

Migration should be a personal choice, not the only one - a reflection on scientific diasporas

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Abstract

A brain drain phenomenon, i.e. the migration of highly skilled professionals, has represented and still represents a severe loss of intellectual capital for Global South countries. Factors driving this migration include limited research infrastructure, funding constraints, political instability and the lack of scientific career prospects in the Global South and the consequences are multifaceted. While this can hinder local development in the Global South, it simultaneously enriches research ecosystems in the Global North, exacerbating existing global inequalities in science and technology. Under this scenario, scientific diasporas represent an effort to counterbalance the brain drain scenario through initiatives that aim to increase science and technology development, which are led by self-organised expat professionals and scientists. While we can find some successful examples of international cooperation driven by scientific diasporas, without a proper organisation and full participation of the governments of the countries of origin, scientific diasporas can become dysfunctional and can promote more migration upon training. We, five early-career scientists, discuss our perspectives and personal

reflections on scientific diasporas. We describe three migration models of highly skilled professionals, starting with a brain drain model, scientific diaspora and dysfunctional scientific diaspora and provide some ideas to help the implementation of successful scientific diasporas. We believe that migration must be a personal decision seeking scientific growth and professional development and not the only option we should have to pursue a fulfilling career in science.

Keywords

decolonising science, global knowledge asymmetry, Global South, science networks, skilled migration, neocolonialism

Introduction

For many years, the migration of highly skilled working professionals and scientists, primarily from Global South to Global North countries, has meant a loss for the country of origin (Grubel and Scott 1966, Dodani and LaPorte 2005, Séguin et al. 2006a). This dynamic model of 'brain drain' (Stark et al. 1997, Pellegrino 2001, Kapur and McHale 2005, Tejada and Bolay 2010) has been one of the main consequences of globalisation (Docquier et al. 2007), causing the loss of human capital from countries in the Global South and impeding their development (Tejada and Bolay 2010) (**Fig. 1**).

During the 1990s and early 2000s, the most representative regions experiencing a brain drain were the Caribbean, the Pacific, sub-Saharan Africa and Latin America and the main destinations were the United States, Canada, Australia, Germany, the United Kingdom and France (Docquier and Rapoport 2011). The lack of working and learning opportunities, as well as political and economic instabilities (Docquier et al. 2007), has contributed to the emigration of researchers from the Global South in search of opportunities abroad. While destination countries often benefit from this mobility, literature also highlights several potential gains for countries of origin, including remittances, return migration, diaspora externalities, improvements in governance and increased returns to education (Séguin et al. 2006b, Docquier et al. 2007). However, these benefits may be limited in contexts where emigration rates exceed optimal levels (5–10%) (Docquier et al. 2007).

Currently, there is an attempt to shift the perspective so that the 'brain drain' model can be replaced with a 'brain gain' or 'brain circulation' model, representing a win-win situation for both the country of origin and destination (Séguin et al. 2006b, Gëdeshi and King 2021, Bonilla et al. 2022). Under this context, the idea of scientific diasporas (**Fig. 2**) arises as an essential tool to develop science and technology (Séguin et al. 2006a, Bonilla et al. 2023) in the Global South, counterbalancing the brain drain model (Séguin et al. 2006b, Silva 2014). In a scientific diaspora dynamic and model, expat scientists and working professionals who maintain strong ties and/or still feel attached to their home country or have a sense of moral obligation to retribute to their countries (Séguin et al.

2006a, Silva 2014) may self-organise to contribute to developing science, technology and education in their countries of origin (Séguin et al. 2006a, Tejada and Bolay 2010). The aim of these initiatives is to strengthen local research and innovation systems, enhance human capital and facilitate the circulation of knowledge between host and origin countries. For instance, diaspora members may promote mentoring programmes, online teaching and training, business and research partnerships and policy-making initiatives in their home countries (Séguin et al. 2006b, Soares 2025a). Through these activities, they contribute to skills development, foster international collaboration, support entrepreneurship and innovation and provide expertise that can provide information for science, technology and education policies.

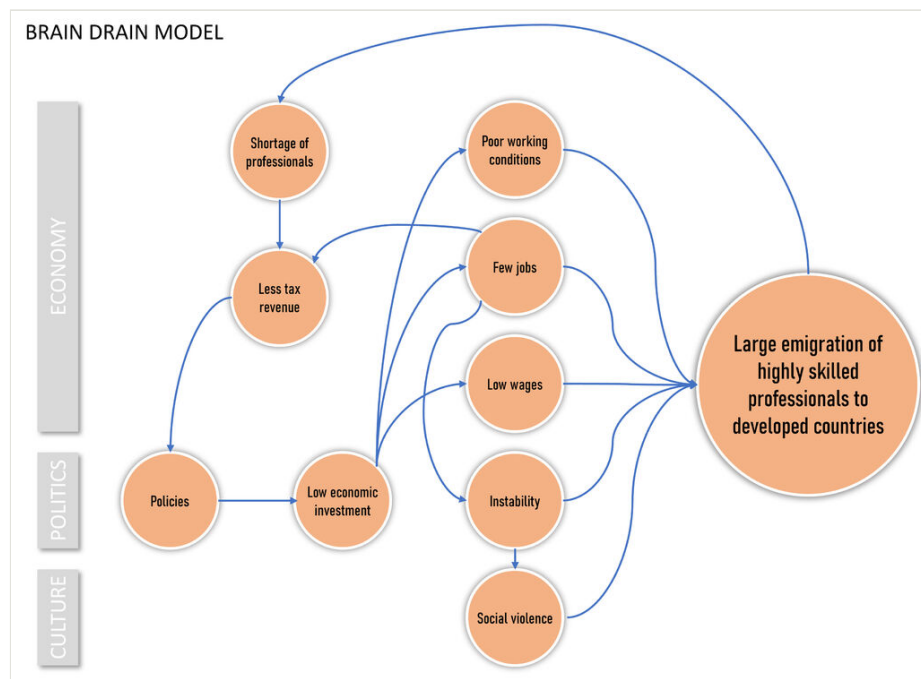


Figure 1.

A brain drain model in which insufficient policies and investment in science and technology, often associated with political and economic instability, limit research and career opportunities, motivating the emigration of highly skilled professionals to Global North countries and reducing the human capital in the countries of origin.

Many members of such diasporas are not considering or expecting to return to their home countries in the short term if the conditions that motivated their immigration do not change (Morimoto 2024). However, they can still contribute to their communities and support the public sector to improve conditions for residents in their countries of origin. Engaging and fostering collaborations with universities and research institutions in the home country can be challenging due to factors, such as limited institutional support, bureaucratic hurdles and insufficient funding. Successful diaspora initiatives, therefore, require the active participation of governments, key stakeholders and society to create enabling

conditions. Without such support, diasporas risk being underutilised and scientists may remain primarily focused on migration, perpetuating brain drain despite their training and expertise (**Fig. 3**).

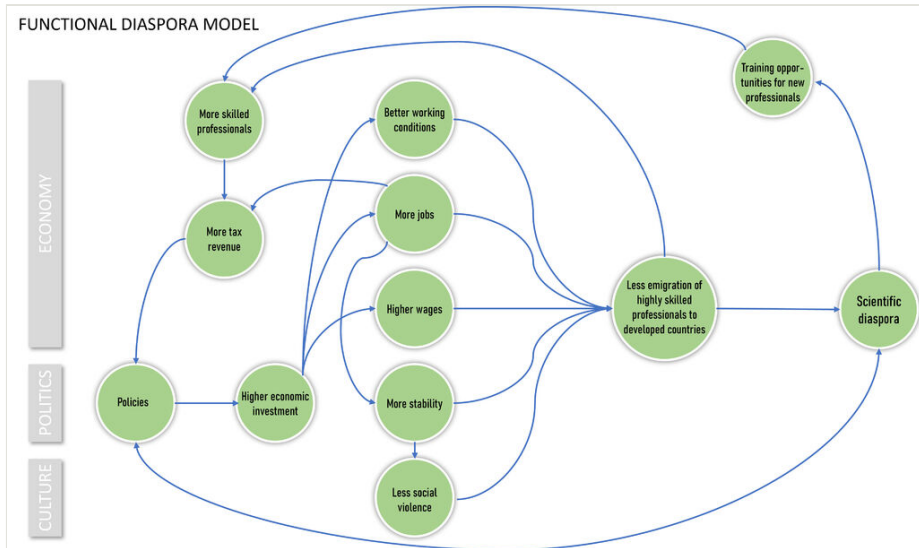


Figure 2.

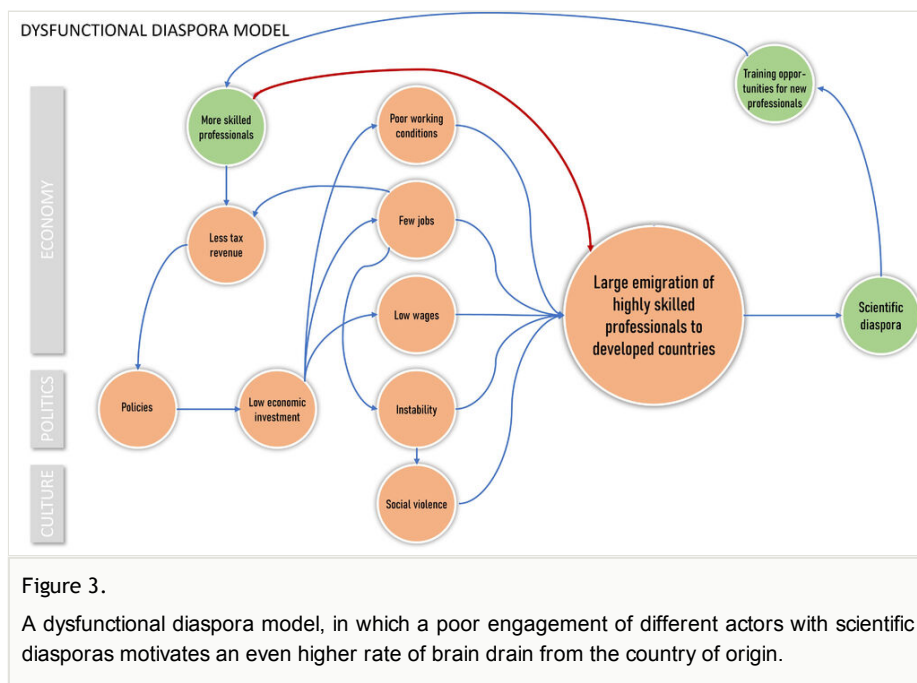
Alternative functional diaspora model. A scientific diaspora can become a powerful tool through which self-organised skilled professionals can work together with policy-makers, science diplomats and the business sector in their countries of origin and provide training opportunities for new professionals, increasing capacity building in their countries. In the long term, brain drain is reduced due to better working and living conditions in their countries of origin.

This opinion piece explores the dichotomy between a typical brain drain and a scientific diaspora model. It is authored by early-career researchers from the Global South who have experience moving between countries. We discuss why a scientific diaspora might fail, increasing the migration of high-skilled human capital. Finally, we provide some perspectives and reflections that could help implement scientific diasporas between our countries of residence and our home countries and avoid migration as the only choice to pursue a career in science, as opposed to a personal choice of personal and scientific growth.

Brain drain - historical perspective of its origins

Brain drain is defined as the loss of highly skilled or educated individuals from one country, region, institution or job sector to another, often motivated by better pay, improved living conditions and expanded opportunities (Thesaurus 2024). This term was first described in 1963 when the Royal Society marked the exodus of British skilled workers to the United States post-Second World War, often with a negative connotation

(Wolfe 1966, Altbach 1991, Watanabe 1995, Brandi 2006). At that time, the skilled individuals were mainly scientists, medical doctors and engineers (Wolfe 1966, Altbach 1991, Watanabe 1995). Currently, the term is applied more broadly to any emigration of skilled professionals from various fields (Muller 2017, Vega-Muñoz et al. 2021) and, in the worst cases, it can turn into a 'brain waste' scenario when highly skilled workers take jobs below their education level in the destination country (Özden 2006, Lozano-Ascencio and Gandini 2012).



A 'brain drain' model can also be seen as a legacy effect of colonialism, influencing migration patterns through 'Third World Countries' (a term we recognise is outdated) and the Global South (Altbach 1993, Brandi 2006, Vega-Muñoz et al. 2021). For instance, the British Empire attracted United Kingdom citizens born in their colonies, especially from India and South Africa, to the mainland through more education and job opportunities (Scott 1971). These countries even modified their education system to adopt the colonial language and academic model (Altbach 1993, Muller 2017), so that highly skilled workers could easily migrate. Even in non-British colonies like Brazil or non-colonised countries like China (Altbach 1993, Brandi 2006, Vega-Muñoz et al. 2021), the 'brain drain' scenarios appear as a social phenomenon, with the human capital being moved towards countries with European established academic systems, which, in turn, promise better opportunities for professional growth and higher salaries (Scott 1971, Altbach 1993, Brandi 2006, Muller 2017, Vega-Muñoz et al. 2021).

In contrast, the case of Latin America is particular since Portugal and Spain did not prioritise improving education or developing local intellectual resources. Instead,

although the first universities in Latin America were established in the 16th century, their primary focus was to educate the elite and clergy rather than foster widespread intellectual development (Jones 1939). Therefore, since their independence, countries in Latin America have faced challenges in building and sustaining strong scientific institutions (Coelho and Vasconcelos 2009, Arévalo 2010). It is important to highlight that there are some exceptions in Latin America, like the Pontificia Universidad Católica de Chile (PUC) in Chile and the University of São Paulo (USP) in Brazil (Symonds 2025), to name but two. Such universities are leading research institutions in Latin America. However, despite their success, the overall landscape of scientific research and higher education in the region remains uneven. Structural and historical disparities in funding, infrastructure and academic resources hinder the region's full ability to capitalise on its intellectual potential (Turba 2025). Historically, this has contributed to a brain drain dynamic, as talented individuals sought opportunities for intellectual and professional growth outside their home countries, where educational and career prospects would not be as limited (**Fig. 1**).

The dynamics driving brain drain (**Fig. 1**) have been studied for decades and supported by quantitative analyses (Truscott 1971, Das and Sharma 1974, Portes and Ross 1976). In Latin America, brain drain emerged contemporaneously with those of the United Kingdom and the United States (Thesaurus 2024), with a mass migration of highly skilled workers, particularly Argentinian engineers, to Global North countries (Oteiza 1965). Currently, the leading destination country is the US (Thesaurus 2024). Over half of highly skilled workers from five Caribbean countries (Jamaica, Haiti, Guyana, Belize, Grenada) and roughly 10% from South American countries such as Colombia, Ecuador and Uruguay have emigrated, with rates steadily increasing since 1990 (Özden 2006). Early contributing factors included social instabilities, coups, wars and economic crises and structural issues such as low salaries, insufficient research funding and poor integration between academia and industry (Truscott 1971, Meyer and Charum 1994). Caribbean countries historically show extreme emigration rates (60–80% of tertiary-educated nationals abroad around 2000) due to small populations and limited domestic opportunities, whereas larger South American countries like Colombia, Ecuador and Uruguay had lower rates (~ 10%), reflecting larger human capital stocks and somewhat broader opportunities (Mishra 2006, Docquier et al. 2007, Medina-Durango and Posso-Suárez 2011). Although these figures are 20 years old, more recent reports indicate that a high share of Caribbean and South America emigrants are highly educated, underscoring ongoing developmental concerns, even if comparable updated statistics are limited (Brissett 2018, Brissett 2021, Platt and Zuccotti 2025).

Five decades later, most of these factors persist (**Table 1**). However, such factors cannot be separated from historical contexts, such as sudden economic shocks or crises even though some of these reasons have been questioned (Truscott 1971, Meyer and Charum 1994). Evidence indicates that Latin America transitioned from being a net recipient of migrants to experiencing significant emigration, with skilled professionals leaving in large numbers (Pellegrino 2001). In the Southern Cone of America, political scientists and other highly trained professionals migrated both for political reasons and for better

employment opportunities, with these patterns intensifying from the 1980s onwards as disciplines became more professionalised (Freidenberg and Malamud 2018). Albeit earlier discussions often suggest that economic shocks, debt crises or coups contributed to emigration, the available data do not provide direct quantitative links between such events and migration decisions. More recent findings highlight that perceptions of insecurity, corruption and instability, rather than wage differences alone, are important drivers of professional migration (Tigau and Bolaños Guerra 2015). Overall, while instability appears to play a role, the causal mechanisms behind brain drain remain complex and not fully validated, with most research focusing on documenting trends rather than explaining their specific drivers (**Fig. 1**).

Table 1.

Authors' perspectives on Scientific Diasporas.

Reasons for Leaving: We left our countries due to a combination of factors, including living conditions, limited job opportunities, political and economic instability, lack of support for research and personal safety concerns. Some of us also left in pursuit of academic or career opportunities not available in our home countries, such as specific PhD programmes or research interests.

Feelings of Responsibility: Despite leaving, we feel a sense of responsibility to give back to our countries, often stemming from our having received public funding during our education. Hence, we feel a desire to contribute to our home country's society, helping to improve political and social conditions and acknowledging the support we received during our academic journeys.

Challenges of Coming Back or Giving Back: The challenges for us to return still include the reasons for leaving (lack of job opportunities, funding for research and proper salaries). Moreover, the political and economic instability and the deficit in governmental policies that incentivise our return, such as hiring arrangements by the state, scholarships with return clauses and mentoring initiatives, only show a systematic lack of support for us and other returning professionals. To give back, though, we wish to collaborate as co-authors, visiting professors or mentors. However, the restrictions on grant applications and funding limitations still pose obstacles.

From a brain drain to a scientific diaspora

Regardless of the period and geographical location, the 'brain drain' model (Kwok and Leland 1982) (**Fig. 1**) has unveiled the importance of improving conditions of education and career opportunities to retain human capital (Wolfe 1966, Baldwin 1970, Watanabe 1995, Vega-Muñoz et al. 2021). Thus, the 'scientific diaspora' model has emerged as a potential solution to counterbalance brain drain scenarios and promote brain circulation (Chen et al. 2021).

As defined by Khadria (2003), 'scientific diasporas' are mainly self-organised communities of expatriate scientists and engineers who actively engage with their countries of origin to support the development of science, technology and education. This engagement is achieved through knowledge transfer, capacity building, promoting bilateral cooperation and initiating business and entrepreneurship activities (Newland

and Plaza 2013, Warner et al. 2022) (**Fig. 2**). However, the contribution of governmental institutions, non-government organisations (NGOs) and grassroots diaspora networks are fundamental for scientific diasporas' long-term success (Warner et al. 2022). For instance, EURAXESS (EURAXES 2025) is a successful diaspora funded by the European Union that gathers and allows interaction amongst researchers, entrepreneurs and universities in STEM-related fields (science, technology, engineering, the arts and mathematics) (Butler et al. 2022). The ISSNAF (Italian Scientists and Scholars in North America) (ISSNAF 2025) is a scientific diaspora organised via an NGO to promote collaborations amongst Italian expats living in the US. Likewise, RAICEX supports Spanish scientists living and working in 18 countries through grassroots associations and helps to promote their work and scientific cooperation with the destination countries (Ortega-Paino and Oliver 2022).

In Latin America, many examples of scientific diasporas are grassroots and self-organised. For example, although not formally registered, the Guatemalan Scientific Diaspora (GSD) actively collaborates with the development of the Guatemalan government, academia and industry through connections with the Guatemalan National Secretary of Science and local universities (Bonilla et al. 2022). Similarly, in Honduras, despite not being formally recognised by the government, organisations like AGEAP-Zamorano, Honduras Global and OWSD Honduras have built capacity and improved living conditions in the country (Bonilla et al. 2022). Finally, in Perú, Científicos.pe and Sisay mentors are two examples of scientific diasporas with a strong focus on scientific communication and mentoring, self-organised by expat Peruvian professionals worldwide (Científicos 2024, Sisay 2024). SACNAS (Society for the Advancement of Chicanos/Hispanics and Native Americans in Science) is an organisation with chapters throughout the United States that, transcending nationalities, unifies minority groups with a significant presence of migrants from the Global South (SACNAS 2024).

Finally, bilateral cooperation agreements between Global North and Global South institutions have also become an important mechanism for strengthening the research capacity in Latin America. These initiatives typically involve funding, joint research programmes and training opportunities provided through partnerships between universities and research agencies (different from helicopter research, see below). For example, France supports the "Instituto Franco-Argentino de Estudios sobre el Clima y sus Impactos" (IRL 3351 FAECI/CNRS-CONICET-IRD-UBA), a collaborative programme that facilitates joint research and provides funding for climate studies in Argentina. Similar initiatives exist across South America. At the same time, some universities in the United States, including the University of California-Davis and Harvard University, maintain research collaborations or institutional programmes in Chile (i.e. UC Davis Life Sciences Innovation Center and Harvard-UAI Collaborative Research Grant Program, respectively). While these partnerships are primarily institutional rather than diaspora-driven, they can create channels through which members of the scientific diaspora collaborate with institutions in their countries of origin, for example, through joint research projects, mobility programmes and training initiatives.

Making scientific diasporas functional

In the previous sections, we have explored how discussions of skilled migration, traditionally framed through a “brain drain” perspective, have increasingly incorporated the concept of scientific diasporas as an alternative framework for understanding the potential contributions of expatriate professionals to their countries of origin. However, without proper support, a scientific diaspora could play an important role in increasing the migration of skilled workers, what we call 'a dysfunctional scientific diaspora' (Fig. 3). For example, Brazil invested significant funds in international mobilities that helped create and maintain international collaboration networks (Mazza 2009). Unfortunately, this investment only increased brain drain (Mazza 2009). In Colombia, a similar, sort-of-failed experience was the Caldas Network ('Red Caldas'), created in 1991. The Caldas Network successfully established 29 nodes of Colombian scientists in different countries, integrating them into the national scientific community (Echeverría-King 2022). Over time, these nodes became increasingly specialised and the Caldas Network faced several operational challenges, including difficulties mobilising expatriate researchers, infrastructure limitations in Colombia and uneven levels of activity across its nodes (Schlemmer et al. 1996, Meyer et al. 1997). These constraints illustrate some of the practical difficulties involved in sustaining diaspora initiatives over time. In this section, we want to offer a perspective based on our experience of how a scientific diaspora can be successfully established.

Top-down approaches, such as policies, transnational cooperation (Ciumasu 2010, Bolay and Tejada 2014, Echeverría-King et al. 2022) and bottom-up or more personal decisions are required to implement successful scientific diasporas and avoid neo-colonial research (also known as helicopter research) (Minasny et al. 2020, Adame 2021). One of the main top-down measures involves a higher investment in science and technology by local governments, accompanied by a more fair, transparent and straightforward process of hiring academic personnel that allows clear expectations and a balance of teaching and research duties. In some Latin American countries, like Peru, a scientific career incorporating PhD students, postdocs and tenure track positions is missing and must be implemented to allow international cooperation with other Peruvian scientists worldwide (pers. commun. L. Chavez Rodriguez). Moreover, professorship calls in Brazil often require candidates to be physically present for multiple stages of evaluation, sometimes with short notice for interviews and teaching demonstrations (two weeks or less). These requirements can create logistical and financial barriers for internationally based candidates, particularly when remote participation is not permitted. In contrast, recruitment processes in many institutions in North America and Europe increasingly allow remote interviews during early selection stages. Such constraints may, therefore, discourage diaspora scientists from applying to positions in their countries of origin, indirectly reinforcing patterns of brain drain (pers. commun. B. Soares and G. Oyarzabal). In Mexico, national calls for new researchers are opened annually with a demand of several hundred applicants per vacancy, but unfortunately, the selection processes are often marred by corruption (pers. commun. A. Guzmán Luna). Many countries in Latin America focus science efforts heavily on applied research and, even

though it is essential in the context of Global South countries, this reduces the possibility of establishing partnerships with scholars dedicated to fundamental research (pers. C. Marín).

Governments and universities can work towards improving graduate programmes and keeping long-term connections with their alumni. For instance, many Global North institutions actively maintain relationships with their alumni networks, which may include mentoring programmes, professional networking and, in some cases, philanthropic contributions that can influence or support institutional initiatives (Kowalik 2011). Such structured alumni engagement mechanisms are generally less institutionalised in many Latin American universities. Graduate programmes in Global South countries could explore mechanisms to engage alumni as collaborators in research, mentoring or training activities, through voluntary participation or small stipends supported by specific programmes or external funding. Universities and governments could also involve alumni as co-advisors or committee members, helping strengthen professional networks and provide information for curriculum development, based on alumni experience.

Successful diasporas also require meaningful collaborations (Adame 2021) with Global North partners through scholarships and joint projects with Global South countries, promoting specific funds that can allow international cooperation. For instance, Canada offers the International Alliance grant (Canada 2024), which supports its scientists doing international research. International scholars in Canada could apply to fund projects with their home universities and train local students in doing research. Such systems could also be integrated into graduate programmes in the Global South to promote international cooperation with their students worldwide.

Finally, successful diasporas benefit from the willingness of expat scientists to collaborate in science and technology efforts in their home countries (bottom-up approaches). Even when expatriate scientists are settled abroad, many maintain strong ties to their countries of origin and are willing to support the next generation through mentoring, online teaching and training and policy engagement (Séguin et al. 2006a, Mwampamba et al. 2021). Therefore, diaspora initiatives do not necessarily need to focus on facilitating permanent return, but can also promote collaboration and knowledge exchange from abroad (Soares 2025b). However, as we showed before, proper and formal channels of collaboration driven from the top down are crucial to facilitating the success and spread of scientific diasporas (Bonilla et al. 2022).

Conclusions

This work, along with our personal experiences, shows the importance of a functional scientific diaspora that effectively addresses brain drain and leverages the expertise of skilled professionals. Our stories, like many others, show a variety of challenges and opportunities inherent to the migration experience, from the departure to the eventual return to our home countries. Therefore, to harness the full potential of scientific

diasporas, it is essential to implement comprehensive policies and initiatives that would actively encourage and facilitate the re-integration of migrant scientists.

Migrant scientists are a valuable resource of expertise, networks and innovative ideas that drive scientific advancement and societal development. Therefore, investing in human capital is essential for Global South scientists' sense of belonging and their countries' sovereignty. To achieve this, governments and institutions should reduce bureaucratic barriers, such as complex hiring procedures that disadvantage researchers based abroad, limited mechanisms for remote participation in recruitment processes and administrative obstacles to international collaboration. At the same time, they should create research environments that support innovation and collaboration through stable funding schemes, joint international research programmes and institutional partnerships. In this context, policies that facilitate engagement with scientific diasporas, such as mentoring programmes, collaborative research initiatives and platforms for knowledge exchange, can help strengthen connections between researchers abroad and institutions in their countries of origin.

Achieving this vision requires a collective commitment from multiple actors, including Global South governments, academic institutions, researchers and other stakeholders, to prioritise the needs and aspirations of scientists abroad and create conditions that allow them to contribute meaningfully to their countries of origin. Ultimately, a functional diaspora goes beyond reversing brain drain; it seeks to harness the collective expertise, networks and perspectives of scientists working across borders to address societal challenges. This requires a holistic approach that recognises the value of science and promotes inclusive and supportive environments — through collaboration, knowledge exchange and institutional engagement — where diaspora scientists can actively participate in strengthening research and innovation in their home countries.

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Conflicts of interest

The authors have declared that no competing interests exist.

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