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Challenges or opportunities?

ARTICLES

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Academic and non-academic career paths of international and domestic PhD holders

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Abstract: Some countries have strong culturally rooted practices and policies to incentivize their PhD candidates to develop their doctoral studies abroad. Their programs provide cultural and methodological diversity opportunities and globally oriented career prospects. In the last years, many of those countries are increasingly developing their own domestic doctoral programs, which may offer career benefits due to their strong connections to the local research and academic environment. The career paths of 126 PhD holders working in Paraguay, a country in which doctoral studies abroad intersect with national-based doctoral programs, were examined using the ECRID survey. The perceptions of those who completed their doctoral studies domestically and those who studied abroad were compared in terms of the usefulness of the skills provided by their respective PhD programs.

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The results showed that most PhD holders in Paraguay work full-time in the academic sector. The percentage of PhD holders employed in non-academic roles reflects the diversity of career options available to PhDs holders in the Paraguayan labour market. Furthermore, results indicated how the participants re-signified the skills acquired during the doctoral program to adapt them to various professional settings. This process underscores the emerging demands of the current labour market and the necessity for universities to adjust doctoral training models to better equip graduates for diverse professional paths. This adjustment includes institutional support to reduce cultural shock and subsequent burnout levels. Pioneering results from the Paraguayan context provide empirical evidence to enrich the reflection on the resources and opportunities for PhD holders at both structural and organizational levels.

Keywords: Academic career; non-academic career; PhD holder; domestic PhD holder; international PhD holders; doctoral competences.

I. Introduction

Over the past two decades, economic globalization has led to a remarkable increase in doctoral candidates and graduates, a phenomenon observed in either highly scientifically developed and less developed countries (OECD 2024; Kuzhabekova et al. 2019). Although doctoral training is recognized as essential for acquiring research skills and preparing for academic careers, many domestic universities in less developed countries face limitations in training young scientists both in terms of quantity and quality (Sakurai and Masson 2023). This situation illustrates to what extent upgrading local institutions is a lengthy and costly process, further constrained by the existing scientific workforce (Müller et al. 2018).

In parallel to the growing trend of students remaining in their home country, there has been a significant increase in the number of PhD candidates choosing to continue their studies abroad, especially in less developed countries (OECD 2024; Robertson and Nguyen 2021). The most attractive destinations include countries such as the United Kingdom, the United States, and Australia, where a significant proportion of the student population comprises international (OECD 2024). Other non-anglophone destinations like Spain, have been also traditionally relevant for some candidates. Barcelona has recently become a popular destination within the Latin American and Caribbean (LAC) communities, mainly due to cultural and linguistic similarities (Valls-Figuera et al. 2023).

To support PhD studies abroad, developing countries provide national and international scholarship programs, reflecting their efforts to strengthen their research capacity through international training (Flecha 2018; Huang

and Jung 2023). The standard expectation for the governments that provide financial incentives for doctoral students to study abroad is that they will return and contribute to enhancing research productivity and economic development of their countries, in line with the principles of Responsible Research and Innovation (RRI) (Huang and Jung 2023; Sala-Bubaré et al. 2022; Müller et al. 2018; Ramos and Velho 2011).

Transitioning from doctoral training to the labour market can be challenging for PhD holders, as they must re-evaluate the skills and competences, they acquired during their doctoral training to align them with their professional objectives and the new cultural context (Canolle and Vinot 2020). This situation is particularly true for those transitioning to non-academic jobs and those returning to their home universities (Canolle and Vinot 2020; Shmatko et al. 2020). Results from research in the last decade indicate that although a significant proportion of doctoral graduates still enter academia, there is a growing inclination towards non-academic careers (Roach and Sauermann 2017; Germain-Alamartine et al. 2020; Walters et al. 2021; Castelló et al. 2023). The current situation may be attributed to the shortage and instability of academic positions compared to the increasing number of doctoral graduates but also to new trends in research and innovation that increased research job positions in the industry (Germain-Alamartine et al. 2020; Van der Weijden and Teelken 2023) and has prompted a shift in how research and researchers address societal changes (Huang and Jung 2023).

Research has illustrated that post-doctoral career paths are highly dependent on various contextual factors, such as the specific country or institution in which they take place (Sakurai and Mason 2023), and that a combination of factors, such as salary, job stability, social recognition, contribution to the welfare state, satisfaction from developing an innovative activity, and the time commitment required, influence post-doctoral career choices (Canal-Dominguez and Rodríguez-Gutiérrez 2016; Shmatko et al. 2020). Available evidence on international PhD holders' career paths who return to their home context, and the differences with those experienced by domestic PhD holders come from European countries such as Greece (Labrianidis et al. 2022) and Portugal (Tavares et al. 2019), as well as in African and Asian countries such as Ghana (Attom and Eshun 2018) and Pakistan (Baloch et al. 2021), respectively. However, empirical evidence on the reintegration of international and domestic PhDs in the Latin American context is limited, especially when looking for studies that include national and international PhDs in the academic or non-academic sectors.

This study contributes to fulfilling this gap by exploring the career paths of domestic and international PhD holders working in Paraguay¹. We analysed Paraguayan PhD holders' perceptions regarding the usefulness of the skills provided by their domestic or abroad doctoral training programs. Moreover, we related these perceptions with their current job position within or beyond academia. Increasing our knowledge regarding those issues might provide valuable insights for aligning higher education, doctoral education and research policies with labour market needs, and supporting the PhD holders' reintegration in Paraguay and other similar contexts.

Therefore, this study aimed to examine the career paths of Paraguayan PhD holders who graduated from national and international universities. Specific objectives were:

- Explore the type of professional career pursued by domestic and international PhD holders.
- Identify PhD holders' perceptions regarding which skills acquired during doctoral training were relevant in their current professional contexts.

II. Literature review

II.1. PhD Graduates: Training and employment destinations

Developing an academic career and accessing stable academic positions is an increasingly precarious and uncertain option for newly graduated PhD students (Van der Weijden and Teelken 2023; Castelló et al. 2023). In the last ten years, researcher careers have gradually become multifaceted, and core activities such as planning a project, collecting and analysing data, or managing R&D-related projects are no longer exclusively confined to academia but are also prevalent among non-academic sectors (Shmatko et al. 2020; Kyvik and Bruen Olsen 2012).

Many countries (e.g., UK, USA, Canada, or Australia) have been progressively modifying their doctoral education to guarantee not only research proficiency but also transversal competences to enhance competitiveness in the labour market (Canal-Domínguez and Rodríguez-Gutiérrez 2016; Lamon et al. 2024) and to allow PhD holders to progress in their careers in a range of fields and across sectors, even in non-academic

¹ In Paraguay, with a population of around 7 million, there are 1.832 people involved in research, of whom only 34% hold a PhD (RICYT 2021).

research and innovation contexts (Ganapati and Ritchie 2021; Li and Horta 2023).

In contrast, a traditional PhD training model persists in many South American countries, with higher education institutions and research centres serving as the main trainers and employers for most doctoral candidates (Mendoza-Otero et al. 2021). In Paraguay, where this study is based, approximately 60% of PhD holders pursued careers as university teachers a decade ago (Jiménez-Chávez and Duarte-Masi 2013). Current data on the employability rate, destination, and quality of employment of domestic PhDs is not publicly available but trends appear to be similar (Díaz-Villalba and Castelló 2024).

Research on the career paths of PhDs who have crossed borders to further their studies abroad has been prevailing on sending countries, such as China, Saudi Arabia, Kazakhstan, Malaysia, Hong Kong, Macau, Taiwan, and various sub-Saharan African countries. These studies focused mainly on issues such as identity negotiation, the psychological adjustment of academic returnees within their university roles, the intricacies of reintegration into the higher education sector after international doctoral studies, and the use of networks to access the labour market (Ai and Wang 2017; Alkubaidi and Alzhirani 2020; Lu and McInerney 2016; Li and Horta 2023; Kuzhabekova et al. 2019; Eduan 2017; Da Wan et al. 2022). Their results highlight variances in academic cultures between host and home universities, notably when moving to Japan, Australia, and the United Kingdom (Sakurai and Mason 2023; Lamon et al. 2024; Robinson-Pant 2009).

Several studies suggest that the employability opportunities facilitated by networks are related to the place of graduation. On the one hand, foreign-trained PhDs generally have more collaborators in scattered networks, which leads to higher international collaboration possibilities. On the other hand, domestic PhDs usually have stronger relationships and mentor collaborations within their networks (Lu and McInerney 2016). Due to the limited connection with international colleagues, there is minimal collaboration for publication in higher-impact journals, resulting in fewer citations and less visibility, which, in turn, limit professional advancement (Jiménez-Chávez and Duarte-Masi 2013).

Research has also highlighted the relationships between the availability of academic opportunities and the career transitions to non-academic sector (Walters et al. 2021; Li and Horta 2023). A first type of transitions refers to ‘involuntary transitioners,’ who were primarily interested in academic careers but were forced to explore alternative paths due to the limited number of available academic positions and their high level of precariousness (Van

der Weijden and Teelken 2023; Shmatko et al. 2020). This shift is a direct consequence of the challenging academic job market, where the demand for positions far exceeds the supply (Walters et al. 2021). In contrast, ‘voluntary transitioners’ did not have a primary interest in pursuing an academic career and some of them usually worked in professional non-academic environments or collaborated with industry during their doctoral training (Pablo-Hernando 2015). This group demonstrates a deliberate inclination toward exploring various professional paths beyond the conventional academic route (Li and Horta 2023).

In a recent study conducted in the Catalan context, data indicate that PhDs pursue a diversity of professional pathways, both within and beyond the academic realm. These roles extend from research and teaching to consulting and entrepreneurship (Sala-Bubaré et al. 2024). It is not uncommon for a PhD candidate to be linked with a research institute, laboratory, or innovation centre, where the individual may occupy a role within the research and development (R&D) department, focusing on a specific project, the development of new technologies or methodologies, or collaboration with other researchers. Furthermore, it is even more common for PhD graduates to join the workforce in private companies, non-governmental organisations (NGOs), or the public sector. They typically occupy roles in project management, data analysis, policy development, consulting, and technical or leadership positions (García-Morante et al. 2024b). Although less prevalent, there is a discernible upward trend towards entrepreneurship or independent consulting, wherein PhD holders deploy their expertise in a practical setting, establishing and overseeing their own enterprises (Sala-Bubaré et al. 2024; García Morante et al. 2024a).

Furthermore, career paths are not always linear, with at least three potential combinations (Castelló et al. 2023). The ‘in-out’ trajectory represent a perspective in which PhD candidates view the transition as an ‘escape’ from academia (Rönkkönen et al. 2024), yet maintain an emotional connection with academic work and express interest in returning if conditions are favourable. The ‘Out-in-out’ group comprises those who view the non-academic sector as a means of consolidating their careers, rather than as a mere exit strategy. They are often motivated by the prospect of enhanced working conditions and professional advancement (García Morante et al. 2025). The ‘Hybrid’ group comprises individuals who value the opportunity to combine both spheres, viewing the transition as a strategy for professional diversification rather than as a definitive exit (García-Morante et al. 2024).

It is important to note that, in terms of labour conditions, those working outside academia are less likely to have a job that requires a doctoral degree

and to be engaged in research tasks. However, they are more likely to have permanent and full-time contracts, as well as higher salaries than those employed at universities and research centres (Sala-Bubaré et al. 2024).

Researchers' career is being reoriented globally as a result of this shift in career paths (Castelló et al. 2023). During the transition to the labour market, PhD holders re-signify the skills and competences acquired during their doctoral training in order to adapt them to their professional goals and contexts (Canolle and Vinot 2020). This adaptability is particularly crucial in certain professional environments or specific cultures, where the assumption of new responsibilities brings additional challenges to their careers (Skakni et al. 2021; Castelló et al. 2017; Al-Nawafleh et al. 2013).

In a recent study, García Morante et al. (2024) analysed the experiences of Spanish PhD holders who had diversified their career paths into non-academic fields, assessing how they perceived the relevance of their doctoral training and the adequacy of the competences acquired in relation to their current professional roles. The results showed that the development of transferable skills and competences is valued as an essential component of doctoral training, as it prepares graduates for the challenges of the labour market and enables them to apply their training in a variety of professional contexts, thereby increasing their employability and effectiveness in non-academic roles.

In certain sectors, these skills and competences are already highly valued (Griffiths et al. 2018). In a study conducted in several European countries, academic and food industry employers were asked about the desirable employability skills that PhD students should acquire during their studies. The results showed that competencies related to research skills and techniques, research management, personal efficacy and communication skills were considered most valuable to meet the future needs of the labour market (González-Martínez et al. 2015). Furthermore, a more recent study in 2024 has reinforced the significance of communication skills—both oral and written—as fundamental in their non-academic labour market roles. This study emphasized the centrality of dialogue and comprehension in their jobs, noting that these skills are often not reflected in job specifications, which, in turn, indicates that communication capabilities, which are honed during doctoral training, are crucial for success in non-academic environments (McAlpine and Castelló 2024; Canolle and Vinot 2020).

The evolving career paths of PhD holders are challenging the traditional boundaries between academic and non-academic roles, facilitating a more fluid exchange of knowledge and competencies across sectors (García Morante et al. 2024a). Consequently, this dynamic contributes not only to the

professional development of individuals, but also to the strengthening of research and academia globally (Sala-Bubaré et al. 2024; Müller 2018). Returning PhD holders not only should reframe the competences and skills they have acquired but also experienced a transformed view of the scientific world (Karakaş 2020; McAlpine et al. 2023). Moreover, they can integrate the values, knowledge, and skills acquired abroad into their new context, enriching it rather than compromising it (Kuzhabekova et al. 2019).

II.2. Context

Over the last decade, Paraguay has shown a growing interest in consolidating research and development, and this trend is reflected in the macroeconomic data. From 2014 to 2020, the investment in Research and Development (R&D) as a percentage of Gross Domestic Product (GDP) increased from 0.08% to 0.16%, marking a significant improvement (Conacyt 2022). Although 0.16% of GDP is still a relatively low percentage compared to countries with a long history of scientific development, it is important to consider the implications of this increase in R&D expenditure for the scientific, technological, and economic progress of the Paraguayan nation. This study focuses on one of the strategic pillars of such progress: the training and consolidation of advanced human capital.

One of the scientific policies that has been most successful in increasing research capacity is the training of researchers abroad by granting postgraduate scholarships. Specifically, from 2016 to 2023, it was reported that 300 professionals and researchers started their doctoral training abroad through the BECAL². Approximately 70 have returned, although it remains unclear how many have completed their PhDs. In parallel with the emphasis on training researchers abroad, the promotion of doctoral training in the country has experienced a notable increase in enrolments and graduates. Between 2014 and 2021, 6,148 master's students enrolled in doctoral training programs, and 1,466 graduated, with an annual growth of 4 % (Conacyt 2022).

The consolidation of researchers is being pursued through two programs. First is the National Incentive Programme for Researchers (PRONII), a categorization system for researchers in Paraguay, with different levels ranging from Research Candidate to Level III, each with specific requirements. Second, the Programme for the Return and Relocation of Researchers from

² National Programme of Scholarships Abroad for the Strengthening of Research, Innovation, and Education in Paraguay "Don Carlos Antonio López" (BECAL).

Abroad. However, Paraguay's experience with the return of researchers is relatively recent. It was only in 2022 that the first and only call for proposals was issued to promote the attraction and return of highly qualified professionals to strengthen human capital at the national level. In contrast to other Latin American countries, namely Mexico, Argentina, Uruguay, Ecuador, Colombia, Chile, Paraguay still needs to implement researcher repatriation programs as part of its national science and technology policy (Broitman-Rojas and Rivero 2022).

Research on Paraguayan researchers' career paths has focused on the scientific productivity of specific groups, such as members of national universities or those enrolled in the *Programa Nacional de Incentivos para Investigadores -PRONII-* (Solis et al. 2018; Flecha 2018). Hence, the career paths of highly educated people, specifically those holding a PhD, have received scant empirical attention. The researchers have limited knowledge of the differences between PhD holders who studied in Paraguay and those who returned to the country after completing their PhD abroad.

III. Method

The study adopted a cross-sectional design to analyse the perceptions of Paraguayan PhD holders who graduated from national and international universities and were working in Paraguay, either in academic or non-academic contexts.

III.1. Participants

Altogether, 126 PhD holders who graduated between 2012 and 2022 and are currently working in Paraguay participated in the study. Table 1 shows the characteristics of the final sample. The gender distribution is balanced, with men representing 50.8 % of the sample and women 49.2 %. The majority reside in Asunción (45.2 %) and the Central region (35.7 %), although there were also representatives from other departments³ in smaller proportions, such as Alto Paraná (7.1 %), Itapúa (5.6 %), among others. They come from different disciplines, with life sciences and biomedicine (35.7 %) and social sciences (38.1 %) being the most predominant, followed by

³ Paraguay's territorial and administrative organisation includes: two regions (*Oriental* and *Occidental*), departments (17) and municipalities or districts (245). Asunción is a department in its own right (independent), the Central Department is divided into 19 districts, Alto Paraná into 22 and Itapúa into 30, which correspond to provinces or regions in other countries.

technology (20.6 %), arts and humanities (4.0 %) and physics (1.6 %). Regarding family background, 65.1 % of participants have dependents, while 34.9 % do not (see Table 1).

Table 1
Socio-demographic characteristics of the participants of the study

		n	%
Gender	Woman	62	49.2
	Man	64	50.8
Residence Department	Asunción	57	45.2
	Central	45	35.7
	Others Departments	24	19.0
Graduation Area	Life Sciences and Biomedicine	45	35.7
	Technology	26	20.6
	Arts and Humanities	5	4.0
	Physic	2	1.6
Family background	Yes	82	65.1
	No	44	34.9

III.2. Instruments

The instrument used in this study was a reduced version of the cross-national survey: *Early Career Researcher Identity Development: Research within and beyond academia (ECRID)*⁴ (Spanish version). The full version of the survey explores different areas of early career researcher career paths and has been used and validated in a previous study to explore the experiences of PhD holders beyond academia (Pyhältö et al. 2024). It was cross-culturally developed and is available in four languages: Catalan, Spanish, Finnish, and English.

The reduced version used in this study included three sections. The first section, “*About You*,” collects socio-demographic information (year of birth, place of residence, university, other) (20 items); the second section, “*Your Job*,” collects information about the participants’ employment situation (7

⁴ Available for free download at the project's website: <https://www.researcher-identity.com>

items). The third section, “*Professional Competences*,” assesses how often PhD graduates carry out a list of activities in their current job (14 items) and whether they acquired the competences to perform these activities during their PhD (14 items) (see annex 1).

III.3. Data collection

A twofold complementary strategy was developed to recruit participants. First, potential participants were identified from two databases: 1) researchers categorized in PRONII at all levels, provided by the National Council of Science and Technology (Consejo Nacional de Ciencia y Tecnología - Conacyt), and 2) scholars who have returned to the country and have been registered in BECAL. Second, information about the study was posted on social networks with an email address for potential participants to express their interest. In both cases, interested individuals provided their basic data through a form before being recruited, and some of them shared the information within their networks, facilitating a snowball recruitment effect.

All forms received from interested potential participants were filtered, and those who met the eligibility criteria were included. The inclusion criteria were: 1) having completed a PhD in the last ten years either at domestic or international universities, 2) having a job either within or beyond academia, and 3) living in Paraguay. An email was sent to all eligible PhD holders, inviting them to respond to the ECRID survey.

All participants received written information about the project and gave their consent to participate according to the research ethics clearance procedures in the authors’ respective jurisdictions. Completing the survey took 15 to 20 minutes. Data collection took place during May, June, and July of 2023.

III.4. Data analysis

The analytic plan to reach the first objective included two steps. First, descriptive analyses were conducted to explore the main characteristics of PhD holders’ employment, whether they graduated from domestic or international universities. Participants were grouped according to their type of job (*academic vs. non-academic*) and their doctoral program (*international vs. domestic*). This analysis provided a general overview of the career profiling, highlighting overall trends and specific variations based on the current employment sector and the location of the doctoral program. Second, academic and non-academic career paths were assessed for their frequency and distribution.

To address the second objective, we performed a series of Exploratory (EFA) to determine the factor structure of the scale items. This analysis assessed the frequency of use of these skills and competences in the current job. The decision about the number of factors to retain was based on previous factor analysis conducted as part of the ECRID project (García Morante et al. 2024). The analysis resulted in a two factors scale: a) *core research capabilities* and b) *research-related capabilities*. Items related to research skills, knowledge generation, and the application of scientific methodologies were grouped under the ‘*core research capabilities*’ factor, while those related to cross-cutting professional skills were included in the ‘*research-related capabilities*’ factor.’ Additionally, independent t-tests were conducted to compare the academic and non-academic groups. The two factors previously obtained were used to analyse the responses to the question of whether the respondents had the opportunity to acquire the required skills and competences during their doctoral studies, illustrating regularities in researchers’ perceptions of their learning of these competences.

IV. Results

IV.1. Professional career paths of international and domestic PhD holders

The majority of the respondents obtained their PhD from universities abroad (65 %), while 35 % of the participants graduated from domestic universities (Paraguay). Interestingly, the sum of both groups, in terms of the employment sector, showed that only 23.8 % of domestic and abroad graduates were employed outside the academic sector (see Table 2).

The analysis of the age distribution reveals significant differences between those Paraguayan PhD holders with academic and non-academic career paths. Within those with non-academic career paths, the highest percentage is concentrated in the 29-39 age group (12.6 %), while among academics, the majority is in the 40-49 age group. In terms of years since graduation, the majority of Paraguayan academics were in the first group, with 0 to 5 years of graduation representing 46.8 % of the participants. In contrast, respondents with a non-academic career path represent 20.6 % of the sample (see Table 2). These results suggest a trend toward the non-academic sector among early career researchers.

Regarding PRONII levels, 84 % of the participants were classified as researchers in this system. *Level I*, typically indicating the PhD completion and active participation in research projects, included 30.2 % out of those

with academic career paths, while non-academic career paths represented 8.7 %. Additionally, 25.4 % were situated at the *Candidate Level* (18.3 % academic and 7.1 % non-academic career paths), suggesting that they may have entered the system as doctoral students and may not have had the opportunity to progress to a higher level due to current organizational or structural factors. Of those classified at *Level II* (19.7 %), most were involved in research projects and have published in high-impact journals. It is noteworthy that 15.8 % (academics and non-academics) have not been categorized, which may indicate non-compliance with entry criteria or a deliberate decision not to categorize, possibly due to being at a different stage in their professional paths or lacking interest in the categorization process.

Table 2
Paraguayan PhD holders' career path

Current main job (n= 126)		Academic (n=96)	Non-academic (n=30)
Graduate	International	57 (45.2 %)	25 (19.8 %)
	Domestic	39 (30.9 %)	5 (3.9 %)
Ages	29 - 39 years old	30 (23.8 %)	16 (12.6 %)
	40 - 49 years old	46 (36.5 %)	12 (9.5 %)
	50 years old	20 (15.8 %)	2 (1.5 %)
PhD holders' years	0 - 5 years	59 (46.8 %)	26 (20.6 %)
	6 - 10 years	37 (29.3 %)	4 (3.1 %)
PRONII level	Candidate	23 (18.3 %)	9 (7.1 %)
	Level I	38 (30.2 %)	11 (8.7 %)
	Level II	22 (17.4 %)	3 (2.3 %)
	No	13 (10.3 %)	7 (5.5 %)
Dual Employment	Yes	66 (52.3 %)	21 (16.6 %)
	No	30 (23.8 %)	9 (7.1 %)
Graduation expectations	Academic	47 (37.3 %)	3 (2.3 %)
	Career beyond academia	3 (2.3 %)	4 (3.1 %)
	Hybrid career	47 (37.3 %)	22 (17.4 %)

Regarding a dual employment, one-third of the participants had more than one job (52.3 % academics and 16.6 % non-academics), while a minority (30.9 %) had only one job at the time of the survey.

In terms of *career expectations*, the majority of Paraguayan PhD holders working in academia expected to pursue an academic career (37.3 %) or to develop a hybrid career (37.3 %) and, to a lesser extent, to work outside academia (2.3 %). Among Paraguayan PhD holders with a non-academic career path, the majority expected to develop a hybrid career (17.4 %) and, to a lesser extent, a career focused on the non-academic sector (3.1 %) and academia (2.3 %).

Table 3
Main job characteristics of the academic career paths

Current main job (n=96)		International (n=57)	Domestic (n=39)
Dedication	Full-time	37 (38.5 %)	25 (26 %)
	Part-time	20 (20.8 %)	14 (14.6 %)
Duration	Permanent	41 (42.7 %)	35 (36.5 %)
	Temporary	16 (16.7 %)	4 (4.2 %)
Vinculation	Employed	34 (35.4 %)	29 (30.2 %)
	Self-employed	23 (24 %)	19 (19.8 %)
Organization Entity	Public	45 (46.9 %)	28 (29.2 %)
	Non-profit	7 (7.3 %)	2 (2.1 %)
	Private	5 (5.2 %)	9 (9.4 %)
PhD required	Yes	12 (12.5 %)	12 (12.5 %)
	No	45 (46.9 %)	27 (28.1 %)

Among *international PhD holders working in academia*, most were employed full-time (38.5 %) and permanent (42.7 %). In terms of type of employment, the majority were employees (35.4 %), while an interesting percentage opted for self-employment⁵ (24 %). The distribution by type of

⁵ Academic self-employment refers to individuals who work independently in the academic field without formal appointment by an educational or research institution. Their work consists mainly of teaching on an hourly basis but also includes consultancy, private tutoring, and similar activities.

organisation showed a significant presence in public institutions (46.9 %), and low presence in non-profit (7.3 %) and private organisations (5.2 %). Regarding the job requirements, only one-third of academics (12.5 %) indicated that having a PhD was required for their position (see Table 3).

The employment of *domestic PhD holders working in the academic sector* was predominantly full-time (26 %) and permanent (36.5 %). Regarding the type of employment, the majority were employees (30.2 %), while an interesting percentage opted for self-employment (19.8 %). The distribution by type of organization showed a significant presence in public institutions (29.2 %), followed by private organizations (9.4 %), and, to a lesser extent, non-profit organizations (2.1 %). Regarding the job requirements, only 12.5 % of academics indicated that having a PhD was required for their position (see Table 3).

Table 4
Main job characteristics of the Non-academic trajectory

Current main job (n=30)		International (n=25)	Domestic (n=5)
Dedication	Full-time	19 (63.3 %)	2 (6.7 %)
	Part-time	6 (20 %)	3 (10 %)
Duration	Permanent	14 (46.7 %)	4 (13.3 %)
	Temporary	11 (36.7 %)	1 (3.3 %)
Vinculation	Employed	8 (26.7 %)	2 (6.7 %)
	Self-employed	17 (56.7 %)	3 (10 %)
Organization Entity	Public	11 (36.7 %)	5 (16.7 %)
	Non-profit	4 (13.3 %)	0
	Private	10 (33.3 %)	0
PhD required	Yes	4 (13.3 %)	0
	No	21 (70 %)	5 (16.7 %)

International PhD holders working beyond academia were mainly employed full-time (63.3 %) and, to a lesser extent, part-time (20 %). Moreover, the percentages were close between permanent (46.7 %) and temporary (36.7 %) employment. The majority chose self-employment (56.7 %). Regarding the type of organization, similar results were found between public

(36.7 %) and private (33.3 %) organizations, but no differences were found in non-profit organizations (13.3 %). Most respondents indicated that having a PhD was not a requirement for their current position (70 %) (see Table 4).

Domestic PhD holders working beyond academia tended to be employed part-time (10 %) and a slightly lower percentage (6.7 %) full-time. In terms of employment length, most participants held permanent positions (13.3 %), while a small percentage had temporary jobs (3.3 %). Regarding the types of employment, the numbers were very close, with 10 % being self-employed and 6.7 % being employees. The entire group was employed in public organizations (16.7 %). In addition, all of them stated that having a PhD was not a requirement for their current position (16.7 %) (see Table 4).

IV.2. *PhD holders’ perceptions about the relevant skills and competences in their current professional contexts*

Results regarding which skills and competences acquired during doctoral training were relevant in PhD holders’ current professional contexts indicate significant differences in only three of the six skills and competences analysed. Specifically, the skills related to *data analysis* ($t(126) 2.09, p=.039, d= 0.43$), *data integration* ($t(126) 2.11, p=.036, d= 0.42$), and *dissemination criteria and priorities* ($t(126) 2.61, p=.010, d= 0.53$) were considered significantly more relevant in the academic environment than in professional contexts outside the university (see Table 5). The impact size was relatively modest in this context.

Table 5
Comparison of *Core Research Capabilities* between Academic and Beyond Sector

Main Job					
	Academia (n = 96)	Beyond (n = 30)	t	p	d
	Mean (SD)	Mean (SD)			
Data Collection	5.45 (1.23)	5.06 (1.33)	1.48	.141	0.30
Data Analysis	5.58 (1.26)	5.03 (1.24)	2.09	.039	0.43
Information Search and Critical Examination	5.92 (1.16)	5.63 (1.32)	1.16	.245	0.23
Data Integration	5.63 (1.16)	5.10 (1.34)	2.11	.036	0.42
Designing Data Processes	5.06 (1.64)	4.46 (1.59)	1.74	.083	0.37
Dissemination Criteria and Priorities	5.31 (1.49)	4.46 (1.69)	2.61	.010	0.53

Although mean scores of the academics were higher than the mean scores of the non-academics in all the *research-related capabilities* items (see Table 6), significant differences were restricted to five of the eight skills and competences analysed.

Specifically, the scores of academics regarding *resource management and funding skills* (M=4.83; SD=1.77) were significantly higher than those non-academics (M=3.03; SD=1.71), $t(126)=4.88$, $p=.000$, $d=1.83$; similarly, academics rated the relevance of *training and mentoring skills* significantly higher (M=5.88; SD=1.67) compared to non-academics (M=4.43; SD=1.67), $t(126) 5.02$, $p=.00$, $d= 0.97$). Significant differences were also found between academic and non-academic PhD holders’ perceptions regarding the relevance in their current jobs of skills related to *project management* ($t(126) 3.05$, $p=.003$, $d= 0.58$), *leadership and team management* ($t(126) 3.1$, $p=.002$, $d= 0.60$) and *communication with different audiences* ($t(126) 2.78$, $p=.006$, $d= 0.56$). These differences highlight the value attributed by participants to these activities as particularly relevant in their respective professional fields, with moderate to large effect sizes.

Table 6
Comparison of Research-related Capabilities
between Academic and Beyond Sector

Main Job					
	Academia (n = 96)	Beyond (n = 30)	t	p	d
	Mean (SD)	Mean (SD)			
Working in Collaborative Teams	5.58 (1.43)	5 (1.78)	1.83	.069	.35
Project Management	5.53(1.32)	4.6 (1.83)	3.05	.003	.58
Leadership and Team Management	5.21 (1.47)	4.2 (1.84)	3.1	.002	.60
Communication with Different Audiences	5.33 (1.43)	4.46 (1.65)	2.78	.006	.56
Training and Mentoring	5.88 (1.28)	4.43 (1.67)	5.02	.000	.97
Resource Management and Funding	4.83 (1.77)	3.03 (1.71)	4.88	.000	.03
Innovation and Commercialization Ideas	3.13 (1.7)	2.66 (1.76)	1.3	.194	.27
Intellectual Property Rights	2.66 (1.71)	1.96 (1.4)	2.03	.044	.44

When analysing whether or not the competences most demanded in their current jobs were acquired during doctoral training, a small percentage of participants felt that they had not acquired the *core research capabilities* during their doctoral training (see Figure 1). Although the values ranged from 4.8 % to 13.6 %, this figure was interesting since the aim of doctoral training in any context is to train competent researchers.

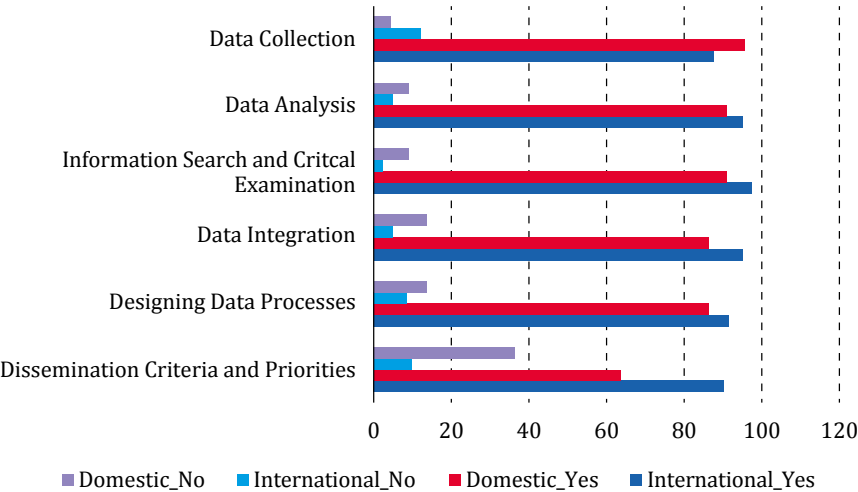


Figure 1
Core Research Capabilities Learning

Regarding *core research capabilities*, the distribution between graduates in domestic and international universities, did not show major differences. However, it was interesting to note that there was a slight difference in skills acquisition between the two groups regarding *dissemination criteria and priorities* skills. 90.2 % of the international PhD holders stated that they had acquired this competence, compared to 63.6 % of the domestic PhD holders (see Figure 1).

Regarding *research-related capabilities*, the distribution between the groups varied in two ways. First, more than half of the respondents acknowledged they did not acquire some skills and competences, such as those related to managing human resources (58.7 %), getting funding (62.7 %), mastering market ideas (78.6 %), or intellectual property (64.3 %). Secondly, international PhD holders were more likely to report having acquired at least two of the analysed competences.

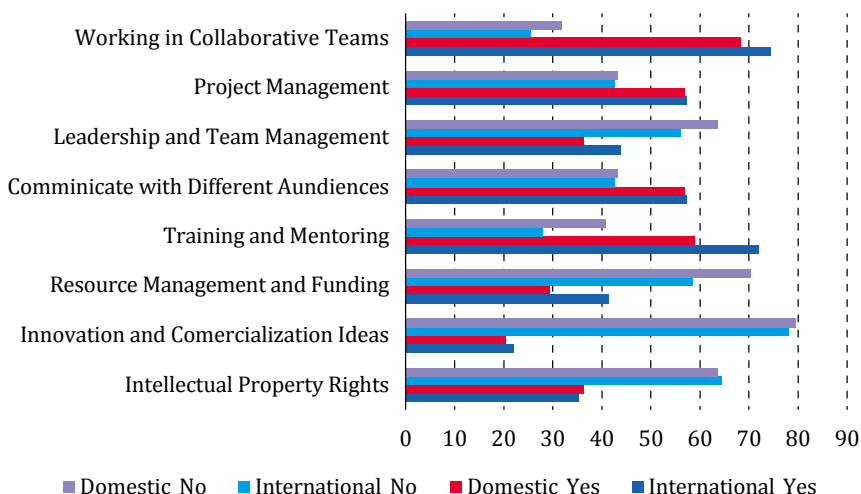


Figure 2
Research-related Capabilities Learning

Specifically, differences were found in mentoring, where 72 % of the international PhD holders stated that they had developed this competence, compared to 59.1 % of the domestic PhD holders. Similarly, differences in funding skills were observed between domestic and international participants. Of the domestic PhD holders, 70.5 % stated that they had not acquired it, compared to 58.5 % of the international PhD holders who stated that they had not acquired it (see Figure 2).

V. Discussion and future directions

This study aimed to explore the career paths of PhD holders working in Paraguay by examining the types of professional careers pursued by domestic and international PhD holders and analysing their perceptions of the relevance of skills and competences acquired during doctoral training in their current academic or non-academic professional contexts.

The results offer novel insights while also raise unresolved questions. Firstly, although a significant percentage of PhD graduates from both domestic and international universities were primarily employed in academic positions, the results regarding PhD holders employed in non-academic jobs reveal the diversity of career options available in the Paraguayan labour market. This diversity includes jobs in public, non-profit, and private

organizations. Interestingly, while a third of the participants' aspirations or expectations during their doctoral training relate to developing a hybrid career, thus combining academic and non-academic positions, two-thirds ended up developing their careers exclusively in academia, albeit with more than one job in the same sector. This pattern reflects trends observed in other Latin American countries and could inform broader regional strategies for integrating PhD talents in diverse economic sectors. These findings highlight that while there is a considerable demand for academic professionals in Paraguay, there is still a significant gap in the recognition of the added value that PhD holders can bring to non-academic sectors, as research in other contexts has also underscored (Shmatko et al. 2020; Kyvik and Bruen Olsen 2012). They also underscore the importance of initiatives that bridge the gap between academia and industry, promoting the benefits of employing highly qualified researchers in various professional settings. Such efforts would not only help to align the career paths available to doctoral graduates with their expectations and interests but also enhance the overall innovation and productivity of the national workforce and could serve as a model for similar initiatives in countries with comparable economic and educational landscapes (García-Morante et al. 2024; Castelló et al. 2023).

Secondly, there is a shift among early career researchers towards the non-academic sector, as shown by age differences and job positions. This growing preference for exploring non-academic career options can either indicate an incipient labour market diversification to adapt to the emerging demands of knowledge societies, as observed in other countries (Shmatko et al. 2020; Canolle and Vinot 2020) or the Paraguayan academic positions saturation and precariousness. Hence, having a quarter of international PhDs working as self-employed in the academic sector is a clear indicator of the precarious nature of Paraguayan academic positions. These self-employed PhDs work independently in the academic field without formal appointment by an educational or research institution, although their work primarily includes teaching on an hourly basis, consultancy, private tutoring, and contract research.

Furthermore, and related to the previous statement, while some participants mentioned that their current position required a PhD, the majority acknowledged it was not mandatory for developing their professional roles. This implies that, in many instances, holding a PhD was viewed as a valuable asset rather than an indispensable credential. While this is a common situation in several countries for non-academic positions (Ganapati and Ritchie 2021; Li and Horta 2023), what is surprising is that, in some cases, PhD holders appear to be overqualified even in academia. In Paraguayan

universities, it is possible to have a teaching position without a PhD (Díaz-Villalba and Castelló 2024). This fact indicates a significant flexibility in academic requirements, shared by other countries in the region, which diverges from many international regulations where a doctorate is required for developing an academic career. It seems necessary to raise awareness of expert academics with consolidated positions in Paraguayan universities regarding the added value that the increasing number of early career researchers with a PhD might bring to Paraguayan universities, both in terms of contribution and presence of research in Paraguay and international contexts. Exploring diverse career paths aligned with various research responsibilities can also offer universities an opportunity to strengthen their faculty careers. This, in turn, could enhance Paraguayan universities' outcomes in both teaching and research.

Regarding the usefulness of skills and competences acquired during the PhD in current jobs, Paraguayan PhD holders employed in academia demonstrate a better match than their non-academic counterparts. As expected, the results suggest that competences related to core research capabilities are crucial in academia. However, the differences between academic and non-academic profiles indicate a clear mismatch between doctoral training and non-academic job requirements (Canal-Dominguez and Rodríguez-Gutiérrez 2016; Lamon et al. 2023), which is more significant for those who graduated from domestic universities. These results, aligned with previous research in different contexts (García-Morante et al. 2024; Castelló et al. 2023), have important implications regarding the training of doctoral candidates in an evolving landscape, not only in Paraguay but also internationally. In general, graduates from international programs tend to report higher levels of research-related capabilities, including transversal skills such as mentoring and financing, compared to domestic graduates. This finding suggests that domestic doctoral programs may show less diversification and adaptation to the evolving landscape than the training opportunities available in other national contexts (Karakaş 2020).

In light of the findings, we conclude that integrating doctoral graduates into roles directly linked to research has faced challenges in Paraguay's scientific context. While a significant percentage of doctoral graduates are located within academia, the difficulties in navigating alternative career options, the limitations of professional networks outside academia, and the lack of adequate preparation and support for career transitions contribute to the challenges of securing non-academic employment after graduation in the studied context (Díaz Villalba and Castelló 2024). These challenges are not unique to Paraguay but are reflected in other developing countries trends. There is a clear need, and also an opportunity

to expand and diversify career support and networking opportunities for PhD graduates, which could significantly impact their professional integration (Castelló et al. 2023). Overcoming the restrictive notion that doctoral graduates should exclusively pursue careers within academia is central to this paradigm shift. Preparing them for developing research-related competences in an evolving research landscape is also relevant particularly for those trained in domestic PhD programs.

V.1. Limitations, significance and implications of the study

The study is not without limitations. First, the fact that 65% of participants graduated from international universities, while only 35% completed their PhDs at domestic institutions, may restrict the generalizability of the findings to the entire population of PhD holders in Paraguay. Second, the relatively low proportion of graduates employed outside the academic sector (23.8%) may skew the analysis regarding transitions to non-academic careers, potentially underrepresenting the experiences of those who pursue such paths. Third, the study focuses exclusively on the perspectives of PhD holders regarding the utility of the skills they acquired. Future studies could expand this scope by examining the impact of dual employment on career paths and incorporating employer perspectives to evaluate the relevance of acquired skills in the labour market.

This study, pioneering in the Paraguayan context, offers empirical evidence that enriches the necessary reflection on at least three crucial aspects to enhance the success of doctoral studies and early career researcher careers. While Paraguay is the primary focus, the insights gained are equally relevant to other countries facing similar educational and economic challenges.

Firstly, it is crucial to provide resources and opportunities tailored to the needs of doctoral students, both from Paraguay and internationally. This inclusive strategy might ensure a smoother transition between academic and non-academic settings. Additionally, to mitigate the cultural shock often associated with international PhD holders coming back home and transitioning to the labour market, it is imperative to develop clear policies that facilitate reintegration and support doctoral graduates' professional development in their respective fields (Skakni et al. 2021).

Second, efforts should be made at two levels: structural and organizational (McAlpine et al. 2023; Castelló et al. 2017). At the public policy level, there is a call for institutions to adopt more responsive structures that recognize and value the skills and competences acquired during doctoral training,

supporting early career researchers. At the organizational level, it is crucial to develop working environments that promote work-life balance, provide professional support, and recognize the diversity of doctoral career paths.

Finally, these recommendations lay the groundwork for future initiatives to enhance the positive impact of doctoral graduates in different sectors (Shmatko et al. 2020). The implementation of these practices on an international scale has the potential to accelerate global efforts to integrate doctoral training more effectively into national development strategies. In particular, this approach will contribute to broader initiatives to build societies based on responsible research and innovation.

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