

**IMPACT OF BRAIN DRAIN IN DEVELOPING COUNTRIES****\*Ivonne Bonilla**PhD candidate in International Relations/ Atlantic International University, United States of America),  
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**Abstract**

This article aims to study the consequences of the phenomenon named brain drain or migration of human capital flight and loss of productivity. Thus, it can also generate positive effects such as exports of technological capital and generation of Foreign Direct Investment (FDI) in the country of origin. This topic was developed through the theory of social networks which axis consists in that the scientist from the developing country chooses his/her related network, that has the environment to develop productivity, which is in developed countries, and then decides to emigrate. Subsequently, the situation of migration is deepened under the concepts of brain drain and brain gain, which are analyzed by different authors who expose their different points of view, claiming that the brain drain generates negative repercussions for the ejection economies and gains for the receiving economies, thus, there are others who claim that it generates positive consequences for both the sending and receiving economies. The graphs show the brain drain index in Latin America and Caribbean countries, led by El Salvador, which indicates the loss of high skilled human resource in the continent. The study concludes that, if the scientist from the developing country emigrates under certain conditions to the developed country, s/he can generate brain gain in both the sending and receiving economies.

**Keywords:** Brain drain, Brain gain, Developing country, Developed country, Social media theory.

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**INTRODUCTION**

The objective of this research is to review the background, situations and consequences of the brain flow towards the most developed countries, its global impact and to propose possible mechanisms to counteract these effects and convert these effects into brain gain. A review of the topic is carried out through documentary analysis. Brain drain is a global phenomenon, and it is not new, but it has changed its nuance, to become part of the expropriation of people by large transnational corporations and first world countries, with repercussions, on certain occasions, negative in their countries of origin. The discussion about the economic repercussions of skilled migration for nations of origin is a permanent topic of debate. This situation has been debated for almost fifty years or more. During this period, most researchers argued that skilled migration is detrimental to sending countries, while receiving economies benefit from the influx of skilled workers. Furthermore, talent is becoming one of the most leveraged resources in contemporary economies. Companies and governments in developed nations recruit and retain skilled migrants from around the world to address shortages of skilled workers. This transfer of skilled labor can have negative or positive repercussions on the prosperity and development of the countries of origin. From this scoop, the questions arise: What are the consequences of the “brain drain”? Is it suitable for developing countries? To answer these questions, this essay will be guided by the theory of social networks.

**Hypothesis**

Based on the theory of social networks in which the nodes or vertices embody individuals with high level of training who

are researching in their area of expertise and the ties express the academic, scientific or investigative work that they carry out with their colleagues. This occurs at an international level and that is why people decide to emigrate, seeking these scientific links and a greater social and economic well-being. On the basis of this theory, the “brain drain” emerges from the moment the researcher or scientist finds a network in their area of expertise or complementary and this is how the feeling of emigrating arises (exogenous form). On the other hand, endogenous force or brain gain may arise when the scientist emigrates and produces benefits to his/her country of origin or, also, once s/he is well trained in the host country, s/he returns to his/her home country, working and producing what s/he did abroad.

**Brain Drain**

Brain drain refers to the mobility from one nation to another of a large number of individuals who have a high level of qualifications. The brain drain has a negative impact on the countries of origin since they lose a part corresponding to the most significant factor of production. With the brain drain, the nation of origin is deprived of the potential for development and endogenous growth [1]. Furthermore, brain drain can be defined as one of the propensities of migratory mobilities: the migration of highly trained individuals, that is, those who have scientific-academic training, either in the natural, physical-mathematical, social or humanistic areas [2].

**Brain Gain**

Brain gain is the benefit for a country as a result of the immigration of a highly qualified person [3]. Furthermore, brain gain is achieved through the training and strengthening of networks of professionals and scientists. These networks seek to operate as links between national and international

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scientific and technological development networks. The network admits those who have settled in other nations to have the opportunity to cooperate with colleagues and scientific communities established in their nations of origin through technical reports, consultancies or other forms of academic liaison [4].

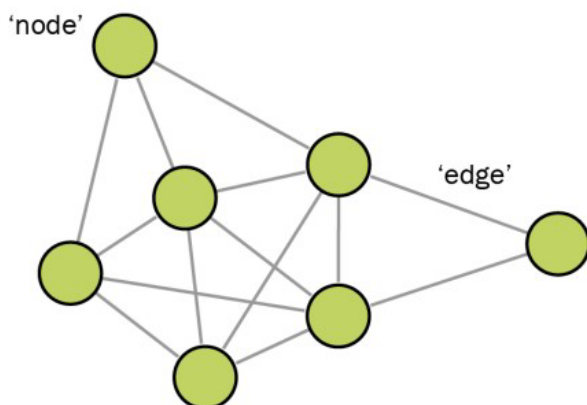
## METHODS

### Theory of social networks

Social network theory is implemented by means of diagramming techniques that described as networks with the nodes being the actors (for instance, an individual, a scientist or an institution, etc.) and the relationships being described as ties or edges between the knots [5]. The type of relationships could, for instance, be that of communication, state of competence, economy or work. The interactions are labeled by the frequency, type of relationship, extent or strength of the interaction, and so on. The interaction ties between the different actors in the network could be understood as an indicator of the quantity and quality of the information they perceive, and the level of trust established among the nodes, contributing to increasing or decreasing the possibility of action of each one separately and of the network as a whole [6].

According to scholars, there are three types of social networks that social scientists explore, these are the followings:

- Ego-centric networks are linked with a solo node or individual. For instance, you, the node, tied to all your close friends.
- Socio-centric networks are closed networks by default. For example: laborers inside an office or organization.
- In open-system networks, the delimitate lines are unclearly sharp. For instance: connections between corporations, or the chain of influencers of a specific decision. Examples of this network model that can be cited are links between companies.



**Fig. 1. Social Network [7]. The node is the individual or entity. The edges are the relations between them**

In both cases, brain drain and brain gain, there is a network formation, which is why this topic will be discussed under the theory of social networks. In this model there are nodes that embody individuals with a high level of training who are conducting research in their area of expertise and the ties express the academic, scientific or investigative elaborations

that they carry out with their others. The scientist or professional who wishes to emigrate considers that when deciding to do so he will follow the following principles: the average level of the network, since the productivity of scientists depends on the level of scientific cooperation they form; the usefulness of the various types of links; the consequence that those close to them have on individual productivities; the estimates from the different places and the technology used by scientists [1]. The expert who decides to emigrate chooses scientific neighbors from the same local network or scientists from the developed country with whom he will produce positive and complementary effects on his productivity.

In other words, when the expert emigrates to a developed nation, when deciding to do so he not only considers economic value such as salary, but also takes the social criteria such as intellectual analogies. Exposing the brain drain through social network theory means understanding how clusters of scientists or high skilled human resources impact the decision of the professional from the developing nation to emigrate to a developed nation. The influx of scientists generates a greater scientific contribution and, this in turn, increases the productivity of each researcher, since it establishes links with other professionals and rises the progress of scientific work or the number of research products achieved. Scientific contribution networks forge economies of scale, these stimulate scientists to replace the geographic network to which they previously belonged since only scientists located in specific geographic areas can benefit from the developed economies that forge knowledge clusters. Professional groups encourage scientists' interest in emigrating. The brain drain occurs due to the search for greater scientific cooperation often requires geographic linkage, since the work of the expert carried out in groups must be supported by logistical elements such as technology and capital at the disposal of the exercise of research which usually are located in some places in first world nations.

The experts most likely to emigrate are those who are working on cutting-edge research in high technology or in fields whose development is barely superficial in the nation: electronic or biomedical engineering, biomedicine, neurology, or mathematics [1]. For them, the largest number of researchers with whom they can interact are located outside their geographical area, therefore, to enjoy all the benefits that the scientific cooperation network of the developed nation provides them, they must modify their geographical location or emigrate. Experts who make the decision to emigrate do so because they seek to increase their productivity. As the productivity of each scientist depends on the scientific contribution that s/he can provide with his colleagues, the experts will opt for those territories where there is the greatest expectation of increasing the level of productivity of each one. Networks with a higher average level appear with greater scientific contribution. The research contribution produces increasing profits, which in the model will allow the agglomeration of researchers; this figure has positive repercussions that affect the scientist's productivity and having other researchers strengthens his work. In addition to the research contribution, the productivity of scientists depends on the infrastructure, technological resources and investment capital they have at their disposal. In the developed countries, there is a significant influx of these highly trained human resources, which demands a better technological infrastructure.

When experts from the developing nation move to the developed nation, their geographic network moves may be temporary or permanent. If the number of links that the expert develops is higher than the average level of the investigative cooperation network, his brain drain will be perennial, while if the number of links the researcher has with the network of the developed nation is less than the average level of the network, the brain drain will be temporary. Once he carries out the expertise process that led him/her to leave his nation of origin, s/he will return, since there is greater analogy with the experts located in his/her nation of origin, with whom he develops most of his/her research. Here there could be what is called "brain gain" since his country would be benefiting from the training or experience obtained abroad.

### **Brain drain, Brain gain and Economic effects**

Since the appearance of the first universities, scientists and intellectuals have moved around the world, which has led to the "cross-fertilization" of ideas between scientific communities with different degrees of development. "Scientific nomadism" is a common phenomenon in the society of scientists and engineers [4]. The mobility of scholars and professionals becomes a social issue, susceptible to being addressed through policies applied by the State, when the exchange flows of scientists and professionals determine a net loss in the stock of more qualified human capital. The current peak of economic globalization has opened a window of opportunity for human capital to accumulate where it is already abundant and yet best rewarded, for example, in developed nations. This trend has been strengthened by the regular introduction of selective immigration policies in several OECD nations since the 1980s. Together with the usual self-selection effects on the supply side, this clarifies the inclusive trend that the migration rates are much higher for the highly qualified. Globalization indicators reveal that between 1990 and 2000, the global Exports/GDP (Gross Domestic Product) ratio has increased by 1.5 and the FDI /GDP ratio. At the same time, the total number of foreign-born people legally residing in OECD member countries has also increased by 1.4, with greater growth for high-skilled migrants than for low-skilled migrants [8].

In the late 1960s, large numbers of scientists and engineers moved from their developing countries to developed ones; it was the first time that concern increased about the migration of highly educated people. Such reallocation of skilled workers was considered detrimental to the nations of origin. Furthermore, it decreased the productivity of lagging workers and implied negative fiscal repercussions [9]. In addition, it is a stock-flow imbalance between nations that invest in education for their researchers and professionals with the aim of optimizing the human capital that they believe is scarce and others that, due to their greater kindness and academic organization, act as poles of attraction. This phenomenon is known as "brain drain" since in 1963 the Royal Society called the emigration of qualified English intellectuals to the United States. In that case the dispossession occurred between two developed nations, one that stood out after the Second World War in 1944 with 80% of the gold in bars and the other heavily punished and looted from its empire in the same war [12]. However, in the 1990s the brain drain increased radically. The United Nations projected the total of highly skilled South-North migrants between 1961-72 at just 300,000. Later, in 1990, the US census revealed that there were more than 2.5

million highly skilled immigrants from developing nations residing in the US alone. The emigrants are college educated and, what's more surprisingly, Mexico in 1990 was the world's third largest exporter of university-educated migrants. Since this year, the main causes of brain drain have been strengthened due to a combination of supply-side reforms that favor positive self-selection among migrants and quality-selective immigration policies on the demand side. Quality-selective immigration policies were first disclosed in Australia and Canada in the 1980s in the form of points systems that had previously been progressively implemented by other OECD nations. For example, European nations such as France, Germany, Ireland and the United Kingdom have recently adopted policies aimed at attracting a qualified workforce [8].

Recently, new judgments have emerged warning that skilled migration can produce net gains for people left behind thanks to positive externalities. For instance, the possibility of migrating to a country with higher wages increases the expected income for education; this increase creates incentives for people to invest in human capital, which, with tentative migration projections, could leave the nation with a higher level of human capital. This would be conceptualized as brain gain. Conventional literature considers brain drain to be detrimental to countries of origin. If migrants have higher levels of human capital per worker than the remaining population, then the stock of human capital per worker decreases, both in the case of temporary regulation costs and externalities. This fall produces a loss of well-being [9]. A new increase in dynamic patterns increases the possibility of benefits from skilled migration for developing nations. The most common justification is that migration does not leave the human capital development process unchanged. If educational income is quite low in the country of origin, the possibility of migration will not only reduce human capital, but also augment the prosperity of educational attainment for those left behind, boosting the skill creation process; as a result, a net brain gain may occur. When it presents the country's opening to qualified migration, it generates a stimulus to invest in education that, if large enough, can result in an increase in human capital in the face of the existence of uncertain emigration scenarios (the main idea is that some of the people who invest in education to have the opportunity to migrate, decide to stay in their nation).

On the other hand, in Latin America, the rise of studies on the emigration of highly qualified people occurred mainly in the sixties and early seventies. The concern about this issue was consistent with the pattern of economic development that was promoted at the time, consisting of an endogenous development model and the promotion of industrial development at the national level. Depending on the countries and the different historical moments, the main factors of the "brain drain" have been related to political and economic issues. Since the 1990s, another cause which conditions the migration of young people is the mobility of "brains" within the framework of globalization and internationalization of markets, the so-called competitive advantages and the centrality of knowledge in this process [4]. In the 1980s, the concern about quantifying the brain drain was added to the identification of another possible way to address this asymmetric movement of scientists and professionals towards developed nations, the "brain exchange." This phenomenon was about to compensate for the losses derived from emigration by promoting mobility and the exchange of highly qualified resources between nations of origin and developed

nations. Parallel to the changes in the conditions of knowledge production and after the revolution in information technologies, in the 1990s the design of policies to achieve a "brain gain" began to be explored through the training and strengthening of networks of scientists and professionals. These networks seek to act as links between local and global scientific and technological development networks. The network allows those who have settled in other countries to have the possibility of helping and collaborating with colleagues and scientific communities based in their nations of origin through technical reports, consultancies or other forms of academic links [4]. Regarding the network of scientists, 41 integrated knowledge exchange networks have been identified by expatriates belonging to 30 countries (which in some cases have more than one network). The list includes seven Latin American networks, which have their centers in Colombia, Argentina, Venezuela, Uruguay, El Salvador and Peru. For example, we can mention the following networks: the National Program for Interaction with Argentine Scientists and Technicians Abroad (PROCITEX); the Colombian Network of Researchers Abroad (CALDAS); the TALVEN network with the support of UNESCO to re-link Venezuelan scientists; the Franco-Uruguayenne Association pour le développement scientifique et technique (AFUDEST); the Interregional Network of Latin American and Caribbean Scientists Program (ALAS / UNESCO); the United Nations Development Program (UNDP), which supported the Knowledge Transfer program through Expatriate Nationals (TOKTEN), the ANACITEC Network of Argentine Scientists in the area of Medical Sciences, among others [4].

In the research of the Yevgeny Kuznetov Institute coordinated with the World Bank, it says about successful experiences of diasporas (professional communities abroad) that have played a primary role in the economic, commercial developments and technological and scientific exchange of their nations of origin. India is an example [4]. Some of the highly skilled Indian emigrants who moved to the United States and became top executives of huge corporations in the software industry later contributed to the development of this industry in their country of origin. They did this by subcontracting Indian companies first for simple projects, and then demanding increasingly more sophisticated ones. According to this research, the Indian diaspora was essential in the process of emergence and consolidation of the software industry in India. The numbers, disseminated by various media, shed a more accurate light on the true consequences of these trips promoted by the North between the countries of the South. Between 1960 and 2000, the United States and Canada managed to attract more than 1.5 million professional immigrants from the south countries. Today, 23% of science doctors residing in the United States were trained abroad. Similarly, in Germany, 38% of qualified people are from India [12]. 150 million people who collaborate in scientific activities around the world, 90% are gathered in seven of the developed countries. The highest number of brains drain corresponds to the Caribbean countries, a region where the majority of the countries that comprise it are English-speaking [12]. To get an idea of this situation in the Caribbean, it is known, for instance, that 8 out of 10 Haitians with university degrees live abroad. Also in Latin America, from Guyana and Suriname, 86% and 90%, respectively, of their professionals have emigrated [12]. Similarly, the latest migration data collected reveals that, throughout the 1990s, the number of highly skilled migrants living in OECD countries increased by 8 million (40% of all migrants landed there). The

degree of brain drain movement seems to be particularly large in recent years; for example, in 2000 more than 50% of the African skilled migrant population landed during the previous decade [9]. In case of Africa, there is an approximate of 16 million African highly skilled at present laboring and living, principally in developed states [10]. It looks towards the West conditions the absence of nurses, doctors and teachers in many spaces that require them to break the cycle of poverty and underdevelopment they suffer. The World Health Organization (WHO) warned that the sub-Saharan region bears 24% of the global burden of diseases, including AIDS, and only has 3% of the world's skilled workers [12].

In developing countries, where skilled human talent is produced with great effort, sometimes with competitive training, they are high-paid employees in developed countries. Even among the latter, there are also flows, for example, from Canada to the United States [12]. In figure 2, it can be seen the average brain drain index for 2023 based on 20 Latin American and Caribbean nations, which was 5.28 points of the brain drain index, 0 (low) - 10 (high). The country that leads is El Salvador with 8.7 points, then Haiti has an index of 8.3 points and the lowest value are Argentina and Costa Rica with 2.9 points.

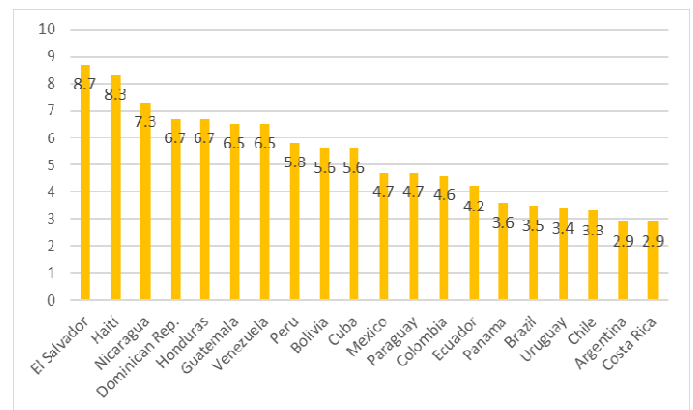


Fig. 2. Brain Drain Index in Latin American and Caribbean countries [11]

The brain drain to developed economies transcends prosperously in them: in the 20 years between 1976 and 1996, the fraction of world trade classifiable as "high-tech products" doubled (from 11% to 22%) while the corresponding fraction to primary products was reduced from 34% to 13% [12]. There is a tendency towards agglutination in the production of knowledge and developed nations concentrate more than 90% of all scientific production. Socially generated knowledge is privatized globally in favor of the capital of these developed nations. Scholarships in industrialized nations for students from developing countries is another way used to promote brain drain. Nearly a third of all experts trained in the Third World do not work in their countries of origin, and it is estimated that just over 50% of those who travel to do a doctorate in North America or Europe do not return to their countries of origin [12]. Although originally the selective emigration of scientists and technologists began spontaneously, guided by the decline in living and working conditions; in recent years, the promotion of this emigration has become an official policy of several nations, with incentives and procedures, such as those mentioned above for the "cards" (green or blue) [12]. On the other hand, first of all, supporters of the neoclassical perspective claimed that skilled

migration is promising internationally: for both origin and host nations. The main advantages of this process caused the progress of science and technology in the world for both developing and developed countries, which means, according to the author, that there is always a gain in brains. Second, world systems approach researchers argued that brain drain is largely harmful, at least for sending nations [13]. Proponents of world system theory have discerned the migration of highly skilled workers as an indicator of the economic backwardness of developing nations in the South and the development of developed nations in the North. The international flow of skilled labor has been responsible for widening economic inequalities and reducing the economic potential of poor countries in the South, particularly when it comes to productivity.

Theoretical research on skilled migration has been strengthened in the 1990s within the framework of endogenous development. Different academics have analyzed this phenomenon; who emphasized the role of rising incomes in progressing education: the brain drain increased national income and earnings for education in recipient countries, but in contrast, decreased the tendency to study and incomes at home. Other authors claimed that the brain drain slowed the growth of human capital in the home economies and therefore contributed to the lasting decline in the economy's rate of increase. On the other hand, in the mid-1990s, a new research component emerged, called the new economics of brain drain. This new scheme has greatly changed the investigation of the economic repercussions of the means of skilled migration to nations of origin. Researchers of this approach claim that skilled migration could have a favorable impact on both origin and host nations, which would translate into brain gain. Therefore, they focused their attention on the optimistic aspects of brain drain, which had been abandoned or omitted in previous literature. Specialists describing the new school of brain drain economics claim that brain drain can produce, in some situations, some positive consequences for the sending economy or the so-called brain gain. Furthermore, these consequences can counteract the harmful effect of the departure of qualified personnel on the human capital stock and economic development of these nations.

### ***Economic Benefits for Countries of Origin (Brain Gain)***

Home countries can benefit from the emigration of skilled workers in four ways (brain gain) [13]:

- A. Encouraged education effect in terms of the migration view increases the attractiveness of educational investments in the nation of origin, thus contributing to greater accumulation of human capital and faster development.
- B. Return migration: some of the members of the Diaspora may return to their country of origin, generating accumulated social, physical and human capital, thus contributing to economic growth.
- C. Remittances: migrants transfer part of their income to their home country. In some cases, these transfers comprise a large portion of national income and, if properly consumed, could help improve economic development.
- D. Diaspora implications: even if they reside abroad, members of the diaspora can be a valuable benefit to the home nation, offering advice, acting as intermediaries or they simply invest their money. This consequence could be perceived directly, such as FDI from migrants and their

businesses, or indirectly when members of the diaspora pressure other entities to do so.

The most notable and outstanding beneficial consequence of the brain drain, related to this new perspective, is incentivized education. According to some research, the possibility of solo migration could be a powerful tool that helps the economies of developing countries to overcome the trap of underdevelopment and increase the rate of prolonged development. In some theoretical examples, the possibility of advantageous brain drain or brain gain, the circumstance in which the positive consequence of education fostered by the output of skilled workers, has been advocated. Subsequently, the developing country ends up with more skilled people than, on the contrary, if the borders had been closed. Another form of brain gain could be that migrants can also receive remittances from their country of origin and invest physical capital in the host country. Furthermore, there is the possibility of strengthening bilateral trade between sending and receiving countries, which means not only the growth of exports for the emigration nation, but also some goods and services are imported.

Moreover, when it is not a brain drain and becomes a brain gain, according to scholars [13], there are three different means for an advantageous brain drain or brain gain to work:

- A) Skilled migrants increase economic well-being at home due to a fairly large flow of remittances.
- B) Selective immigration policies in host countries could increase the attractiveness of migration for highly skilled migrants, which in turn increases the private benefits of education and encourages additional investment in education at home.
- C) Skilled migration could benefit the transmission of technology that enriches growth, trade and FDI between the source and recipient nations, being part of the network effects.

Finally, the development of migrant networks generates FDI and business connections that help strengthen the benefits of trade and the diffusion of knowledge, which ultimately stimulate the development of the home nation. Network or diaspora externalities arise as an impact of a decrease in transaction costs and other information costs related to the commitment that is innate in network relationships.

### **Conclusion**

As a result of the research question, this work suggests several potential channels through which skilled migration can impact well-being and growth in countries of origin; the most controversial is the effect on human capital, which is probably also the most important, but there are also other elements to take into account when assessing the welfare impact of human capital flight. Likewise, all scholars who defend brain gain agree that remittances from host countries and then their appropriate use can contribute to the development of the home country. In addition, the creation of networks abroad can encourage FDI in the home country of its members. The research contribution is restricted by the geographical location of the scientists since, for example, the developed nation has better technology and greater investment capital available for research, also in the developed country clusters of researchers are created that increase the productivity of who are inside it.



Research clusters and technology operate as means for scientific contribution to be carried out, regardless of the geographical location of the experts. Similarly, it is worth mentioning that one of the main reasons why there is a brain drain of qualified workers is because in their country of origin they did not find the expected conditions or work to develop professionally, for example, low salary. A professional with higher education will accept an offer of a very well-paid position with health benefits or other benefits from abroad (normally these types of offers come from a developed country). It seems that in some countries of origin the high education of their populations is still not valued, which could be resolved with new policies in order to persuade the highly qualified worker not to leave their country of origin, otherwise facilitating the high-skilled migrant educational level to invest from abroad in his/her country. The performance of each expert depends on the technological infrastructure at their disposal and the development of their research network or clusters of scientists. Its members produce a higher level of development in the investigative course of each expert, which leads the network *per se* to develop further. Normally the interaction that some researchers can achieve in developing countries is low, therefore, they decide to emigrate, while in developed nations experts have greater ties with other scientists, that is, the average level of the scientific network of a developed nation compared to the average level of the network of researchers in a developing nation is higher. In developed nations, the order and size of the networks of researchers are greater, that is, there is a greater number of experts, nodes, and a greater number of scientific contribution alliances, that is, ties, which facilitates production of scientific research and/or patents. There is a direct connection between the advancement of the network of experts and the productivity of each scientist. The period of stay in the developed nation of the researcher who emigrates from the developing nation depends on the number of links he makes in the new network. If the number of links that the expert develops is greater than the average level of the research contribution network, his exodus will be perennial, while if the number of links of the researcher with the network of the developed nation is less than the average level of the network, the migration will be temporary.

#### List of abbreviations

AFUDEST - Franco-Uruguayenne Association pour le Développement Scientifique et Technique.  
 AIDS - Acquired Immunodeficiency Syndrome.  
 ALAS - Interregional Network of Latin American and Caribbean Scientists Program.  
 ANACITEC - Network of Argentine Scientists in the area of Medical Sciences.  
 CALDAS - Colombian Network of Researchers Abroad.  
 FDI - Foreign Direct Investment  
 GDP - Gross Domestic Product  
 OECD - Organisation for Economic Co-operation and Development  
 PROCITEX - National Program for Interaction with Argentine Scientists and Technicians Abroad.  
 TALVEN - Venezuelan Talent Abroad.  
 TOKTEN - Transfer Program through Expatriate Nationals.

UNDP – United Nations Development Programme.  
 UNESCO - United Nations Educational, Scientific and Cultural Organization.  
 WHO - World Health Organization.

#### Competing interests

The Author has declared that no competing interests exist.

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