Academic Mobility and Scientific Productions: An Analysis of Brazilian Doctors in the Search for Quality

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Abstract. The growing migration of Brazilians in search of better living conditions motivates this study, focused on investigating the exodus of students during their academic training and their scientific productions, analyzing data from the Lattes Platform. Focusing on doctors, the University of São Paulo stood out as a prominent immigration point, highlighting institutional collaborations. There was a preference among migrant doctors, especially internationally, to publish in higher Qualis journals, with a preference for English.

Keywords: Academic Mobility, Academic Production, Data analysis.

1 Introduction

The mobility of Brazilian individuals throughout their academic career is widely discussed in our society, the purpose of which is to obtain a justification for why individuals choose to leave their own city/state/country for the purpose of training in other locations. Studies indicate that a large number of individuals move from their origins to seek a better opportunity in quality education Lombas [4].

The study of mobility is something very relevant, as it portrays the reality of undergraduate and postgraduate course offerings distributed in our country, in addition to this it also involves economic issues and consequently a better quality of life for those who choose to move. According to Jonkers and Tijssen [3] shifts in researcher training demonstrate a correlation with the characteristics of the individual, one of the main characteristics being the degree of international cooperation or scientific production.

Despite its recognized relevance in the present study, acquiring data for analysis is not trivial, since there are few platforms that provide data on academic training and, in most cases, to retrieve them, construction or availability is required. of some tools or frameworks.

Especially when it comes to international academic mobility, it is noted that one of the major problems faced by studies has been gathering adequate information to measure and evaluate the scale, characteristics and impact of the phenomenon. Such problems become an even greater challenge when we recognize the circulatory complexity of mobility and the difficulty of tracking researchers over time and across international borders. Traditional comparable data sources, such as migration or labor statistics and censuses, allow us to visualize some migratory flows of highly qualified human resources, but not the non-permanent mobility of researchers.

In addition to recovery, data filtering and subsequent processing are necessary, considering that in general it is necessary to integrate different data repositories in order to obtain data with greater reliability.

In this context, carrying out an analysis of the mobility of Brazilian doctors, as well as academic productions throughout academic training with curricula registered on the Lattes Platform, aims to contribute to the generation

of national scientific indicators, for a visualization of how Brazilian academic training occurs in relation to to the reality experienced by doctors throughout their training process, also considering possible justifications for choosing mobility in their training. Therefore, the intention of this work is to carry out an analysis of how the migration of doctors occurs throughout their academic career, thus highlighting the main institutions to which doctors have been linked. Furthermore, an analysis of how academic mobility has influenced the scientific production of Brazilian doctors.

2   Related Works

A study was carried out with the aim of understanding how scientific collaboration occurs between the main researchers in Brazil, also analyzing the different types of grants, taking into account only researchers with productivity grants linked to the National Council for Scientific and Technological Development (CNPq). Therefore, they used the CV repository created on the Lattes Platform as a database. From then on, network analysis was carried out to achieve the objective of the study. The results were that individuals belonging to the main type of scholarship (1A) tend to publish equally in congress annals and journals, unlike other modalities that publish in greater quantities in congress annals; Another observation that the authors highlight is that in the highest types of scholarships, collaboration occurs more intensely, whereas at lower levels, scholarship holders tend to collaborate on a smaller scale among individuals with the same level of scholarship, to the detriment of collaboration with the scholarship holders of the highest scholarship modality Dias, Moreira and Dias [2].

Sachini et al. [5] carried out a study with the aim of analyzing the mobility of Greek researchers using bibliometric analyzes (number of publications, affiliation with a research unit). The Scopus database was used to obtain data for the research, as a form of data visualization, network analysis was used to represent how researchers are distributed, as well as the main places where they publish their work. As general results, the authors highlighted that the majority of researchers are stationed in their country of origin, Greece (74.6%). The authors confirmed that mobile researchers make up a smaller portion (21.7%) of the total population, while travelers (60%) - authors who have gained additional affiliations while maintaining affiliation with their home country, represent the majority of mobile researchers. On the other hand, migrants – authors who have left their home country – represent 40% of mobile researchers. Most researchers (86.2%) and especially the elite researchers (90.5%) maintained solid scientific ties with Greece, while building a chain of affiliations that united the nations.

3   Methodology

As a data source, we chose to use the Lattes Platform, as it is a repository that records the trajectory and scientific contribution of each registered Brazilian student, technician and researchers, and because it is an important source of science data. Brazilian.

Initially, the LattesDataXplorer framework Dias [1] was used to collect CVs from the Lattes Platform. Data extraction was carried out in April 2022, totaling 381,462 CVs of individuals with completed doctorates, considering all CVs, regardless of the doctorate completion date stated in the CVs.

In Fig. 1 it is possible to find a general aspect of all the components used and developed to obtain the data to be analyzed.

After collecting the CVs, steps such as selection, filtering and data processing were carried out. In the selection stage, it was possible to apply regular expressions, selecting the entire group of doctors registered on the Lattes Platform.

After selection, the "Data Filtering" module takes place, which is responsible for analyzing the CVs in XML format files in order to obtain information relevant to the research, which characterizes a formatted data extract. The CV information registered in the local repository includes: the individual's state and city of birth; postal code of the individual's current employment relationship, in addition to the identification code for each level of completed training, considering everything from graduation to professional activity and data related to the individuals' scientific production.
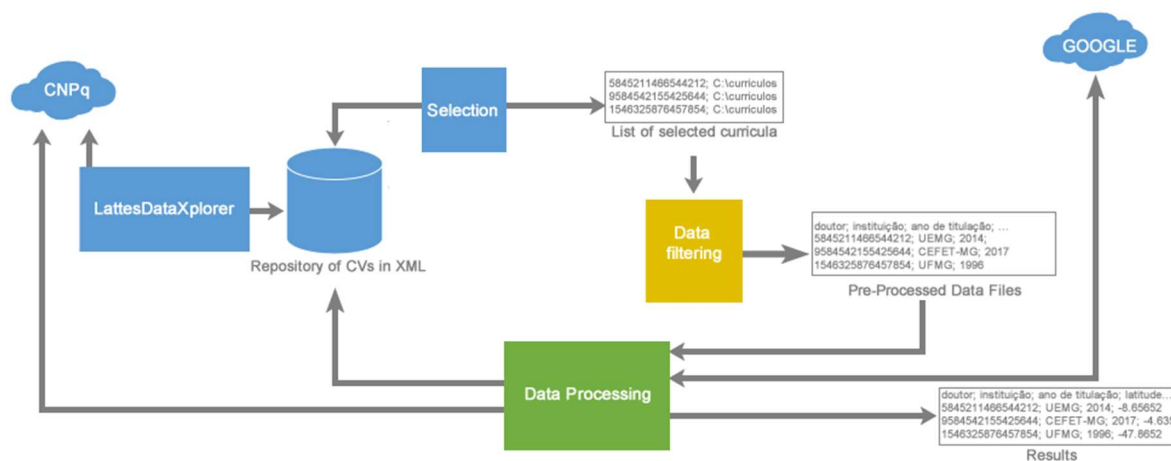
Figure 1. General appearance of the updated components. Source: Authors.

Afterwards, the formatted data extract is sent to the "Data processing" module, in which five steps are carried out: Obtaining the institution's postal code from the Lattes Platform Institutions Directory; Extraction of the classification of periodicals from the Sucupira Platform, obtaining ISSN information and periodical classification for the four-year period 2017-2020; Search by geographic location obtaining the geographic location of the institution to which the individual qualified; Data cleaning and grouping and Data normalization to remove stopWorlds in city names; normalization to extract accented words, and replace them with their unaccented equivalent.

Subsequently, the "Results" file is generated, which contains all the specific data for carrying out the analyses. Therefore, after all the steps described above have been carried out, several metrics are applied to understand the influence of academic mobility of Brazilian doctors on their respective scientific productions, and the interconnections of Brazilian institutions in the face of mobility.

4 Results

Once all the data was processed, it was possible to carry out an analysis aiming to understand the distribution (Fig. 2) of the academic production of articles in journals by Brazilian doctors (considering that the first publication was carried out after/during the year from the beginning of graduation until the last year of publication registered in the CV). Therefore, five different cases were compared (for all cases, only migrations that occurred during undergraduate, master's or doctorate studies were considered): authors who did not migrate during this period; Those individuals who migrated were divided into two groups: individuals who migrated only nationally and individuals who migrated internationally. These two groups were subdivided, with one analysis of data from articles in journals that occurred before the year of migration and a second analysis of data from articles in journals that occurred after/during the year of migration.

Therefore, it is possible to see that when comparing the median of articles published by authors before migration, it is much lower than the median of articles published by doctors nationally and internationally after their migration, a possible justification for this fact may be related the expansion of its network of collaborators, since when an individual immigrates to another location, they create links with other individuals, making it possible to publish in other areas, or even delve deeper into their area of expertise.
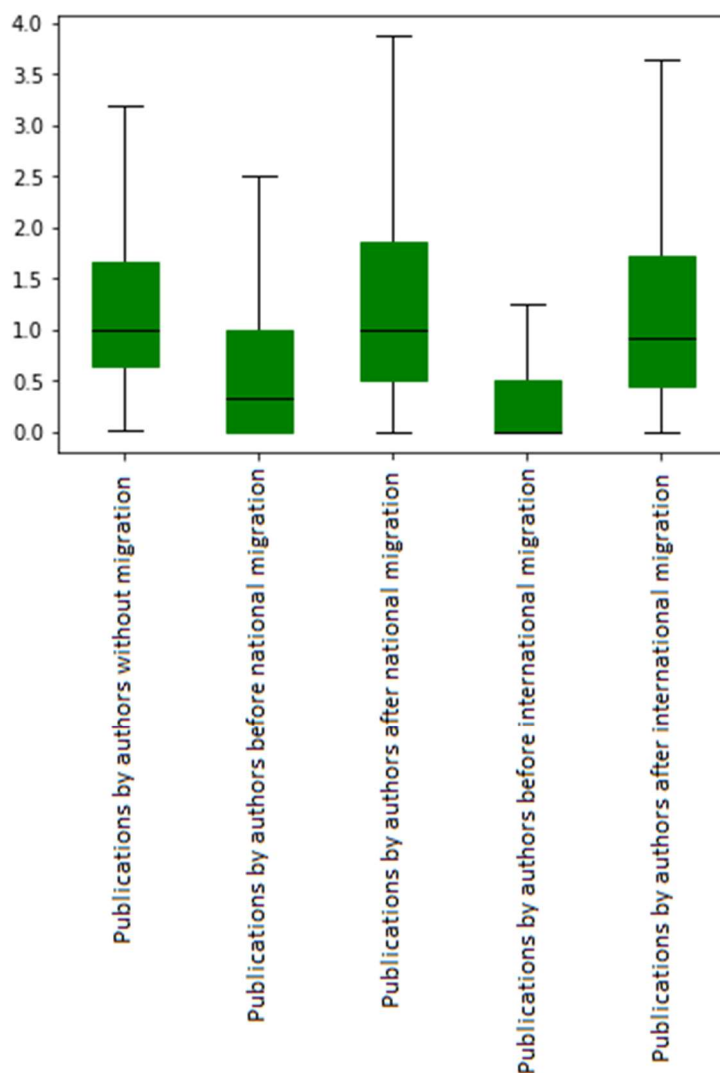
Figure 2. Distribution of publications by Brazilian doctors. Source: Authors.

Subsequently, in order to understand the trend of more frequent publications by doctors, an analysis was carried out with the aim of crossing language and qualification data from Capes (Qualis 2017-2020), based on: individuals who have never migrated (Fig. 3a), individuals who migrated at national level (Fig. 3b) and individuals who migrated internationally (Fig 3c), all these migration data were taken into account from the undergraduate level to the doctorate.

The analysis reveals a predominance of three languages for publishing articles: English, which has the greatest influence, followed by Portuguese and Spanish. This trend is particularly notable in the Qualis A1 to A3 strata, both for individuals with no migration history and for those who migrated nationally. When expanding the analysis to the international scope, a similar dynamic is observed in journals classified as Qualis A4.

One hypothesis for the preference for publishing in English can be justified by the obligation to submit articles in that language or by the authors' choice to translate their work into English, in order to obtain greater visibility for their research. This choice is based on the fact that English is considered the universal language and is frequently adopted by most scientific journals.

On the other hand, in relation to the Qualis B1, B2, B3, B4 and C strata, researchers tend to opt for publication in Portuguese, followed by English and Spanish. This preference can possibly be attributed to the fact that journals classified in lower strata of Qualis do not require publication in the English language.

a) No Migration

b) National Migration

c) International Migration

Figure 3 - Qualis of periodicals and languages published by Brazilian doctors. Source: Authors

As part of a second context of analysis, aiming to investigate Brazilian academic mobility more broadly, we chose to examine the institutions with which individuals maintained links throughout their academic trajectories. Therefore, with the purpose of deepening the analyzes and identifying the institutions that maintain the greatest number of links between them, Tab. 1 was prepared. The data presented were extracted from the CVs of Brazilian doctors, regardless of the year of training, analyzing from undergraduate to post-doctoral level.

Table 1 - Most representative links in institutional networks. Source: Authors.

Origin	Destiny	Quantity	Intrainstitucional	Quantidade
UNESP	USP	3,552	USP	38,865
USP	UNICAMP	1,906	UFRJ	18,885
UNICAMP	USP	1,865	UNESP	17,643
UFF	UFRJ	1,802	UNICAMP	17,290
UERJ	UFRJ	1,748	UFRGS	15,717
UNESP	UNICAMP	1,713	UFMG	14,983
UFSM	UFRGS	1,638	UFSC	10,794
PUC-SP	USP	1,613	UFPE	9,329
PUCRS	UFRGS	1,568	UFC	7,563
UFSCar	USP	502	UFPR	7,455

The prominent position of the University of São Paulo (USP) in relation to other educational institutions stands out significantly, consolidating itself as the favorite among doctors for academic improvement. Considering information extracted from the Sucupira Platform, USP boasts a remarkable set of 173 postgraduate programs, establishing itself as a magnetic hub for individuals in search of educational excellence. The diversity and quality of the programs offered by the institution contribute significantly to its attractiveness, as identified in the institutional networks characterized in this work.

In addition to the robust offer of programs, the geographic proximity of the home institutions emerges as a possible additional justification for choosing USP. In the São Paulo context, other prominent institutions, such as the Universidade Estadual Paulista (UNESP) and the Universidade Estadual de Campinas (UNICAMP), also stand out. Also noteworthy is UNICAMP, which appears as a frequent destination for individuals training at USP and UNESP, highlighting a strategic interconnection between these institutions.

In the state of Rio de Janeiro, UFRJ stands out with the second largest number of intra-institutional links and is the second most chosen option by Brazilian doctors, with a total of 124 postgraduate programs. The influence of geographic distance on the training process is also manifested in choices of nearby destinations, exemplified by the preference of individuals who leave the Federal University of Santa Maria (UFSM) and the Pontifical Catholic University of Rio Grande do Sul (PUCRS) for the Federal University of Rio Grande do Sul (UFRGS).

5   Conclusions

The analysis carried out in this study on the academic production and mobility of Brazilian doctors becomes quite important, revealing significant patterns and emerging trends in the academic context. When examining the distribution of article production in journals along academic trajectories, it can be observed that migration, both nationally and internationally, is associated with an increase in the median number of articles published. This suggests that the network of contacts formed during migration can facilitate collaboration and publication in different areas of research.

Furthermore, the analysis of language preference for publishing articles revealed a clear predominance of English, followed by Portuguese and Spanish, especially in the Qualis A1 to A3 strata. This preference for English can be attributed to its position as a universal language and the search for greater research visibility. However, in the lower strata of Qualis, there is a preference for Portuguese, possibly due to the lack of requirement for publication in English by these periodicals or because they are mostly publishing in national magazines.

When investigating academic mobility, the importance of higher education institutions as centers of educational excellence and research is highlighted. The University of São Paulo (USP) emerges as a prominent choice among Brazilian doctors, consolidating its position as a hub for academic improvement. The geographic proximity and the offer of a large number of postgraduate programs contribute significantly to its attractiveness, while other prominent institutions, such as UNESP and UNICAMP, also play an important role in the academic training of Brazilian doctors.

This study offers a comprehensive and detailed view of the academic production, publication preferences and mobility patterns of Brazilian doctors, helping to develop and improve the country's educational and scientific system.

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