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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, which are led by self-organized expat professionals and scientists. While we can find some successful examples of international cooperation driven by scientific diasporas, without a proper organization 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.

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Keywords

Decolonizing 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 (Dodani and LaPorte 2005, Grubel and Scott 1966, Séguin et al. 2006a). This model of 'brain drain' (Kapur and McHale 2005, Tejada and Bolay 2010Pellegrino 2001, Tejada and Bolay 2010, Stark et al. 1997) has been one of the main consequences of globalization (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 countries 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). Mainly, the lack of working and learning opportunities, as well as political and economic instabilities (Docquier et al. 2007), have pushed researchers from the Global South to other places to search for new opportunities, benefiting only the destination countries and not their countries of origin.

Nowadays, 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 (Bonilla et al. 2022, Gëdeshi and King 2021, Séguin et al. 2006b). Under this context, the idea of scientific diasporas (**Fig. 2**) arises as an essential tool to develop science and technology (Bonilla et al. 2023, Séguin et al. 2006a) in the Global South, counterbalancing the brain drain phenomenon (Silva 2014,Séguin et al. 2006b). In a scientific diaspora model, expat scientists and working professionals who still feel attached to their home country or have a sense of moral obligation to retribute to their countries (Silva 2014, Séguin et al. 2006a) would self-organize to contribute to developing science, technology, and education (Séguin et al. 2006a,Tejada and Bolay 2010). They do it through mentoring programs, online teaching and training, business, research partnerships, and policymaking initiatives in their home country (Séguin et al. 2006b, Soares 2025a).

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 support their communities and the public sector to improve conditions for people living in their countries. Nevertheless, engaging and promoting collaborations with universities and research institutions in their home country is sometimes difficult. Hence, if the diasporas are to happen, but the participation of the

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government, society, and key stakeholders is not present, scientists are only motivated to migrate, increasing the brain drain upon training (**Fig. 3**).

This opinion piece -authored by early career researchers from the Global South moving between countries- explores the dichotomy between a typical brain drain scenario and a scientific diaspora. 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

The Education Resources Information Center - ERIC formally defined 'brain drain' as the 'Loss of highly skilled or educated persons from one country, region, institution, or job sector to another, based on 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 (Altbach 1991, Brandi 2006, Watanabe 1995, Wolfle 1966). At that time, the skilled individuals were mainly scientists, medical doctors, and engineers (Altbach 1991, Watanabe 1995, Wolfle 1966). Nowadays, 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 (Lozano-Ascencio and Gandini 2012, Özden 2006).

A 'brain drain' model can also be seen as a legacy effect of colonialism, influencing migration patterns through 'Third World Countries' (a term we recognize 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-colonized 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 promises better opportunities for professional growth and higher salaries (Altbach 1993, Brandi 2006, Muller 2017, Scott 1971, Vega-Muñoz et al. 2021).

In contrast, the case of Latin America is particular since Portugal and Spain did not prioritize 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

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Latin America have faced challenges in building and sustaining strong scientific institutions (Arévalo 2010, Coelho and Vasconcelos 2009). 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 a few. 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 capitalize 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 and factors causing the 'brain drain' (**Fig. 1**) have been discussed for several decades now, supported by quantitative studies on this phenomenon (Das and Sharma 1974, Portes and Ross 1976, Truscott 1971). The Latin American 'brain drain' was first noticed at the same time as in 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 the highly skilled workers in five Caribbean countries and about 10% in South American countries like Colombia, Ecuador, and Uruguay have left their home countries (Özden 2006), and these percentages have steadily increased since 1990. Early observed factors contributing to a 'brain drain' scenario are mainly social instabilities (Meyer and Charum 1994) that include coups, wars, and economic crises (i.e., extreme inflation). On top of that, Truscott 1971 also identified that excess of graduated professionals, low salaries, lack of funding and support for scientific research, and lack of integration between industries and the academic community could promote a 'brain drain' scenario.

Five decades after this phenomenon was first described, most of these factors still hold (**Table 1**), even though some of these reasons have been questioned (Meyer and Charum 1994, Truscott 1971) or cannot be separated from historical contexts, i.e., 'economic accidents'. For instance, Pellegrino 2001 argues that such factors 'must also be seen in conjunction with a series of variations and nuances derived from the complexity of the phenomenon and particularly the realities of each country's historical context'. Although economic accidents are challenging to predict, we consider that they, directly and indirectly, have contributed to the Latin American 'brain drain' scenario (**Fig. 1**).

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 (Baldwin 1970, Vega-Muñoz et al. 2021, Watanabe 1995, Wolfle 1966). Thus, the 'scientific diaspora' model has emerged as a

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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-organized communities of expatriate scientists and engineers who try to develop science, technology, and education in their home countries. They do it through knowledge transference, capacity building, promotion of bilateral cooperation, and even business and entrepreneurship initiatives (Newland and Plaza 2013, Warner et al. 2022) (**Fig. 2**). However, the contribution of governmental institutions, non-government organizations (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 among researchers, entrepreneurs, and universities in STEM-related fields (science, technology, engineering, the arts, and mathematics) (Warner et al. 2022). The ISSNAF (Italian Scientists and Scholars in North America) (ISSNAF 2025) is a scientific diaspora organized via an NGO to promote collaborations among Italian expats living in the US. Likewise, RAICEX (Red de Asociaciones de Investigadores y Científicos Españoles en el Exterior) (Ortega-Paino and Oliver 2022), through grassroots associations, supports Spanish scientists living and working in 18 countries while helping to promote their work and scientific cooperation with the destination countries.

In Latin America, many examples of scientific diasporas are grassroots and self-organized. 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). Likewise, in Honduras, despite not being formally recognized by the government, organizations like AGEAP-Zamorano, Honduras Global, and OWSD Honduras have positively impacted building capacity and improved living conditions in the country (Bonilla et al. 2022). Finally, in Perú, Cienfiticos.pe and Sisay mentors are some examples of scientific diasporas with a strong focus on scientific communication and mentoring self-organized by expat Peruvian professionals worldwide (Científicos 2024, Sisay 2024). SACNAS (Society for the Advancement of Chicanos/Hispanics and Native Americans in Science) is an organization with chapters throughout the United States that, transcending nationalities, unifies minority groups with a significant presence of migrants from the Global South (SACNAS 2024).

More notable are bilateral cooperation agreements mainly driven and funded by Global North countries in Global South universities. For example, France has the 'Instituto Franco-Argentino de Estudios sobre el Clima y sus Impactos (IRL 3351 FAECI/CNRS-CONICET-IRD-UBA)', which provides Argentina with funding. France has similar initiatives throughout South America. Similarly, some US universities, like University of California, Davis and Harvard, have campuses or strong research programs in Chile.

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Making scientific diasporas functional

In the previous sections, we have explored how a 'brain drain' model predominant in the past 20-30 years is being replaced by a 'Scientific diaspora model'. 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). After some time, these nodes became more and more specialized, and the Caldas Network ended up disappearing, constituting a well-known (for the Colombian scientific community) case of Diaspora failure (Echeverría-King 2022). 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 (Bolay and Tejada 2014, Ciumasu 2010, 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) (Adame 2021, Minasny et al. 2020). 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). In Brazil, professorship calls are very broad, costly, and risky because they must be carried out in person without the possibility of remote participation in interviews and public examinations. Interview schedules are sometimes set two weeks in advance, and mock lectures, chalk talks, and research talks are sometimes one day in advance (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 programs and keeping long-term connections with their alumni. For instance, Global North institutions work to maintain bonds with their alumni. In turn, they become financial contributors to

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university activities, giving them decision-making power in institutional policies (Kowalik 2011). Graduate programs in Global South countries could have specific programs to allow alums to become collaborators in exchange for a small stipend. Governments and universities can organize alumni to remain connected to the program as co-advisors or committee members, boosting alum careers and updating curricula requirements based on alum 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 programs 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 though many expat scientists are settled in other countries, they still have personal ties with their countries and are keen to support the new generation of students through mentoring programs, online teaching and training, and policy-making (Mwampamba et al. 2021, Séguin et al. 2006a) and not necessarily positive programs should focus on getting them back (Soares 2025b). However, as we showed before, proper and formal channels of collaboration (Bonilla et al. 2022) driven from the top down are crucial to facilitating the success and spread of scientific diasporas.

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 reintegration 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 that, removing bureaucratic barriers and creating conducive research environments that foster innovation, collaboration, and academic freedom are necessary. Hence, meaningful policies and career opportunities that promote professional growth, proper salaries, mentorship programs, collaborative research projects, and knowledge exchange platforms are required.

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Achieving this vision requires a collective commitment, mainly from Global South governments, academic institutions, and other stakeholders, to prioritize the needs and aspirations of returning scientists and provide them with the support and resources necessary to thrive in their home countries. Ultimately, a functional diaspora goes beyond reversing the brain drain, as it should harness the collective potential of scientific talents and their perspectives to address a wide range of challenges. It requires a holistic approach that recognizes the inherent value of science and seeks to create inclusive and supportive environments where former migrant scientists will contribute meaningfully to advancing their home country's society.

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Conflicts of interest

The authors have declared that no competing interests exist.

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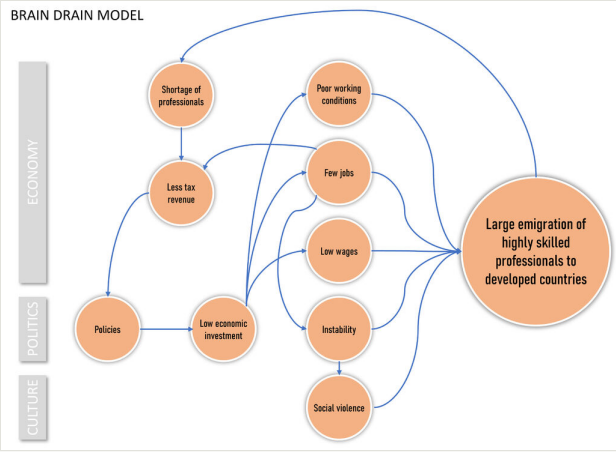

Figure 1.

A brain drain model in which the lack of policies and investment in science and technology, accompanied by political instability, motivates the emigration of highly skilled professionals to Global North countries, reducing the human capital in the countries of origin.

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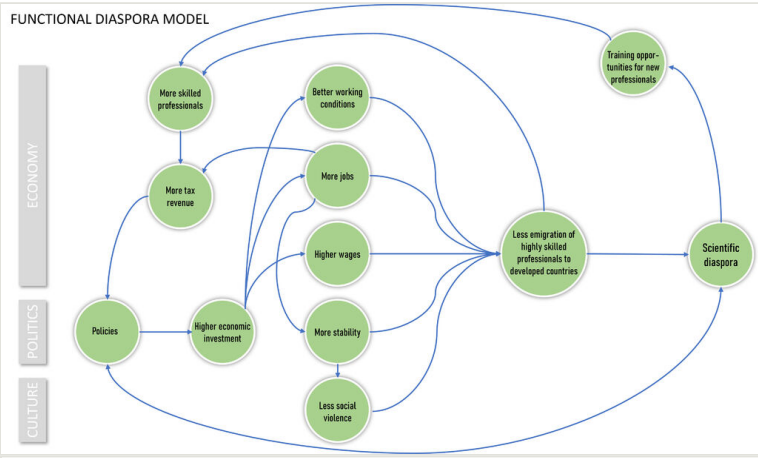

Figure 2.

Alternative model to the brain drain model. A scientific diaspora can become a powerful tool through which self-organized skilled professionals can work together with policymakers in their countries of origin and provide training opportunities for new professionals, increasing the human capital in their countries. In the long term, brain drain is reduced due to better working and living conditions in their countries of origin.

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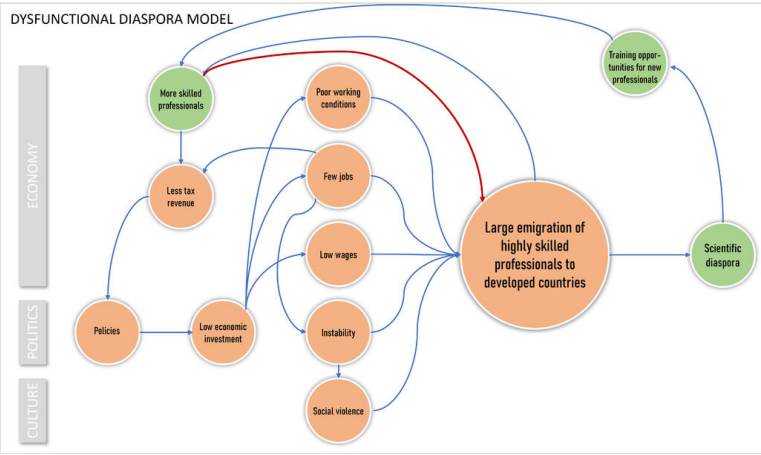

Figure 3.

A dysfunctional diaspora model, in which a poor engagement of policymakers with scientific diasporas motivates an even higher rate of brain drain from the country of origin.

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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 programs 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 incentivize 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.