

Internationalizing postgraduate studies in Brazil: the experience of a Overseas PhD and PhD Exchange Research Grants¹

A internacionalização da pós-graduação no Brasil:
a experiência do doutorado pleno e doutorado sanduíche no exterior

La internacionalización de los estudios de posgrado en Brasil:
la experiencia de un doctorado completo y un doctorado sándwich en el extranjero

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Abstract: This paper systematically reviews two distinct types of PhD research grants in Brazil: Overseas PhD and PhD Exchange Research Grants. The research method employed is a historical analysis. The former enables students to pursue their entire PhD studies abroad, while the latter necessitates students to be enrolled in a Brazilian graduate program and spend a portion of their PhD course overseas for research purposes. The paper begins with a historical overview of graduate programs in Brazil and subsequently delves into a comprehensive examination of the two grant types. This examination includes a historical perspective on their development as well as an exploration of current discussions surrounding them. The paper concludes that the lack of data systematization and discourse on these research grants hinders the analysis of their impact on the field of national science.

Keywords: postgraduate courses in Brazil; research grants; CAPES.

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Resumo: Este artigo apresenta e discute como o percurso da pós-graduação e sua internacionalização ao longo do tempo auxilia no debate sobre os impactos, benefícios e gargalos do doutorado pleno e sanduíche no exterior. A metodologia empregada foi uma sistematização histórica. O artigo inicia com um histórico do desenvolvimento dos cursos de pós-graduação no Brasil, utilizado como contexto geral para a discussão acerca do emprego e efetividade das bolsas nas modalidades de bolsas doutorado pleno e doutorado sanduíche no exterior. Depois de apresentarmos o histórico destas mobilidades de bolsas de estudos, apresentamos as discussões existentes em torno destes tipos de financiamento de pesquisa. Concluímos que a falta de uma sistematização completa de dados sobre a efetividade das duas formas de fomento para o avanço da produção do conhecimento no Brasil dificulta uma análise mais profunda do impacto destes tipos de financiamento, assim como informar melhor as políticas públicas que visem o desenvolvimento da ciência nacional.

Palavras-chave: pós-graduação no Brasil; bolsas de estudo; CAPES.

Resumen: Este artículo presenta y analiza cómo la evolución de los programas de posgrado y su internacionalización a lo largo del tiempo contribuyen al debate sobre los impactos, beneficios y obstáculos de los doctorados completos y en modalidad sándwich en el extranjero. La metodología empleada consiste en una revisión histórica. El artículo comienza con una reseña del desarrollo de los programas de posgrado en Brasil, que sirve como contexto general para la discusión sobre la utilización y efectividad de las becas en las modalidades de doctorado completo y doctorado sándwich en el extranjero. Tras exponer la historia de estas oportunidades de becas, se presentan las discusiones actuales en torno a estos tipos de financiamiento de la investigación. Se concluye que la falta de una sistematización exhaustiva de datos sobre la efectividad de ambas formas de apoyo al avance en la producción de conocimiento en Brasil dificulta llevar a cabo un análisis más profundo del impacto de estos tipos de financiamiento, así como proporcionar una base sólida para orientar las políticas públicas destinadas al desarrollo de la ciencia nacional.

Palavras clave: estudos de posgrado em Brasil; becas; CAPES.

1 Introduction

Brazil boasts a complex postgraduate system, the development of which has occurred over an extended historical trajectory. This paper seeks to grasp this process and its evolution toward internationalization over time. An examination of the evolution of postgraduate programs in the country and their internationalization process contributes to a more comprehensive discussion regarding the impacts, benefits, and challenges associated with pursuing a PhD overseas and engaging in PhD exchange research. This paper advocates for a deeper discourse on the role of postgraduate studies in Brazil and highlights the deficiency in data systematization regarding its two primary internationalization programs: overseas PhD and PhD exchange research.

Within this paper, we explore the internationalization of knowledge production, the mobility of individuals, and the emergence of postgraduate studies in Brazil. To this end, we provide a concise historical account of the development of postgraduate programs in the country, with a particular emphasis on research scholarship programs abroad. Subsequently, we scrutinize the ongoing debate concerning the effectiveness of doctoral scholarships abroad, both full and exchange programs, for advancing science in Brazil. In conclusion, we argue that there remains inadequate data systematization at the national level regarding the efficacy of these two scholarship types, and the discussion must continue to address the impact of this financing on the development of national science. This paper does not aim to exhaust the subject or the discussions surrounding the effectiveness and history of Brazilian postgraduate studies but rather seeks to bring to the forefront the key points of discussion that can and should be further explored (Flores, 2019).

1.1 Doctorate abroad and its relationship with postgraduate studies in Brazil

In this section, we provide a concise history of the development of postgraduate studies in Brazil, with a particular focus on internationalization programs. Training abroad has been a common practice aimed at cultivating a pool of skilled researchers. Many developed countries employ this approach in their internationalization strategies, especially as they endeavor to nurture expertise, maturity, and fortify their postgraduate programs (Abreu, 2009). In developing nations, the practice of sending doctoral candidates to foreign institutions, in comparison to domestic ones, significantly contributes to an increase in international collaboration (Ramos, 2014).

The internationalization of Brazilian higher education, especially regarding postgraduate education, occurred in distinct phases. During the 1920s, international academic collaboration underwent a period of isolated initiatives, despite having a global outlook (Canto, 2005). The first notable forays into international cooperation involved scholarships for doctoral programs abroad, which were essential for building a critical mass capable of establishing postgraduate studies. This, however, materialized decades later, primarily during the 1980s (Rosa, 2008).

Since its inception in 1951, Capes has been dedicated to the development and consolidation of master's and doctoral programs, alongside its role in supporting the Ministry of Education (MEC) in crafting higher education policies. Capes' primary activities encompass evaluating postgraduate courses, disseminating scientific output, nurturing high-level human resources both within Brazil and abroad, and fostering international scientific collaboration¹. Starting from 2007, its activities extended to encompass basic education as well (Wolff; Rocha Neto; Schetinger, 2018).

Capes initiated the University Program (PgU) in 1953, focusing on projects targeted at university centers or academic units. These projects aimed to recruit distinguished researchers who could serve as focal points around whom assistant

professors could establish departments and postgraduate courses (Córdova, 1996). During that period, numerous foreign visiting professors were engaged, active internationalization was encouraged, and cooperation activities between institutions were fostered, leading to the awarding of 79 scholarships (CAPES, 2019). In the subsequent years, the University Program became a central focus of Capes' activities (Córdova, 1996). Until the beginning of the 1960s, investments for training human resources, especially at the doctoral level, were limited and not connected to a development project articulated with other public policies (Nunes Sobrinho; Zinn, 2000). Capes' first international partnership program was signed in 1956 with the Rockefeller Foundation and the second was signed in 1964, Capes/FORD Program, in partnership with the Ford Foundation (Rosa, 2008). The scholarship agreement with the Ford Foundation aimed at training human resources in basic sciences and this program helped to boost the growth of postgraduate studies in Brazil (Wolff; Rocha Neto; Schetinger, 2018).

The second phase started with the Capes/COFECUB Program's partnership with France in 1978. From that point on, individual mobility activities of students, professors, and researchers traveling abroad and returning were replaced by an institutionalized collaborative model involving Brazilian and French research groups. The program provided funding for students and professors engaged in themes proposed by joint research projects (Rosa, 2008).

In the 1970s, a phase of "mature institutional collaboration" emerged, which could also be described as "scientific and technological cooperation," "horizontal partnership," or even "symmetric collaboration" (Canto; Hanna, 2006, p. 220). This new phase of collaboration necessitated the support for training human resources and the development of projects of mutual interest. Joint research projects with countries such as France, Germany, and the United Kingdom exemplify the shift toward more dynamic collaboration. These agreements were envisioned as instruments of strategic and long-

term commitments, in contrast to opportunistic partnerships based on occasional, asymmetrical, and short-term collaborations (Canto; Hanna, 2006).

Rosa (2008) emphasizes the scarcity of reliable documents regarding the number of students benefiting from Capes scholarships abroad in the first decades following its establishment. However, the author affirms that, during its early years, CAPES played a pivotal role in training human resources within the country. The creation of the PgU, which primarily awarded scholarships for overseas studies and formed partnerships with North American international organizations, contributed significantly to CAPES' internationalization and served as critical milestones in its consolidation. Substantial investments were made in full doctoral scholarships abroad, funded through federal Science and Technology (S&T) agencies, especially in the United States and Europe, to equip faculty at public universities.

Adopting international postgraduate mobility was a strategic move by the Brazilian government to nurture and fortify the National Postgraduate System (SNPG) (Velho; Ramos, 2014). It provided training to academics and scientists in foreign countries facilitated the expansion of our higher education system, significantly influenced by international factors. These human resources educated abroad played a pivotal role in developing academic programs and cementing the postgraduate system, which was strongly shaped by the American model of postgraduate education (Rosa, 2008). Unlike other Latin American countries, Brazil closely emulates the North American-style postgraduate system, responsible for graduating around 10,000 doctoral candidates annually (Schwartzman, 2009). The Brazilian system witnessed remarkable growth following the university reform in 1980 and embodies two primary dimensions: i) it is predominantly comprised of public universities; and ii) funding and evaluation are directly overseen by the MEC and funding agencies that provide scholarships for overseas studies.

The third phase of cooperation materialized around the turn of the 21st century. During the 1990s, various cooperation agreements were established to promote joint research projects, including (DAAD) with Germany in 1994; (SECyT) with Argentina in 1998; (MES) with Cuba in 1999; Spain (MECD-DGU) in 2001; and the University of Texas in 2001 (Rosa, 2008). These agreements aimed to foster more balanced collaborations between partner nations. Diverse forms of collaboration still exist with countries in the southern hemisphere, ranging from traditional symmetrical joint research projects with Argentina, Cuba, Uruguay, and Mexico, to collaborations in technology transfer or cooperation with Portuguese-speaking countries, MERCOSUR members, and Latin American nations at large (Rosa, 2008). CAPES' international cooperation activities are multifaceted, and various types of collaboration from these three phases continue to evolve today, contingent on the social and scientific development levels of countries and their financial resources. Based on the records of Capes and CNPq, Spagnolo and Matsunura-Tundisi (1997) infer estimates and indicate that in almost half a century of support for scientific and technological activities, as these two institutions have contributed to training approximately 10,000 doctors abroad. The agencies' commitment to training abroad was particularly intense in the 1980s and early 1990s. This was particularly true to Capes, which in 1989 and 1990 had approximately 2,200 scholarship holders in different modalities. Capes funded the studies of around 2,500 full doctoral scholars abroad in the 1990s, awarding an average of 250 new scholarships a year.

The PhD Exchange Research Grants Program, a new type of funding for internships abroad, was created at the end of the 1980s. "Initially in the "counter modality", that is, with candidates selected by the evaluation committee. This model was developed specifically to serve doctoral students from programs with lower levels of evaluation by Capes" (Abreu, 2009, p. 5). This type of training proved to be effective,

and in 1990, by means of Circular nº. 1.727/1990, the Doctorate in the Country with Internship Abroad Program (PDEE) was established.

The PDEE was officially launched in early 1990s and was implemented by Capes. It sought to contribute and maintain scientific exchange with scientifically and technologically developed countries through scholarships that would allow training abroad for a minimum of four months and a maximum of twelve. According to CAPES, the Doctorate in the Country with Internship Abroad Program:

[...] aims to strengthen PhD programs in the country, promoting the necessary exchange with similar institutions abroad. It is hoped that the Program will stimulate links between the programs themselves and their teaching staff with their peers abroad and improve the quality of the students' training, allowing them to carry out studies and research in advanced centers, enabling their access to infrastructure resources that do not exist in the country and to cutting-edge theoretical and scientific instruments (CAPES, 1992, no page number – own translation).

In 2011, the PDEE was succeeded by the new Capes Institutional Program for PhD Exchange Research (PDSE). 'The objective of this change was to increase the number of allocations provided to Higher Education Institutions (HEIs) and expedite the process of granting doctoral internship scholarships abroad' (CAPES, 2011, online). This form of scholarship is considered by Schwartzman (2009) to be significantly more cost-effective than a full overseas PhD, which can cost US\$ 200,000 or more per scholar. In contrast, a complete four-year PhD program at a foreign university typically amounts to around US\$ 100,000 (Nunes Sobrinho; Zinn, 2000). The precise approximation of this cost is crucial, serving as a reference for various purposes, including budget negotiations and matters pertaining to research and postgraduate policies, particularly concerning personnel training. It can serve as a compelling rationale for a more targeted approach to sending scholars abroad.

While full doctoral scholarships are expensive, they offer substantial added value. This added value can provide numerous personal and professional advantages to the scholarship recipient, such as research experience with foreign research groups, enhanced knowledge and proficiency in techniques employed abroad for application in their thesis, networking opportunities with researchers from other countries, and access to state-of-the-art laboratory equipment. A straightforward method for cost reduction is to adopt partial scholarships spanning two years instead of four, with the possibility for the PhD candidate to work as a research or teaching assistant. Another option is securing a local scholarship, a common but highly sought-after opportunity within postgraduate programs in the United States (Schwartzman, 2009).

In pursuit of the developmental objectives for the national postgraduate system, Capes has continued to send students from various fields of knowledge for overseas training up to the present day. Since 1990, when the PDEE was officially inaugurated, it has been reserved solely for programs with the highest Capes ratings of 6 and 7, with the selection of internship candidates conducted by the universities themselves (Abreu, 2009). Consequently, programs that receive ratings of six and seven exhibit the highest levels of internationalization (Morosini, 2011).

Capes has established a system for the institutional evaluation of postgraduate studies, employing committees of experts drawn from their respective fields of knowledge. This system operates on a scale of one to seven points² (CAPES, 2023a), with master's degrees being evaluated for excellence with a maximum of five points and doctorates with a maximum of seven (Matos; Velloso, 2002). In its early years, the PDEE program was relatively small, primarily due to the conditions at the time, which

² The evaluation has been taking place since 1976 and is applied every four years. Programs receive grades on the following scale: 1 and 2, the operating authorizations and recognition of the master's and/or doctoral courses offered by them are cancelled; 3 means regular performance, meeting the minimum quality standard; 4 is considered a good performance and 5 is the maximum grade for programs with only a master's degree. Grades 6 and 7 indicate performance equivalent to high international standards. PPGs offering only master's courses can obtain a maximum of 5.

imposed limitations on the number of courses belonging to the top-rated group. It wasn't until around 1995 that the program began to expand significantly, experiencing annual growth (Abreu, 2009).

The debate regarding postgraduate training models has been ongoing since the expansion of national master's and PhD programs, which were initially considered sufficient to meet the country's demands (Matos; Velloso, 2002; Balbachevsky, 2005). By the 1990s, many doctoral programs had become well-established, meeting international standards, especially in fields with a long tradition of postgraduate training. Research on scientific leaders in Biochemistry, Physics, and Chemistry in Brazil suggested that pursuing a doctorate in a reputable Brazilian program, followed by a post-doctorate abroad, would lead to a successful career. These findings redirected the discussion on training scientists abroad and were disseminated during a period of constraints on funding for science and technology. The budget cuts in the 1990s significantly impacted CNPq's budget, which led to a gradual reduction in the availability of full doctoral scholarships for studying abroad (Matos; Velloso, 2002).

The number of full doctoral scholarships for studying abroad granted by the two main funding agencies, Capes and CNPq³, continued to decline due to cuts in CNPq funding and the strengthening of Brazilian doctoral programs in the 1990s. Data from CNPq's Directory of Research Groups illustrates that the proportion of individuals trained abroad steadily decreased over the years (Matos; Velloso, 2002). Full doctoral scholarships from CAPES and CNPq dropped from 2,061 in 1996 to 1,060 in 2003 (Brasil, 2004). During this period, as opportunities for full doctoral programs abroad diminished, the availability of PhD exchange grants and post-doctorate positions abroad increased (MCT, 2001; Morosini, 2011; Schwartzman, 2009; Velho, 2001).

³ The CNPq also financed postgraduate studies through scholarships at home and abroad.

In the latter half of the 1990s, the debate on preferred models or strategies for training scientists continued, driven by the rapidly increasing number of scholarships available within the country. At the same time, only PhD exchange grants were prominent among those offered abroad (Matos; Velloso, 2002). In terms of doctoral scholarships awarded in Brazil between 1991 and 2003, data from CAPES and CNPq showed a 142% increase, rising from 6,000 scholarships in 1991 to 14,500 in 2003 (Brasil, 2004).

2 Doctorates Abroad: the Full and Sandwich Modalities and their (Dis)Advantages

The historical contextualization of the development of postgraduate programs is pivotal in understanding the debates surrounding Brazilian internationalization programs. In this section, we delve into these debates to shed light on the main discussions and lines of thought.

According to Velho (2001), the PhD Exchange Research program has garnered significant support and advocates within the scientific community, among doctoral students, and among technical staff at the agencies. Support for this program increased from 12% in 1996 to around 20% in 2000, while supporting full doctoral scholarships dropped from 74% to 48% during the same period. The PhD Exchange Research scholarship is more cost-effective due to its contract to cover academic fees at foreign Higher Education Institutions (HEIs), and the tuition fees for scholarship recipients are limited to a maximum of one year. It provides doctoral students with an opportunity for training, study, and research experience in another country while preventing them from staying abroad, thus mitigating potential adaptation challenges upon their return (Velho, 2001). To be eligible for this scholarship, the student must have an academic affiliation with a Brazilian doctoral program and, at a suitable stage in their doctoral journey, allocate a portion of their research time at a foreign HEI. During their time abroad, the student would have co-supervision by a foreign researcher alongside their

advisor in Brazil, overseeing the dissertation. In this context, the PhD Exchange Research scholarship fulfills the criteria for international training and aims to establish a channel for broader scientific interactions, fostering partnerships between research teams and reducing the risk of emigration among these doctoral students (Lombas, 2013).

It's worth noting that, in addition to changes in scholarship distribution, there has been an evolution in the Brazilian government's requirements for scholars to return to Brazil after completing their doctorate. These requirements have become more stringent in terms of returning to the country or full reimbursement of the government's investment in their studies (in cases where return does not occur). According to the author, the government has also expressed less prominent yet implicit concerns, such as the risk of a 'brain drain' and the appropriateness of the knowledge acquired by Brazilians studying abroad (Schwartzman, 2009).

According to Balbachevsky and Marques (2009), the government's decision to impose a requirement for return should be scrutinized to determine if it genuinely serves the country's strategic interests. The authors argue that Brazil could incur more significant losses by compelling recent doctoral graduates to return to a professional environment with limited internationalization and productivity. In the authors' perspective, implementing a policy aimed at strengthening connections between human resources abroad and our institutions and research groups necessitates coordination. Allowing researchers to remain abroad, affiliated with dynamic and productive institutions, represents an alternative strategy worth considering. The study concludes that it is unreasonable to treat a researcher who opts to prolong their stay abroad after completing their doctorate as a transgressor. Moreover, it is inconsistent to demand their return at any cost when local working conditions fail to guarantee a return on the investment made in their training.

Spagnolo and Matsunura-Tundisi (1997) report that some scholarship recipients who have participated in sandwich programs believe that when the institution possesses financial resources, infrastructure, and internationally renowned research groups, exchange scholarships offer an excellent means of collaborating with distinguished researchers and complementing the training initiated in Brazil through new experiences and access to additional knowledge. Among the advantages highlighted by those who have benefited from exchange scholarships are the necessity to maintain connections with the institution and researchers in their field in Brazil, and the substantial time savings in the thesis writing phase by composing it in Portuguese. These scholarships also serve to strengthen the ties between Brazilian and foreign researchers through doctoral students.

Castro e Cabral Neto (2012) caution against being too optimistic about the outcomes of exchange scholarships. Doctoral students spend a maximum of one year at a foreign university and then return to complete their thesis in Brazil. Nonetheless, these students are not officially enrolled in any courses and may risk lacking adequate individual guidance while abroad. In such cases, the student's performance could suffer significantly. To mitigate this, it is essential to develop a well-defined project in advance with the foreign supervisor and ensure their genuine interest in your work to prevent such inconveniences.

The question raised by Velho (2001) regarding the PhD exchange research is:

"[...] you get the same as a full doctorate, with advantages and at a lower cost. Is that so? This question has not been properly answered. It is assumed that the PhD exchange research contributes just as much to the doctoral student's training and insertion into the scientific mainstream as the full doctorate, but there is no comparative study that has produced evidence of this. This marked increase in the former to the detriment of the latter seems unreasonable when no data is available on the training and impact of either" (Velho, 2001, p. 622 – own translation)

Spagnolo (1995) asserts that, beyond the evident cost savings, the PhD exchange research program fosters a more productive collaboration between the sending and receiving departments. The author highlights that this program can be regarded as one of the most intriguing options for undertaking postgraduate studies abroad. It represents a harmonious fusion of interests among Higher Education Institutions (HEIs), academic fields, and funding agencies. For certain fields of knowledge, opting for a PhD exchange research grant offers a viable means of responding more effectively to the unique requirements of that domain.

Another aspect is addressed by Meneghini (1991) who, when checking the thirty most cited scientists in the field of chemistry, found that 90% of them had studied for a doctorate in Brazil and that twenty-nine of them had done post-doctoral training in other countries, especially in the USA, England, Germany, and France. The researcher recommends the model of pursuing a doctorate in one's home country followed by a doctoral internship abroad as the most suitable approach for Brazilian postgraduate training. In another study, Meneghini (1995) conducted research across various physics specializations, encompassing 43 of the most highly cited Brazilian physicists. To his surprise, just over half had earned their doctorates abroad, complemented by post-doctoral internships in other countries. Only 25% obtained their doctorates in Brazil, followed by predominantly post-doctoral internships in the USA. Despite these findings, the author underscores the preference for investing in doctoral studies in Brazil and encourages a stronger emphasis on post-doctoral studies abroad.

Agreeing with this preference for Brazilian training, Meneghini (1995) delves into the need for a meticulous evaluation of the postgraduate training policies of funding agencies. In his view, promoting full doctorates has drawbacks for the country. He points out the risk of brain drain, and the high cost associated with this type of scholarship. He also highlights the issues related to reintegration that full PhD students face when returning to Brazil, rejoining their studies, and reacclimating to Brazilian

social life. In this context, he advocates in favor of pursuing a PhD in one's home country, followed by a post-doctorate abroad, and emphasizes that the most exceptional postgraduate programs offer training that is on par with what is obtained in scientifically advanced countries.

Velho (2001) challenges the argument presented by Meneghini (1995) when she assesses the quality of Brazilian postgraduate programs. Out of the 667 doctoral courses, only 127 (approximately 20%) received a rating of 6 or 7. She highlights that the exact number of programs with international-standard quality remains uncertain since international evaluation committees have not completed their assessments of these programs. Nevertheless, according to the author, given the limited number of programs in Brazil that meet international standards, the option of full training abroad should not be discarded. By exposing emerging scholars to top-tier departments with greater research resources and infrastructure, as well as facilitating collaboration with other researchers, full PhD students can derive cognitive and social benefits:

Once they are strategically placed in the stratification system in the initial phase of their training, their chances of career success become greater, either because of the contacts they make, or because of the greater learning opportunities, or because of the "model" they incorporate. Part of this model is the acquisition of publication habits, teamwork, collaboration with researchers from different countries, collaboration with the productive sector (Velho, 2001, p. 618 – own translation).

Balbachevsky and Velloso's (2002) survey of biochemistry researchers reveals that the full international experience significantly contributed to their professional activities in the years following the completion of their training. Scientists who earned their doctorates and completed post-doctoral work abroad exhibited a higher level of engagement in projects managed outside the country and in regulatory bodies relevant to their field, such as journal committees and international agency committees. This suggests that individuals trained abroad maintain more robust connections with the international academic community compared to those who obtained their doctorates in Brazil. The authors note that in Biochemistry, Electrical Engineering,

Physics, and Chemistry, researchers with full doctorates and post-doctoral experience abroad consistently demonstrated a greater degree of inclusion in international research networks compared to researchers trained in Brazil with post-doctoral experience abroad (Balbachevsky; Velloso, 2002, p. 210).

Carvalho's research (2002) also demonstrated the positive impact of international experience on the academic integration of PhDs in Electrical Engineering, particularly for those who completed both their doctorate and post-doctoral work abroad. In these cases, collaborative publications, especially with foreign researchers, in A1⁴ journals (CAPES, 2023b) and involvement in internationally managed projects were more frequent.

Ramos' study (2017) affirms that professors who earned their doctorates abroad play an active role in facilitating internationalization. A coordinator of a PPG in Physics emphasized that "international networks stem from natural collaborations between individuals, not programs" (Ramos, 2017, p. 19). Other researchers added:

[...] the choice of universities with which we have formal contracts varies according to the contacts our faculty has with researchers in other countries," and that this was facilitated by the international experience of "former students [now faculty members in our program]" (Ramos, 2017, p. 19 – own translation)

Ramos (2017) reiterates that the presence of professors trained abroad plays a pivotal role in the internationalization of postgraduate studies and research in Brazil. These professors have the capacity to leverage their international networks to foster scientific exchanges and collaborations. However, the absence of a national strategy and the inadequacy of administrative systems and institutional policies in many of the country's higher education institutions impede the development of these connections.

⁴ The classification of journals is carried out by the Capes evaluation areas and undergoes an annual updating process. These journals are classified in quality strata, from A1 to C, with A1 being the highest stratum.

Nunes Sobrinho and Zinn (2000) align with Ramos' perspective. They assert that pursuing doctoral studies in world-class institutions abroad allows scholarship recipients to establish contacts that may have far-reaching implications for future postgraduate programs in Brazil. It serves as a crucial factor in the formation of cutting-edge research centers that are closely aligned with globally recognized research hubs. Studying abroad provides opportunities to leverage research infrastructure, gain access to consumables and reagents, and establish connections with influential researchers. This experience brings a distinct advantage that the future doctor is expected to bring back to Brazil upon returning to their professional environment.

Spagnolo and Matsunura-Tundisi (1997) emphasize that exchange scholarships should not entirely replace full doctoral programs, particularly in less-established areas. To yield the expected results, specific conditions must be met for PhD exchange grants. Such scholarships should be granted when there is already a well-established collaborative relationship between Brazilian research groups and the foreign institution. The foreign supervisor should not merely serve as a nominal contact or play a purely formal role. In essence, the interaction between the Brazilian and foreign supervisors, as well as with their respective research groups, should be effectively established before the doctoral student's arrival. The research project should initiate in Brazil, with approval from both the Brazilian and foreign supervisors.

The allocation of exchange scholarships varies significantly. According to Spagnolo and Matsunura-Tundisi (1997), it depends on the supervisor's interest in the scholar's work and their influence within the department or laboratory. Some scholars reported feeling lost or neglected by the institution and the agency, which hindered their thesis development. Others faced no restrictions and received the same treatment as regular students, including library access, laboratory usage, equipment availability, and on-campus accommodation. There were even cases where scholars felt privileged

compared to other PhD students, as they were afforded the same status as visiting researchers.

Contemporary studies examining the impact of full and PhD exchange research programs maintain similar discussions. Berwig and Carraro (2023) analyze two PhD exchange research experiences in the field of Social Work and conclude that these experiences fostered partnerships, agreements, and new exchange opportunities between institutions. Similarly, Neves, Lavarda, and Martins (2019) assert that professors in postgraduate programs recognized for their excellence play a pivotal role in stimulating and solidifying internationalization within their respective programs. They underscore the importance of these professionals in advancing national scientific development through their efforts.

Conclusion

Agencies should identify and use human resources training as an instrument to achieve specific objectives, with emphasis on the following questions: i) do you want to train researchers to be able to generate new technologies? ii) to merely know how to choose imported technologies? iii) to teach new researchers? iv) to work in companies, in government, or in academia? (Velho 2001). According to Carvalho (2002), in several strategic areas of rapid scientific and technological progress crucial for Brazil's development, the country cannot afford to forgo fully training PhDs in high-level programs abroad. This not only stimulates the consolidation of the national postgraduate system but also bestows scholars with cognitive, cultural, and social advantages, which are essential for their enhanced performance within international knowledge production networks.

In the Brazilian context, it's prudent to adopt a mixed approach to integrate research resources into international networks (Velho; Velho, 2002). Relying solely on

the consolidation of the domestic postgraduate system should not be the sole strategy. Instead, training human resources must be an integral component of a comprehensive plan that determines the proportions of scientists to be trained in Brazil or abroad. This plan should also specify the areas, institutions, countries, and outcomes, necessitating continuous monitoring and evaluation (Velho, 2001).

The discourse on the significance of internationalization for Brazilian postgraduate programs reveals that while there are numerous studies analyzing the efficacy of doctoral programs abroad (both overseas and exchange) for scientific development in Brazil, there is a notable absence of meta-studies comparing the positive aspects of these programs across different fields of knowledge, types of institutions, and regions within the country. This gap in knowledge limits the ability to revamp internationalization strategies. In the absence of such studies, the assessment and evaluation of human resources training abroad risks becoming outdated and potentially detached from the current context, as it is primarily reduced to internal analyses conducted by universities that send researchers abroad.

Agencies and other funding institutions should maintain comprehensive and up-to-date systems for systematic data collection. This data will be indispensable for formulating effective internationalization policies that cater to the unique needs of each field of knowledge. It facilitates the process of evaluating the specific requirements of postgraduate departments, thereby enabling the selection of the most appropriate scholarships, whether full or PhD exchange research grants, to meet each program's specific demands. Therefore, these institutions must play an increasingly proactive role in policymaking and implementation.

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