and by-interacting among producers and users of knowledge is characteristic of the cumulative and continuous nature of innovation systems.

2 Empirical Approach and Main Findings

This research examined SSC from an innovation system perspective to understand how collaboration can cultivate new solutions, products, or services in the health biotechnology sector. The research was guided by two questions : how is SSC in health biotechnology shaped by the stated principles of SSC ; and, how is SSC in health biotechnology shaped by cooperation with the innovation systems in the participating countries ?

The research involved further analysis of an earlier large-scale project on SSC in health biotechnology in collaboration with researchers from Brazil, Canada, China, Egypt, India, South Africa, and Zambia. Health biotechnology is a science-intensive sector that typically involves active contributions from both public and private institutions. Many of the agreements developing countries are making single out cooperation in health and biotechnology. The research used multiple methods : a survey of biotechnology firms about their SSC ; a scientometric analysis of research collaboration using co-authored publications in international peer reviewed journals ; and case-study research on health biotechnology in 13 developing countries that examined both research and entrepreneurial cooperation.

Data collection was aimed at examining the opportunities, challenges, and impacts of the SSC and identifying strategies to strengthen cooperation and its contributions to global health and innovation. The cases examined bi-national cooperation between two low- or middle-income countries. Data were collected on existing health-biotechnology cooperation to learn from researchers and entrepreneurs who had direct experience with SSC. The research focused on these cases of bi-national cooperation : Brazil with Argentina and Cuba ; China with India, Thailand, and Cuba ; Egypt with China and

Jordan ; India with Brazil and Bangladesh ; South Africa with Kenya and Zambia ; and sub-Saharan Africa (Kenya, Nigeria, and South Africa) with China and India.

The case study research relied heavily on interviews with health-biotechnology researchers and entrepreneurs who were asked about their cooperation experiences. In each country, policymakers, representatives from drug regulatory agencies, and intellectual property rights experts were interviewed to gain better insights into : the policies and programs in place to promote SSC ; and how institutions such as the regulatory and intellectual property regimes impact SSC in health biotechnology. A total of 348 individuals were asked in face-to-face settings about their views on SSC and their specific collaborative projects. All interviewees were also asked how to strengthen SSC, how to improve health impacts on local populations, and how to strengthen local innovation.

In addition, other sources of data such as background information, policies, statistics, scientometric data, and firm-survey data were used. The analysis of the case studies combined qualitative analysis gleaned from the in-depth interviews with descriptive quantitative indicators such as policies, statistics, and scientometric data. This research identified some key impacts of SSC on health biotechnology that may help understand how this collaboration is being shaped.

Extended capacity in health biotechnology — A strong message was that SSC helped countries to build capacity in this science-intensive field. This confirmed that a number of developing countries have built capacity in health biotechnology that is in demand in other low- and middle-income countries and can be deepened through their cooperation. Capacity building was important to different groups. Researchers obtained training in advanced methods through their SSC and technology was transferred systematically between firms through their entrepreneurial cooperation. The capacity-building impact of SSC was important both to countries that are relatively weak in health biotechnology and other countries that have strengths in the field. The capacity-building emphasis of the SSC reflected the principle that the SSC should strengthen the self-reliance of low- and middle-income countries. Southern countries are working together to expand capacity in this science-intensive field and lessen their reliance on imports. This was true both for countries with limited capacity in health biotechnology and for countries with greater strength in the field.

Focus on local health problems — This research provided considerable support to the notion that SSC strengthens the ability of developing countries to address common health problems themselves. By working together, researchers gained access to each other's expertise, samples, research infrastructure, and other resources and enhanced their ability to form a critical mass to focus on their shared health problems. The research identified a number of examples of diseases that SSC focused on that were regional or predominantly afflicted people in developing countries (e.g., cholera, malaria, and Chagas disease). SSC frequently involved low-income countries, for example, in Africa where cooperation has focused on HIV/AIDS and malaria, and in Bangladesh and eastern India on cholera.

There was a strong message in the case-study research that SSC was more likely to focus on health needs of developing countries than North–South cooperation. Ac-

cording to the interview evidence, SSC is likely to be more focused on a Southern research agenda and make greater attempts to improve health problems prioritized by developing countries. SSC therefore appears to be shaped by the principles of being demanded driven and promoting mutual benefits. It is, however, a complex and risky process to develop new health solutions. SSC could reduce the risk by stable and dedicated resources. Governments have so far allocated relatively few resources to fund cooperation between developing countries and the interviewees stressed that this had hindered collaboration. In general, resources for North-South cooperation were more easily available and typically provided by high-income countries.

Ability to leverage local resources — Research identified the enhanced ability SSC to leverage local resources. This was the case when countries had particular biodiversity or traditional knowledge that could be harnessed for developing health products and for economic means. Some countries such as China and India have been able to develop an industry based on their biodiversity and traditional medical knowledge. With increasing global demand for such medicines, there is growing interest among developing countries, particularly in Africa, to start systematically harnessing these resources. Researchers in some low- and middle-income countries felt that that they lacked the scientific grounding to harness their traditional medicine and wanted to learn from countries such as China and India. The demand could be for technical expertise on how to isolate and screen plant extracts and on how to analyse and synthesize compounds. In other cases, there has been a demand for SSC to learn how to commercialize products based on traditional medicine and biodiversity.

Southern countries seek to build expertise in diverse aspects of the commercial process : regulating traditional medicine based products ; standardizing traditional medicine products and production ; arranging for patent protection ; managing traditional medicine databases ; learning how benefit sharing can be arranged with those who possess the original knowledge ; and preventing exploitative practices, both domestically and internationally. There have been some impacts of SSC in strengthening the ability of Southern countries to exploit their traditional medicine and biodiversity, but it is at an early stage and growth of SSC is likely, particularly if global demand remains strong. The emphasis on leveraging local resources reflected the principles of strengthening self-reliance through SSC and of increasingly involving the private sector in commercialization.

Availability of relatively affordable health products — The main driver for SSC reported in the survey of biotechnology firms was to gain access to each other markets. In general, trade between developing countries has been increasing. Interviewees reported that the products disseminated by SSC were generally lower in price than those supplied by multinational pharmaceutical firms. Internet searches supported this observation. SSC reflected the principles of reaping mutual benefits for both participating countries and involving industry in the cooperation.

It can be challenging for firms in developing countries to enter each other's markets. For collaboration involving manufacturing or development of health products, it can be a challenge to deal with regulatory systems in both participating countries. Some of the countries had immature regulatory systems, which added a special difficulty for

putting health products on the market. In other cases, some tests had to be repeated or different types of information were required for the regulatory process. Other challenges commonly cited were the excessive time and the high cost of moving products or ingredients across international borders. These challenges represent misalignments between the innovation systems in the participating countries and reflect how the characteristics of these systems are shaping SSC.

3 Main messages for policy and practice

The research reported here shows that SSC in health biotechnology can : extend capacity in this science-intensive field ; strengthen innovation potential ; and provide future health benefits. The cooperation is both shaped by the stated principles of SSC and the characteristics of the innovation systems in the participating countries. Enhanced capacity in health biotechnology has expanded the scope for SSC in this science-intensive field and opened the door for South–South learning. Shared health needs encourage SSC and result in growing research that is focused on needs of developing countries. SSC can both provide health solutions to developing countries' problems and contribute to economic gains based on harnessing a science-intensive field. The cooperation appears to be well aligned with some of the key principles of SSC such as, strengthening self-reliance, reaping mutual benefits, being demand-driven, and increasingly involving industry and the private sector.

Cooperation is shaped by the alignments (or lack thereof) of the innovation systems in the participating countries. Based on this research, the proposed framework involves looking at SSC as interactions between the innovation systems in the participating countries. For SSC to have impacts, attention needs to be placed on calibrating the systemic alignments to allow knowledge and other resources to flow between the countries.

First, to strengthen SSC there is a need for a greater dialogue between developing countries. Developing nations need to consider SSC to be a part of their science, technology, innovation, and health promotion plans. When the cooperation is better integrated in the innovation systems of the participating countries, it increases the likelihood of impact both in health and other science-intensive sectors.

Second, there can be funding misalignments when one participating country provides considerably more resources to the cooperation than the other. This can inhibit joint initiatives between the countries, as one country may not be able to finance the collaboration. It can also lead to unequal roles in the cooperation as the country providing the resources may have greater influences on shaping the partnerships. In general, governments need to invest more in SSC to allow their countries to work together, particularly on research. Another possibility is to explore the potential of triangular cooperation involving high-income countries.

Third, there are misalignments in entrepreneurial cooperation. When firms in two countries are engaged in joint development of a health product, the regulatory process may be unnecessarily cumbersome. If the regulatory systems have the opportunity to collaborate, exchange information about each other's requirements, and align their

processes, development is likely to be less challenging. There were also systemic misalignments in the customs systems in developing countries, resulting in exporting and importing taking a relatively long time. Innovation is increasingly global and takes place in more than one country to take advantage of diverse comparative advantages. The lack of alignment in regulatory systems and customs procedures can thwart this global innovation process. To promote innovation it is not enough for governments to sign agreements and set up joint funds ; they must work together to align their innovation systems and pay attention to their interactions.

Related Resources

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