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Do international doctorates pay off? Income, academic productivity, and sectoral allocation among PhD holders in Chile

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Abstract

The globalisation of higher education has driven emerging economies to invest heavily in international doctoral mobility, operating under the assumption of a “brain gain” upon the return of these scholars. In Chile, the massive *Becas Chile* program exemplifies this strategy. However, despite substantial public investment, empirical evidence comparing the career outcomes of these internationally trained PhDs (“returners”) against their domestically trained peers (“stayers”) remains scarce, particularly regarding their integration into a saturated local labour market. Utilising the 2021 Chilean Survey of Doctorate Holders (CDH) —a representative dataset comprising 18,753 individuals— this study investigates whether an international doctorate confers a tangible “premium” within a developing ecosystem characterised by limited absorptive capacity. We compare these cohorts across three critical dimensions: 1) Economic returns, 2) Labour market dynamics, and 3) Sectoral sorting. Employing a robust econometric framework that includes Propensity Score Matching (PSM) to control for selection bias, we find that returners enjoy a causal income premium (~ 15%) and higher research productivity. Contrary to social capital theories, returners face no penalty in job-search duration, suggesting that the “prestige signal” of an international degree overrides the decay of local networks. However, results indicate a profound structural failure: returners are significantly less likely to enter the private sector, a pattern driven not by funding obligations but by the limited absorptive capacity of the local industrial fabric. These findings suggest that while mobility policies successfully upgrade the academic workforce, the “brain gain” remains structurally trapped within the university system without complementary demand-side industrial policies.

The globalised pursuit of knowledge and the brain circulation paradigm

In the contemporary knowledge economy, doctorate holders are viewed not merely as academics but as critical agents of innovation, economic productivity, and societal resilience (OECD, 2012; Kerr et al., 2016). Driven by this imperative, emerging economies have invested heavily in the production of advanced human capital, operating under the “brain circulation” paradigm. This framework posits that the temporary emigration of highly skilled individuals for training in developed nations results in a net positive “brain gain,” provided these scholars return with enhanced technical skills, transnational research networks, and advanced knowledge (Feld, 2021; Saxenian, 2005).

Chile represents a paradigmatic case of this strategy, yet its position as a middle-income country creates distinct conditions for evaluating returns on investment. Unlike developed nations with mature R&D ecosystems, Chile operates as an intermediate economy caught between aspirations for knowledge production and constraints imposed by limited institutional capacity (Freeman, 2009). Since 2008, the state has pursued a dual expansion policy through the *Becas Chile* program—regulated by Supreme Decree 664 (2009)—designed to upgrade the national workforce by financing postgraduate education in top-tier global universities (Lopez-Rios et al., 2024).

However, the rapid spread of higher education globally and the consequent reshaping of talent flows have created complex implications for this strategy. The efficacy of this demand-side push relies on the assumption that the local labour market possesses the absorptive capacity to reintegrate “returners” effectively. Recent data suggests a structural bottleneck: most doctorate holders in Chile remain concentrated in the higher education sector—capturing 82% of the workforce (MinCiencia, 2024)—while the business enterprise sector’s participation remains marginal. This structural limitation means that investments in international training must be evaluated not just by graduation rates, but also by how the location of doctoral training affects sectoral sorting and integration into high-skill employment sectors (Netz and Grüttner, 2021).

Consequently, a critical question arises regarding the comparative advantage of international training. Does the “returner” —who has accrued human capital abroad— truly outperform the “stayer” —the domestically trained peer? While international training opportunities can facilitate brain drain (Nunn, 2005), for those who return, does the degree act as a valid signal of superior productivity that unlocks access to elite sectors? Or do structural barriers and credential recognition bureaucracies in Chile’s developing ecosystem neutralise these advantages, forcing returners into the same saturated academic tracks as their domestic peers?

This study addresses these questions by conducting a rigorous labour market analysis of the 2021 Survey of Doctorate Holders (CDH). Unlike previous partial evaluations, this representative dataset (N = 18,753) allows us to examine genuine returns to doctoral training locations across three interrelated dimensions. First, the economic trajectories, where we analyse earning differentials and financial returns between domestically and internationally trained PhDs to determine whether an “international premium” exists. Second, the labour market dynamics, investigating the speed of transition into employment and whether international credentials accelerate or hinder initial placement (Van Mol et al., 2021). And finally, sectoral sorting, accounting for market segmentation, to understand if international degrees function as screening devices for access to scarce leadership positions and multinational research roles.

In the Chilean case, studies show that both domestically and internationally trained PhDs achieve comparable employment rates of around 97.4% (Naranjo Douglas et al., 2025). However, there are still significant disparities in financial returns for those who got back with a PhD. In this vein, both De la Vega (2025) and Naranjo Douglas et al. (2025) show that people trained abroad earn higher incomes upon entering the Chilean labour market. In this study, we move beyond anecdotal evidence to test the economic and signalling theories underpinning Chile’s human capital strategy by controlling for selection bias and demographic variables.

The paper proceeds as follows. First, we review the theoretical literature regarding human capital, signalling, and the specific constraints of developing research ecosystems. Second, we detail the methodological approach, emphasising the econometric techniques used to ensure comparability. Third, we present the empirical results derived from the 2021 CDH dataset. Finally, we discuss the implications of these findings for science, technology, and innovation (STI) policy, specifically addressing the return

on investment of international scholarship programs in the context of a stratified and saturated labour market.

Theoretical background to research the existence of a premium on international doctorates

The double-edged sword of international training: Economic outcomes and labour market integration

This research interrogates how the location of doctoral training —domestic versus international— affects financial returns and labour market integration in a developing ecosystem such as Chile. To answer this, the literature presents diverging theoretical approaches, creating a “double-edged sword” for policy evaluation.

First, the expectation of a wage ‘premium’ is strongly rooted in Human capital theory (Becker, 1964) and Signalling theory (Spence, 1973; Stiglitz, 1975). Studying abroad, particularly in world-leading centres, is presumed to enhance skills and productivity beyond what is available domestically (Hunt and Gauthier-Loiselle, 2010), theoretically commanding a higher salary (Zweig, 2016). Complementing this, foreign degrees serve as powerful market signals for unobservable qualities like adaptability and ability (Weiss, 1995), often acting as tiebreakers for scarce leadership opportunities (Mihut, 2022) and being preferred by employers in developing economies (Dopeso-Fernández et al., 2025). However, recent literature suggests this premium is driven by sectoral sorting (Netz and Grüttner, 2021). International PhDs tend to concentrate in high-value sectors (multinationals, elite research) that are inaccessible to domestic peers, who face compressed wage scales in local institutions (Didier, 2024).

In Chile, policies like *Becas Chile* are predicated on this assumption that human capital accumulation translates into economic development (Salas et al., 2017; Didier, 2024; Lincovil, 2022), despite criticisms regarding the program’s productivist bias (Chiappa and Muñoz García, 2015). Empirically, evidence is mixed: while Tani (2020) finds penalties for international graduates in Australia, Dopeso-Fernández et al. (2025) and Waibel et al. (2018) suggest premiums in contexts where such skills are scarce or where structural demand conditions allow. For Chile specifically, studies indicate that, while employment rates are high overall, returners secure significantly higher incomes (Naranjo Douglas et al., 2025; De la Vega, 2025), in contrast to the absorption challenges faced by domestic graduates (Gonzalez and Jiménez, 2014). However, current evidence often lacks robust controls for selection bias (Caliendo and Kopeinig, 2008). Therefore, we posit the first hypothesis:

H1a: *Doctorate holders who earned their degree abroad will have significantly higher gross monthly incomes compared to their domestically trained peers, after controlling for discipline, experience, and sector.*

Conversely, Social capital theory (Granovetter, 1973) suggests a “re-entry penalty.” While “stayers” build dense local networks essential for finding employment (Van der Gaag and Snijders, 2005), returners face a loss of local ties and informational asymmetries described as the “re-entry problem” (Ackers, 2005; 2008). As Gureyev et al. (2020) note, social capital atrophies over distance. This informational disadvantage is compounded by institutional barriers, such as delays in credential recognition (Germain-Alamartine et al., 2021). In a market with limited formal placement mechanisms (McKenzie, 2017), returners may be better qualified on paper (human capital) but less connected in practice, leading to greater friction in securing the first position. Consequently, we posit a second hypothesis:

H1b: *Internationally trained doctors will experience a longer duration between graduation and securing their first employment in a research career compared to their domestically trained counterparts.*

Shaping a career: Research productivity and sectoral sorting

The “cosmopolitan advantage” vs. contextual reality

Beyond economic outcomes, literature posits a strong correlation between international mobility and research productivity. Mobile scholars theoretically benefit from a “cosmopolitan advantage” via cross-pollination and transnational networks (Scellato et al., 2015; Sugimoto et al., 2017), forming “bridging social capital” (Bozeman and Corley, 2004) that favours returners over stayers. Empirical evidence largely supports this: government-sponsored mobility boosts output in China (Gu et al., 2024) and Peru (Núñez Morales and Sanchez Paredes, 2023), while UK and US studies confirm a significant “mover’s advantage” for international graduates (Dias Lopes and Hancock, 2024; Kim et al., 2011).

However, this effect is not universal. In South Africa (Barnard et al., 2016) and parts of Asia (Shin et al., 2014), productivity gaps diminish when controlling for selection bias or postdoctoral experience. Furthermore, the value of mobility is stratified by destination: US-trained graduates often outperform those trained elsewhere (Meng and Shen, 2023), though Shen and Jiang (2023) argue that the quality of mentorship may outweigh institutional prestige. In Chile, despite a policy emphasis on “productivism” (Chiappa and Muñoz García, 2015), recent evidence suggests that training advantages do not always translate into statistically significant productivity differences once employed locally (De la Vega, 2025).

Seeking to quantify this effect in the Chilean context, we posit:

H2a: *Returners, having been exposed to more competitive research environments and larger international collaborative networks, will exhibit higher publication output than stayers.*

The “ivory tower” trap: Absorptive capacity and sectoral sorting

While developed economies push PhDs into the private sector to drive innovation (Roach and Sauermann, 2010), in countries with less R&D-intensive industries like Chile, the private sector often

lacks the absorptive capacity for such specialised skills (Cohen and Levinthal, 1990; Benavente, 2006). Firms frequently perceive PhDs as “overqualified” (McGuinness, 2006) or theoretically misaligned with industrial needs, creating a structural mismatch. Recent Chilean studies confirm that both returners and stayers remain predominantly in academic roles, with no clear sectoral diversification for the international cohort (Naranjo Douglas et al., 2025; De la Vega, 2025), suggesting foreign degrees do not alter the fundamental academic-centric career path.

This concentration is structural. Private reports indicate that 75–80% of Chilean doctoral graduates work in universities, while the business sector remains a minor employer due to a lack of capacity to absorb new researchers and stagnant R&D funding (Doctoral Education Info, 2018). The OECD (2007, 2010, 2016, 2018) supports this, noting that Chile’s specialisation in low-complexity sectors limits demand for advanced qualifications. Furthermore, Chilean firms exhibit “low levels of absorptive capacity” (Klerkx and Guimón, 2017), and the economy’s slow technological change forces high-skilled graduates into jobs with low skill utilisation (Castro et al., 2022).

Consequently, we hypothesise a sectoral sorting mechanism where academia acts as an “academic magnet” for returners, whose training is most legible within the university system. In contrast, “stayers” may find transitions to non-academic roles comparatively easier or necessary due to displacement effects. Thus, we raise the next hypothesis:

H2b: *Returners will be significantly more likely to be employed in the higher education sector (universities) and less likely to be employed in the private enterprise sector compared to stayers, due to the limited absorptive capacity of the local industrial fabric*.

The moderating influence of funding: Prestige, bonding, and institutional anchors

Finally, we move beyond binary comparisons to examine how funding sources and institutional prestige moderate career trajectories. The global academic system operates on a “centre-periphery” dynamic where elite institutions define global standards (Altbach, 2004; Marginson, 2008; Marginson and Ordorika, 2011; Salmi, 2009). Within this stratified field, signalling theory suggests a credential’s value is inextricably tied to its source, with degrees from the “centre” sending stronger quality signals (Spence, 1973; Mihut, 2022).

This hierarchy is institutionalised in the *Becas Chile* program, explicitly designed to import prestige by prioritising top-ranked universities (OECD and World Bank, 2010), thereby reinforcing centre-periphery biases (Demeter, 2019ló, 2024). However, this advantage entails a “bonded scholarship” constraint (Li and Bray, 2007) —a strict return imperative critiqued for prioritising territorial presence over flexible knowledge transfer (Lopez-Rios et al., 2024). This creates an “institutional anchor” for state-funded scholars, channelling them into public or university roles where their credentials are most legible to the state apparatus (Kuzhabekova et al., 2019).

In contrast, foreign- or self-funded scholars operate as “free agents.” As Finn (2014; 2018) documents, these groups exhibit drastically lower return rates, implying that those who do return have self-selected into the local market without the same institutional safety net and rely instead on personal networks. Based on this “bonding vs. free agent” dynamic, we refine the final hypothesis:

H3a: *The source of funding moderates sectoral sorting: Doctorate holders funded by the Chilean state (bonded scholars) will exhibit a significantly higher likelihood of employment in the higher education and public sectors compared to those funded by foreign or personal sources, who will exhibit greater sectoral dispersion.*

From brain drain to brain gain: Methodological approach

Addressing the empirical gap through quasi-experimental design

While the literature highlights competing forces regarding international doctoral training, empirical validation in developing economies remains scarce due to the lack of systematic comparisons between returners and domestic control groups. Leveraging the comprehensive 2021 Chilean Survey of Doctorate Holders (CDH) —aligned with OECD/Eurostat/UNESCO guidelines— this study addresses the critical identification challenge posed by the non-random nature of PhD placement decisions, which are endogenous to individual characteristics such as motivation and financial resources (Caliendo and Kopeinig, 2008). To mitigate this selection bias and isolate the causal effect of training location, we employ a quasi-experimental design using Propensity Score Matching (PSM), constructing a valid statistical counterfactual of “stayers” to disentangle the genuine signalling value of the international credential from underlying individual attributes (Imbens and Wooldridge, 2009).

Analytical strategy

To test the hypotheses derived from our theoretical framework, we employ a multi-stage econometric approach tailored to the distributional characteristics of each outcome variable. We estimate the income premium (H1a) using a multiple linear regression model (OLS) adjusted for heteroscedasticity (Eq. 1), model labour market friction (H1b) via negative binomial regression (Eq. 4) to account for count data overdispersion and analyse research productivity (H2a) using Poisson or negative binomial GLMs (Eq. 5) to address skewed publication counts. Furthermore, sectoral sorting (H2b & H3a) is examined through a multinomial logit model (Eq. 8), estimating the likelihood of entering the “enterprise” sector versus “higher education,” specifically including funding source as a covariate to determine the predictive role of scholarship obligations. Finally, to ensure causal validity, all models are re-estimated using the propensity score matching (PSM) sample defined in Eq. (11).

Statistical analysis

Multiple linear regression adjusted for heteroscedasticity

To model income and its relationship with a set of features, a multiple linear regression analysis is conducted. Let X∈Rn×(p + 1) be the design matrix and y∈Rn be the vector of outcomes, where p denotes the number of features and n is the sample size. The model in matrix notation is shown in Eq. (1).

y=Xβ + u (1)

Where β=(β0,…βp)T are the regression coefficients to estimate, and u∼N0,σ2. The ordinary least squares (OLS) estimator is β=(XTX)-1XTy under the assumption that the variance of the error term u is constant (Olive, 2017). If heteroscedasticity is present, the variance estimate becomes biased and inconsistent; thus, standard tests and inferences are invalid (Cattaneo et al., 2018). To check this issue, the Breusch-Pagan (BP) test is used, which states in the null hypothesis that the variance of the error term is constant (Uyanto, 2022).

To address the issue of rejection of this test, a general heteroscedasticity-consistent (HC) estimator is used by applying weights to the variance of the β estimators generated through OLS in the form shown in Eq. (2) (MacKinnon, 2012; Hausman and Palmer, 2012).

VarHCβ = XTX-1XTdiagu2X(XTX)-1 (2)

Later, a reconstruction of the variance of the estimators is applied through Eq. (3).

VarHCβ = XTX-1XTnn-kdiagu2XXTX-1 (3)

This process generates HC standard errors for the estimators, validating the tests and inferences regarding the parameter distributions and significance, given the adjusted standard errors.

Negative binomial regression

To model a count outcome a negative binomial regression model is applied, considering that y∼NB(μ,α), where E[y]=μ and Var[y]=μ + αμ2 denote the mean and the variance, respectively, and α > 0 is a dispersion parameter. Given a set of predictors in the form X, the μi = E[yi|Xi] = exp{ηi}, such that ηi=XiTβ, we can write the model as shown in Eq. (4) with the canonical log-link (Schober and Vetter, 2021).

log(μi)=β0 + β1Xi1+…+βpXip (4)

The parameters β and the dispersion parameter α are estimated through maximum likelihood estimation (MLE). For its interpretation, the incidence rate ratio (IRR) is calculated, considering μi = exp{βj} for a 1-unit increase (or decrease) in the feature Xj (Xu and Hardin, 2016).

Poisson regression model

To model count data when there is no overdispersion, which means that E[y] = Var[y]=μ, a generalized linear model (GLM) with a Poisson distribution is employed. Consider linear predictors in the form X, the

model is defined in Eq. (5) (Santos Silva and Tenreyro, 2010; Harris et al., 2012).

$\eta i = X\beta$ (5)

Where ηi is the linear predictor. The canonical link for the Poisson GLM is shown in Eq. (6).

$g(\mu i) = \log(\mu i) = \eta i = Xi\beta$ (6)

Exponentiating both sides yields Eq. (7).

$\mu i = \exp\{Xi\beta\}$ (7)

Which ensures that $\mu i > 0$ and generates a multiplicative effect of the predictors. The interpretation of coefficients is conducted through the IRR, as in the NB regression model.

Multinomial logit model

Consider an outcome in the form $yi \in \{C1,\ldots,CK\}$, such that $K > 2$ denotes the unordered categories that the variable yi can take, along with a sector of predictors X that may affect the probability of corresponding to each category. The model setup defines a linear predictor for each alternative $k \in \{1,\ldots,K\}$ in the form shown in Eq. (8).

$\eta ik = Xi\beta k$ (8)

With (8), the probability that an individual i belongs to category k is defined by Eq. (9) (Lay-Raby et al., 2021).

$P(yi = k) = \exp\{Xi\beta k\}/\Sigma k=1K\exp\{Xi\beta k\}$ (9)

This yields a log-odds interpretation relative to a baseline category c in the form shown in Eq. (10).

$\log(P(yi = k)/P(yi = c)) = Xi\beta k$ (10)

The coefficients βk are estimated through MLE, and they measure how predictors affect the log-odds of choosing category k against category c. Furthermore, exponentiation gives relative risk ratios (RRR) that measure the change in relative risk for category k per unit increase in Xj with respect to category c (Menard, 2004).

Model validation

Model validation is tailored to the specific estimation method employed: for the multiple linear regression (Eq. 1), we assess heteroscedasticity via the Breusch-Pagan test and verify that residuals approximate a zero-centred normal distribution (Kamath et al., 2025), whereas for the negative binomial and Poisson GLMs, validity is confirmed through deviance, dispersion, and simulation-based outlier tests, ensuring standardised residuals conform to an ideal uniform distribution (0,1) (Brooks et al., 2019; Khan et al., 2025). Across all specifications, multicollinearity is rigorously monitored using variance

inflation factors (VIFs), with values exceeding 10 treated as indicative of substantial collinearity that could undermine the validity of statistical inference (Lay-Raby et al., 2025).

Causal estimation

To mitigate observable selection bias arising from the non-random assignment of doctoral training location, we employ propensity score matching (PSM), a necessary approach to transcend naive correlational comparisons and approximate the unobservable counterfactual —specifically, the outcomes international graduates would have achieved had they trained locally. The propensity score (PS) is defined as the conditional probability of receiving the treatment given a set of observed pre-treatment characteristics, serving as the statistical basis for causal estimation, as formally defined in Eq. (11).

$$P(\text{International PhD}_i = 1 \mid X_i) = p_i = \Phi(\beta X_i) \quad (11)$$

Where $\Phi(\cdot)$ denotes the logistic distribution function and X_i is a vector of pre-treatment covariates. This step captures everyone's likelihood of studying abroad based solely on characteristics determined prior to the treatment.

In the second stage, individuals who completed a PhD abroad are matched to domestic counterparts based on propensity score similarity, constructing a quasi-experimental sample in which treatment and control groups are comparable in pre-treatment characteristics. To ensure validity, we implement nearest-neighbour matching with a calliper ($|p_i - p_j| < \varepsilon$) and assess covariate balance using standardised mean differences (SMD), considering values below 0.2 as satisfactory. Finally, the models for income, productivity, and sectoral classification are re-estimated using this matched sample exclusively, allowing us to distinguish the true causal effect of international training from differences driven by pre-existing individual characteristics.

Data and variables

The analysis draws on the 2021 Survey of Doctorate Holders (CDH), an instrument framed within the OECD's international project to characterise the mobility, careers, and income of PhD holders under seventy years of age residing in Chile. Representing a population critical for national innovation, the final dataset comprises 1,713 individuals and includes 13 specific features of interest —spanning numerical, categorical, and binary variables (detailed in Table 1)— which serve as the foundation for the modelling stage.

Table 1
Details of features used in the analysis, with description and type of variable

Feature	Description	Type
Income	Monthly income perceived by individuals	Numerical
PhD program	Whether the PhD studies were domestic or international	Categorical
Publications	Total number of publications, articles or book chapters	Numerical
Experience	Years of experience	Numerical
Gender	Individual gender	Categorical
Field	Field of study for the PhD	Categorical
Master degree	Whether the individual holds a master degree prior to PhD studies	Binary
Financing	Financing type for PhD studies	Categorical
Region of birth	Region of birth in Chile	Categorical
Country of previous degree	Country where the prior degree was obtained	Categorical
Age at completion of prior degree	Age at which the pre-PhD degree was obtained	Numerical
Age	Current age at the time of the survey	Numerical
Job	Industry sector by economic activity	Categorical
Employed	Whether the individual is employed in Chile at the time of the survey	Binary

[Table 1 about here]

Regarding the sample structure, 68% of individuals are female, and 60% hold a domestic PhD degree. Regarding the field of study, approximately 42% of PhDs are in the sciences, while 15% are in engineering and the social sciences. Arts represent 10% of the sample, while agriculture, health, and education each account for 6%. About 57% of the individuals hold a master's degree before pursuing their PhD programs. It is worth noting that 85% of the PhDs were financed through national doctoral scholarships, either for domestic or international programs.

Results

Income Effects of International Doctoral Training: Testing the Existence of an International Wage Premium (H1a)

Figure 1 shows the distribution of logged income by PhD program, along with the results of the T-test indicating significant differences in income depending on whether the PhD is domestic or international.

[Figure 1 about here]

The estimates for the model without interactions and the model with the PhD program interacting with financing are shown in Table 2, both after applying corrections to the variance estimates of the parameters. The BP test rejects the hypothesis of constant variance with a p-value of 0.026 for the model without interactions and of 0.040 for the model with interactions, making it necessary to adjust through the HC estimation as shown in equations (2) and (3). It is worth noting that all VIFs for the explanatory variables are below 5, indicating no collinearity issues in the model.

Table 2
Estimates for models of income with and without interactions

Coefficient	**Group**	**Est. (no int.)**	**p**	**Est. (int.)**	**p**
Intercept		13.91	< 0.001	13.91	< 0.001
PhD program	International	0.142	< 0.001	0.143	< 0.001
Publications		0.031	< 0.001	0.031	< 0.001
Experience		0.023	< 0.001	0.023	< 0.001
Gender	Male	0.013	0.560	0.013	0.560
Field	Agriculture	-0.089	0.016	-0.089	0.016
	Arts	-0.133	0.001	-0.133	0.001
	Education	-0.076	0.135	-0.076	0.139
	Engineering	0.165	< 0.001	0.165	< 0.001
	Health	-0.018	0.658	-0.019	0.657
	Social Sci.	0.140	< 0.001	0.140	< 0.001
Master's	Yes	0.066	0.006	0.065	0.006
Financing	Other	0.015	0.612	0.018	0.666
Age		0.002	0.058	0.002	0.059
Country prior	Abroad	-0.045	0.094	-0.045	0.096
PhD x Financing		–	–	-0.004	0.940
BP test		27.16	0.026	25.80	0.040

Results of the multiple regression models show that being in an international PhD program is associated with a 14.2% increase in income, with a significant effect. The number of publications is also significant.

Each additional publication is associated with a 3.1% increase in the outcome, which is consistent with academic productivity effects. Furthermore, each additional year of experience is associated with a 2.3% increase in income. In terms of the field of study, the baseline corresponds to the sciences. Agriculture shows an approximately − 8.9% lower income. Arts show similar results, with an outcome about 13.3% lower. Conversely, engineering and social sciences show about 16.5% and 14.1% higher incomes, respectively. Holding a master's degree is associated with a statistically significant 6.6% higher income. The age and country of prior studies show marginally significant results.

[Table 2 about here]

Transition into employment and job search duration: Evidence on labour market entry speed for international vs. domestic PhDs (H1b)

Figure 2 shows the distribution of job search duration for international and domestic PhD programs. The T-test yields no significant differences across PhD types for the individuals in the sample. The mean duration of the job search is approximately 9.5 months, with a variance of 68.97, indicating overdispersion and justifying the use of an NB regression approach for count data.

[Figure 2 about here]

The coefficients estimated for the negative binomial regression are shown in Table 3. All VIF values are below 5, confirming no multicollinearity. Contrary to the hypothesis that returners would face a "re-entry penalty" due to lost networks (H1b), the results indicate a trend in the opposite direction: International PhD holders search for approximately 30% less time than their domestic peers. While this effect is marginally significant ($p < 0.10$), the direction of the coefficient explicitly contradicts the social capital deficit hypothesis, suggesting that the credential signal may compensate for the lack of local ties. Among control variables, field of study is a strong predictor: graduates in agriculture, education, and the social sciences spend significantly less time searching than those in the sciences, while health graduates face significantly longer search periods.

Table 3
Estimates for the negative binomial regression model

Coefficient	Group	Estimate	IRR	p-value
Intercept		2.938	18.88	< 0.001
PhD program	International	-0.360	0.70	0.077
Gender	Male	-0.257	0.77	0.192
Field	Agriculture	-0.816	0.44	0.036
	Arts	-0.494	0.61	0.134
	Education	-0.956	0.38	0.021
	Engineering	-0.311	0.73	0.259
	Health	0.872	2.39	0.021
	Social Sci.	-1.044	0.36	< 0.001
Master's	Yes	0.247	1.28	0.238
Financing	Other	0.172	1.19	0.499
Age		-0.011	0.99	0.231
Country prior	Abroad	0.195	1.21	0.397

[Table 3 about here]

Research productivity outcomes of international doctoral training: Differences in publication output between returners and stayers (H2a)

The distribution of the number of publications (articles, book chapters, and other publications declared in the survey) per individual, by PhD program, is shown in Fig. 3. The T-test yielded a p-value near zero, showing significant differences in productivity across program types. The average number of publications is about 6, with a variance of 4, denoting no overdispersion in the data.

[Figure 3 about here]

Results from the Poisson GLM model indicate that publication counts differ significantly by PhD program, field of study, and experience, as highlighted in Table 4. Individuals with an international PhD have 6% more publications than domestic students, a statistically significant difference. The agriculture field shows marginally significant results, with about 8% more publications compared to the sciences field. Education and the social sciences show 15% and 18% more publications than the sciences field. Finally, each additional year of experience increases the number of publications by 1%, representing a small but statistically significant effect. It is worth noting that the model's VIF values are below 5, indicating no collinearity among the covariates.

Table 4
Estimates for the Poisson GLM regression

Coefficient	Group	Estimate	IRR	p-value
Intercept		1.567	4.82	< 0.001
PhD program	International	0.066	1.07	0.003
Gender	Male	-0.011	0.99	0.633
Field	Agriculture	0.078	1.08	0.072
	Arts	0.200	1.22	< 0.001
	Education	0.137	1.15	0.002
	Engineering	-0.019	0.98	0.559
	Health	0.035	1.04	0.412
	Social Sci.	0.161	1.18	< 0.001
Master's	Yes	-0.031	0.97	0.190
Age		0.000	1.00	0.413
Financing	Other	0.015	1.02	0.599
Experience		0.006	1.01	0.001

[Table 4 about here]

Sectoral sorting after the PhD: Academic versus business employment trajectories by training location (H2b)

The distribution of job sectors per PhD type is shown in Fig. 4. Individuals with a domestic PhD working in higher education represent about 59% of the sample. Similar results were found for the distribution of job sectors in public administration, with about 55% of domestic PhDs. In terms of the business sector and private institutions, approximately 76% and 64% of PhDs are domestic, respectively. These results highlight differences in the distribution of international and domestic PhDs across various job sectors. Furthermore, as shown in Fig. 4, the Chi-square test yields significant results, indicating that the distribution of job sectors and PhD programs is not independent.

[Figure 4 about here]

The results of the multinomial logit model for the business sector are shown in Table 5. The results show that PhD program type, field of study, holding a master's degree, and country of prior studies significantly influence the likelihood of being employed in the business sector rather than in higher education. Demographic factors, such as gender and age, do not significantly affect the choice of job sector.

Table 5
Estimates of the multinomial logit regression model

Feature	Group	Estimate	OR	p-value
Intercept		-1.971	0.14	0.001
PhD program	International	-0.595	0.55	0.011
Gender	Male	-0.065	0.94	0.761
Field	Agriculture	0.187	1.21	0.636
	Arts	1.192	0.30	0.014
	Education	-2.230	0.11	0.028
	Engineering	0.090	1.10	0.723
	Health	0.008	1.01	0.985
	Social Sci.	-0.549	0.58	0.098
Master's	Yes	0.418	1.52	0.047
Age		-0.003	1.00	0.757
Country prior		-0.590	0.55	0.037
Financing		0.004	1.00	0.989

[Table 5 about here]

International PhD graduates have 45% lower odds of working in the business sector than in higher education, compared to domestic PhD graduates. This result shows that international PhD graduates are more likely to remain in the higher education sector after finishing their studies. In terms of the field of study, graduates in the arts have 70% lower odds of entering the business sector. Graduates with a PhD in education have 89% lower odds of entering business than higher education, indicating a strong preference for academic jobs. Social science graduates have about 42% lower odds of working in the business sector, with borderline evidence. Holding a master's degree increases the likelihood of business-sector employment by about 52%. Finally, individuals with prior studies abroad have 45% lower odds of entering the business sector. Crucially, regarding H3a, the funding source ('financing') yields no statistically significant effect ($p = 0.989$). This indicates that the likelihood of entering the business sector is not determined by scholarship return obligations, suggesting that market structure overrides the specific conditions of the funding mechanism.

Causal estimates of income, productivity, and sectoral outcomes associated with international doctoral training

The PS scores were estimated using a binomial logistic regression model based exclusively on pre-treatment characteristics, including gender, possession of a pre-doctoral master's degree, age at completion of the previous degree, country of prior degree, and region of birth. Treated individuals (those who completed a PhD abroad) were matched to control individuals (domestic PhD holders) using nearest-neighbour matching without replacement, with a calliper of 0.15 standard deviations of the logit of the PS. Balance diagnostics indicate that the matching procedure substantially reduced pre-treatment differences across all covariates: all standardised mean differences were below 0.2 after matching, with the majority below 0.1, and variance ratios for continuous variables were close to unity. Overall, these results indicate that the matched sample achieves adequate covariate balance.

We next turn to the causal estimation of the effects of international doctoral training using the matched sample constructed via PSM. By restricting the analysis to individuals with comparable pre-treatment characteristics, these estimates isolate the average treatment effect on the treated (ATT), capturing the causal impact of completing a PhD abroad relative to the counterfactual scenario in which the same individuals had completed their doctoral training domestically.

Table 6 reports the results of the income regression estimated on the sample matched. The estimated ATT indicates that completing a PhD abroad increases income by approximately 14.9%, relative to comparable individuals who completed their PhD domestically. This effect is statistically significant at the 0.1% level and is slightly larger than the corresponding estimate obtained from the full sample in Table 2, suggesting that selection into international doctoral training does not drive the observed income premium. Instead, the results provide evidence of a positive causal return to international doctoral training.

Table 6
Causal estimates (ATT) – Income regression on PSM sample

Coefficient	Group	Estimate	p-value
Intercept		13.89	< 0.001
PhD program	International	0.149	< 0.001
Publications		0.035	< 0.001
Experience		0.024	< 0.001
Gender	Male	0.005	0.020
Field	Agriculture	-0.107	0.003
	Arts	-0.165	< 0.001
	Education	-0.013	0.792
	Engineering	0.125	< 0.001
	Health	0.031	0.467
	Social Sci.	0.102	0.001
Master's	Yes	0.056	0.018
Financing	Other	0.023	0.454
Age		0.001	0.295
Country prior	Abroad	-0.057	0.035
BP test		25.06	0.330

The estimated effects of publications and experience remain positive and statistically significant, consistent with productivity- and human-capital-based income mechanisms. Field-specific income differentials also persist after matching, indicating that these patterns are not driven by observable selection into international training. The similarity between the matched and unmatched estimates suggests that observable selection plays a limited role in explaining the income premium associated with international doctoral training.

[Table 6 about here]

Table 7 presents the multinomial logit estimates for sectoral employment using the matched sample. The results show that individuals who completed a PhD abroad have 52% lower odds of working in the business sector than in higher education (ATT), compared to otherwise similar domestic PhD holders. This finding indicates that international doctoral training causally reinforces the concentration of talent

in academia. The persistence of this effect after matching suggests that exclusion from the private sector is not due to candidate characteristics but likely to structural demand-side constraints.

Table 7
Causal estimates (ATT) – Multinomial logit on PSM sample

Feature	Group	Estimate	OR	p-value
Intercept		-1.726	0.18	0.023
PhD program	International	-0.725	0.48	0.011
Gender	Male	-0.242	0.78	0.433
Field	Agriculture	0.357	1.45	0.515
	Arts	-1.536	0.21	0.041
	Education	-1.578	0.21	0.130
	Engineering	0.140	1.15	0.702
	Health	0.415	1.51	0.367
	Social Sci.	-0.199	0.82	0.637
Master's	Yes	0.201	1.22	0.508
Age		-0.007	0.99	0.589
Country prior		-0.798	0.45	0.043
Financing		0.111	1.12	0.775

Both fields of study and prior international exposure continue to play a significant role in shaping sectoral outcomes, while demographic characteristics such as gender and age are not statistically significant once comparability is enforced.

Taken together, the causal estimates indicate that international doctoral training yields a positive income premium and influences post-PhD career trajectories toward academic employment. These effects persist after accounting for observable selection and suggest that the returns to international doctoral training extend beyond pre-existing individual characteristics.

[Table 7 about here]

Table 8 reports the causal estimates for research productivity obtained from Poisson GLM on the PSM sample. The estimated ATT indicates that completing a PhD abroad increases the expected number of publications by approximately 7% relative to comparable individuals who completed their doctoral training domestically. This effect is statistically significant at the 5% level and is consistent in magnitude with the corresponding estimate from the full sample (Table 4), suggesting that observable selection does not account for the productivity differential between international and domestic PhD holders.

Table 8
Causal estimates (ATT) – Poisson GLM on PSM sample (publications)

Coefficient	Group	Estimate	IRR	p-value
Intercept		1.662	5.27	< 0.001
PhD program	International	0.069	1.07	0.011
Gender	Male	-0.022	0.98	0.444
Field	Agriculture	0.043	1.04	0.467
	Arts	0.172	1.19	< 0.001
	Education	0.088	1.09	0.121
	Engineering	-0.069	0.93	0.093
	Health	-0.001	0.99	0.868
	Social Sci.	0.139	1.15	< 0.001
Master's	Yes	-0.033	0.97	0.278
Age		0.000	1.00	0.832
Financing	Other	0.014	1.01	0.693
Experience		0.004	1.00	0.081

Field-of-study effects remain salient after matching. Graduates in the arts and social sciences exhibit significantly higher publication counts than those in the sciences, while differences in other fields are not statistically significant. Experience continues to display a positive, though marginally significant, effect on productivity, indicating gradual accumulation of research output over time. Overall, these results provide evidence of a modest but positive causal effect of international doctoral training on research productivity, reinforcing the interpretation that international exposure enhances academic performance beyond pre-existing individual characteristics.

[Table 8 about here]

Considering all results together, the causal estimates indicate that international doctoral training yields consistent benefits in terms of income and research productivity, while simultaneously shaping post-PhD career trajectories toward academic employment.

Discussion

This study examined the labour market, productivity, and sectoral outcomes associated with completing a PhD abroad relative to completing a PhD domestically, using nationally representative survey data for doctorate holders in Chile. By combining descriptive analysis, multivariate regression models, and

propensity score matching (PSM), the analysis provides a comprehensive assessment of both correlational patterns and causal effects of international doctoral training. The findings offer a nuanced picture of the “brain gain,” suggesting that while international degrees confer distinct individual advantages, their broader economic impact is strictly bounded by the structural constraints of a developing ecosystem.

Across all empirical strategies, the results consistently indicate that completing a PhD abroad is associated with, and causally contributes to, higher income. In the baseline income regression, individuals with an international PhD earn approximately 14% more than their domestically trained counterparts. Importantly, this income premium persists —and slightly increases in magnitude— once observable selection is addressed through propensity score matching, yielding an estimated average treatment effect on the treated (ATT) of approximately 15%. The stability of the estimates across unmatched and matched samples suggests that the observed income premium is not primarily driven by selection on observable characteristics but rather reflects a genuine causal return to international doctoral training.

However, the mechanism behind this premium warrants scrutiny. Because the estimated international PhD coefficient remains similar in magnitude when moving from the full sample to the propensity-score-matched sample, the results are consistent with a causal income return (Iriondo, 2020; Asankulova and Thomsen, 2024). Yet, this should not be interpreted solely as a measure of individual productivity. The analysis does not directly observe the demand-side wage-setting mechanisms of universities or research organisations. Consequently, the income premium identified here likely reflects differential institutional sorting. Internationally trained PhDs may earn more not solely because they are more productive in an absolute sense, but because their credentials allow them access to elite universities or research centres that systematically offer higher pay scales (Didier, 2024). This interpretation aligns with the structure of the Chilean academic labour market, characterised by strong wage dispersion across institutions. Thus, the premium is an equilibrium outcome where international degrees function as a “key” to the upper tier of the academic market.

In contrast to our theoretical prediction regarding the “re-entry penalty” (H1b), the empirical evidence does not support the social capital hypothesis. While we hypothesised that the decay of local networks would prolong the job search for returners, the negative binomial estimates indicate a trend in the opposite direction: international doctoral training tends to shorten, rather than lengthen, the job search ($p < 0.10$). This finding is analytically significant. It implies that, in the Chilean context, the signalling value of an international credential is robust enough to overcome the informational disadvantages arising from a lack of local embeddedness.

Employers appear to prioritise the ‘prestige signal’ of the foreign degree over the lower search costs associated with hiring locally connected candidates. This dynamic resonates with the broader literature on student mobility, which suggests that while speed advantages may be context-dependent, the returns to mobility are robustly linked to improved employment quality (Van Mol et al., 2021; Waibel et al., 2018).

In our case, the international credential acts as a dual mechanism: it neutralises the friction of re-entry (preventing delays) while simultaneously unlocking access to higher wage tiers (income premium), effectively optimising the quality of the match over mere placement speed.

Turning to research productivity, the analysis supports H2a. Internationally trained PhDs exhibit higher publication output than domestically trained peers, and this productivity advantage remains statistically significant after matching individuals on pre-treatment characteristics. Although the magnitude of the effect is moderate, the consistency of the results across models suggests that international doctoral training contributes positively to post-PhD research productivity. This finding aligns with theories emphasising exposure to more competitive research environments, international collaboration networks, and stronger publication norms during doctoral training (Scellato et al., 2015). However, it is crucial to note that this productivity is realised almost exclusively within academic settings, which leads to the structural bottleneck identified in our sectoral analysis.

The sectoral allocation results provide the most critical insight into the limits of the current policy model, providing strong evidence in support of H2b. International PhDs are significantly less likely to work in the business sector (odds ratio ≈ 0.48). A critique of this finding might posit that this distribution reflects a simple individual preference for academic autonomy (Mangematin, 2000) rather than a structural constraint. However, our income data refutes this preference hypothesis.

If the private sector possessed a high latent demand for advanced human capital but faced a supply shortage of willing researchers, economic theory suggests we would observe a significant wage premium in the business sector designed to incentivise recruitment. We do not observe such a dynamic. Instead, the income premium is generated primarily within the academic and public sectors. This absence of a corporate wage signal confirms the limited absorptive capacity of the local industrial fabric (Cohen and Levinthal, 1990). The Chilean innovation system effectively creates a ‘sectoral trap’, where the high human capital acquired abroad finds no productive outlets outside the university system. This reinforces academic stratification rather than fostering the industry-academia linkages envisioned by the “Brain circulation” paradigm. The private sector accesses this talent less, not because the talent is unwilling, but because the market structure does not value or remunerate their specific skills (Klerkx and Guimón, 2017).

Finally, regarding the moderating role of funding (H3a), our analysis yields a revealing null result. We hypothesised that ‘bonded’ (state-funded) scholars would be institutionally channelled into the public/academic sector due to return obligations, while self-funded scholars would exhibit greater sectoral mobility. However, our models show that funding sources are not a significant predictor of sectoral placement ($p > 0.05$).

This suggests that the structural rigidity of the labour market is the dominant force, overriding the specific conditions of the scholarship contract. The ‘academic magnet’ effect is so pervasive that it absorbs both bonded and free-agent returners alike. This implies that the concentration of PhDs in universities is not merely an artefact of repayment obligations (the ‘bond’), but a reflection of the utter

lack of viable professional pathways in the Chilean private sector. Whether legally obligated to return or not, international PhDs face the same restrictive opportunity structure.

Taken together, these findings paint a coherent picture of the returns to international doctoral training. International PhD programs generate measurable benefits in terms of income and research productivity, but these benefits are structurally bounded. They are concentrated within academic career paths and mediated by the demand structure of the higher education sector. International training does not, by itself, expand employment opportunities outside academia nor resolve the limited integration of PhDs into the private sector. The “brain gain” is real, but it is an enclosed phenomenon, circulating within the university system rather than diffusing through the broader economy. From a policy perspective, this implies that supply-side investments —like *Becas Chile*— have successfully upgraded the academic workforce but have reached a saturation point in their ability to drive national innovation without corresponding demand-side industrial policies.

Conclusions

This study set out to examine whether completing a PhD abroad generates measurable labour market advantages for doctorate holders in Chile, a middle-income country characterised by a highly stratified academic sector and limited absorptive capacity outside universities. Using nationally representative data from the 2021 Survey of Doctorate Holders and employing a robust quasi-experimental design based on propensity score matching (PSM), the analysis provides clear evidence on the limits and returns of international mobility. By disentangling the causal effects of an international degree from the selection biases inherent to high-ability mobility, this research offers a nuanced corrective to the “brain gain” optimism that has driven science policy in the Global South for the past two decades.

Across all empirical strategies, the results consistently indicate that international doctoral training yields positive, robust returns for the individual scholar. Addressing our first hypothesis regarding economic outcomes, we find clear and consistent evidence of an income premium associated with completing a PhD abroad. Internationally trained PhDs earn significantly higher monthly incomes than their domestically trained peers, a premium that persists —and slightly increases in magnitude— after correcting for observable selection. This stability suggests that the income differential is not driven solely by pre-existing individual characteristics but reflects a genuine valuation of the international credential in the Chilean context. However, this premium must be interpreted through a structural lens; it likely reflects both individual-level signalling effects and differential access to better-paying elite academic institutions, rather than a uniform increase in wages across the entire economy.

Similarly, in terms of research productivity, the analysis supports the “cosmopolitan advantage.” Internationally trained PhDs exhibit higher publication output than domestically trained peers, a productivity gap that remains statistically significant after matching individuals on pre-treatment characteristics. Although the magnitude of the effect is moderate, the consistency of the results suggests that international doctoral training contributes positively to post-PhD research productivity,

likely driven by exposure to more competitive research environments, broader international collaboration networks, and stronger publication norms internalised during the doctoral process abroad.

Perhaps the most revealing finding regarding individual outcomes concerns the transition into employment. In contrast to our theoretical prediction regarding a “re-entry penalty,” empirical evidence explicitly rejects the social capital hypothesis. While we theorised that the decay of local networks would prolong the job search for returners, results indicate a trend in the opposite direction. That is, international doctoral training tends to shorten, rather than lengthen, the job-search duration. This finding is analytically significant, as it implies that, in the Chilean context, the signalling value of an international credential is robust enough to overcome the informational disadvantages arising from a lack of local embeddedness. Employers appear to prioritise the “prestige signal” of the foreign degree over the lower search costs associated with hiring locally connected candidates. Thus, the international credential acts as a dual mechanism: it neutralises the friction of re-entry while simultaneously unlocking access to higher wage tiers, effectively optimising the quality of the match over mere placement speed.

However, these individual successes cloak a profound systemic failure regarding the broader distribution of talent. The sectoral allocation results provide strong evidence that international doctoral training does not facilitate transitions into the private or business sector. On the contrary, causal estimates show that internationally trained PhDs are significantly less likely to work in the business sector relative to higher education. This pattern indicates that international training reinforces academic career trajectories rather than broadening employment opportunities across the economy. Crucially, our income data refutes the argument that this is merely a result of scholars’ preference for academic autonomy. If the private sector possessed a high latent demand for advanced human capital but faced a supply shortage, economic theory suggests we would observe a significant wage premium in the business sector designed to lure talent away from universities. We observe no such dynamic. The absence of a corporate wage signal confirms the limited absorptive capacity of the local industrial fabric. The Chilean innovation system effectively creates a “sectoral trap,” where the high human capital acquired abroad finds no productive outlets outside the university system.

This structural rigidity is further underscored by the null result regarding funding sources. We hypothesised that state-funded, “bonded” scholars would be institutionally channelled into the public sector due to return obligations, while self-funded scholars would exhibit greater market mobility. Instead, we found that funding sources are irrelevant to sectoral placement. The “academic magnet” effect is so pervasive that it absorbs both bonded and free-agent returners alike. This implies that the concentration of PhDs in universities is not an artefact of repayment obligations, but a reflection of the utter lack of viable professional pathways in the Chilean private sector. Whether legally obligated to return or not, international PhDs face the same restrictive opportunity structure.

All in all, our results show that the structure of the Chilean market is heterogeneous, shaped by a configuration that is constrained in several sectors. For instance, the academic circuit exhibits a comparatively high absorptive capacity, whereas the industry displays a low one. The 15% wage

premium enjoyed by PhDs trained abroad does not reflect an economy-wide productivity increase; instead, it serves as a signal valued by universities that demand labour in the academic marketplace. By contrast, this signal is too weak to trigger a parallel expansion of industrial demand. This phenomenon raises new questions. Does the absence of a wage premium in the private sector reveal that the expected productive value of a PhD outside the university is low, or simply that the signal is insufficient?

One possible answer is that domestic firms have not reached the critical mass of absorptive capacity (Cohen and Levinthal, 1990), which would raise their willingness to pay such a premium, or that the prestige signal is inadequate to incentivise demand. From Smith's and Young's perspective on the division of labour (Chandra, 2004), the findings indicate that deepening within industry does not occur because the market for knowledge-intensive intermediate goods and services is narrow. Doctoral training abroad expands the potential supply of ideas, yet in the absence of sufficient locally derived demand, these ideas are "sold" almost exclusively inside the university system. To transform brain gain into national endogenous growth, a coordinated expansion of market size —à la Young (1928)— is required: Fiscal incentives for private R&D, public technological procurement, and university-industry consortia that raise the expected demand for PhDs outside the classroom, thereby inducing a new supply of human capital that finally meets effective demand from industry and the wider economy.

From a policy perspective, these results have urgent implications. They suggest that supply-side interventions —like the massive *Becas Chile* program— have successfully upgraded the academic workforce but have failed to catalyse broader economic innovation. The failure of the brain gain to materialise in the private sector is not a failure of the scholars, but of the market structure. Public investments in international doctoral mobility currently risk reinforcing existing inequalities between institutions rather than expanding the demand for advanced human capital across the broader economy. To transform this "academic brain gain" into a true "national brain gain," policymakers must shift focus from merely producing PhDs to creating markets for them. Without complementary demand-side policies aimed at increasing the absorptive capacity of Chilean firms —such as R&D tax incentives conditional on hiring PhDs or mission-oriented industrial strategies— international training alone will remain an academic luxury rather than an engine of national economic development.

Declarations

Ethical statements

This study used secondary, anonymised survey data from the 2021 Chilean Survey of Doctorate Holders (CDH). No human participants were directly involved. Ethical approval was not required.

Author Contribution

Conceptualisation: J.F.E.-C. and N.L.-R.; Methodology and statistical analysis: H.d.l.F.-M. and G.R.-V.; Formal analysis of economic dimensions: J.F.; Sociological framing and theoretical development: N.L.-R.;

Data curation: J.F.E.-C., N.L.-R., H.d.l.F.-M. and G.R.-V.; Writing — original draft: J.F.E.-C.; Writing — review and editing: J.F.E.-C., N.L.-R. and J.F.; Project administration and supervision: J.F.E.-C. All authors have read and agreed to the published version of the manuscript.

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Data Availability

The datasets analysed during the current study are derived from the 2021 Chilean Survey of Doctorate Holders (CDH), administered by the Ministry of Science, Technology, Knowledge and Innovation of Chile. [Database for the Study Do international doctorates pay off?, [**https://doi.org/10.17605/OSF.IO/W3R28**](https:/doi.org/10.17605/OSF.IO/W3R28) , open access].

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Figures

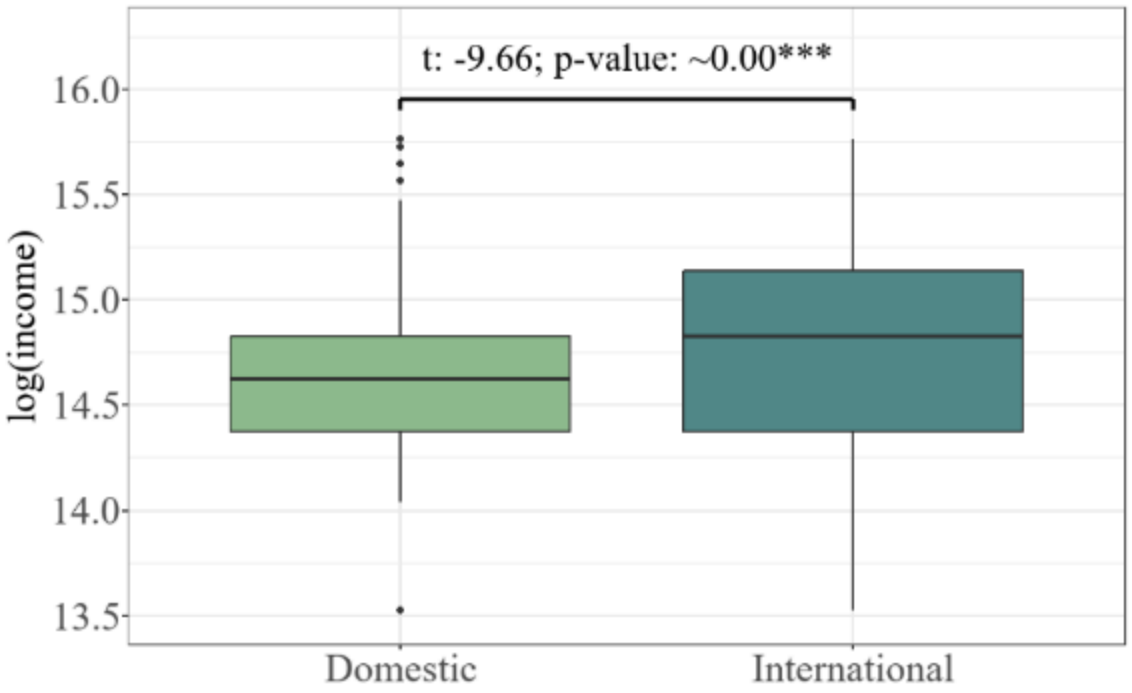


Figure 1

Distribution of logged income by PhD program type, including the T-test statistic and p-value. The mark * denotes statistical significance at 1%.**

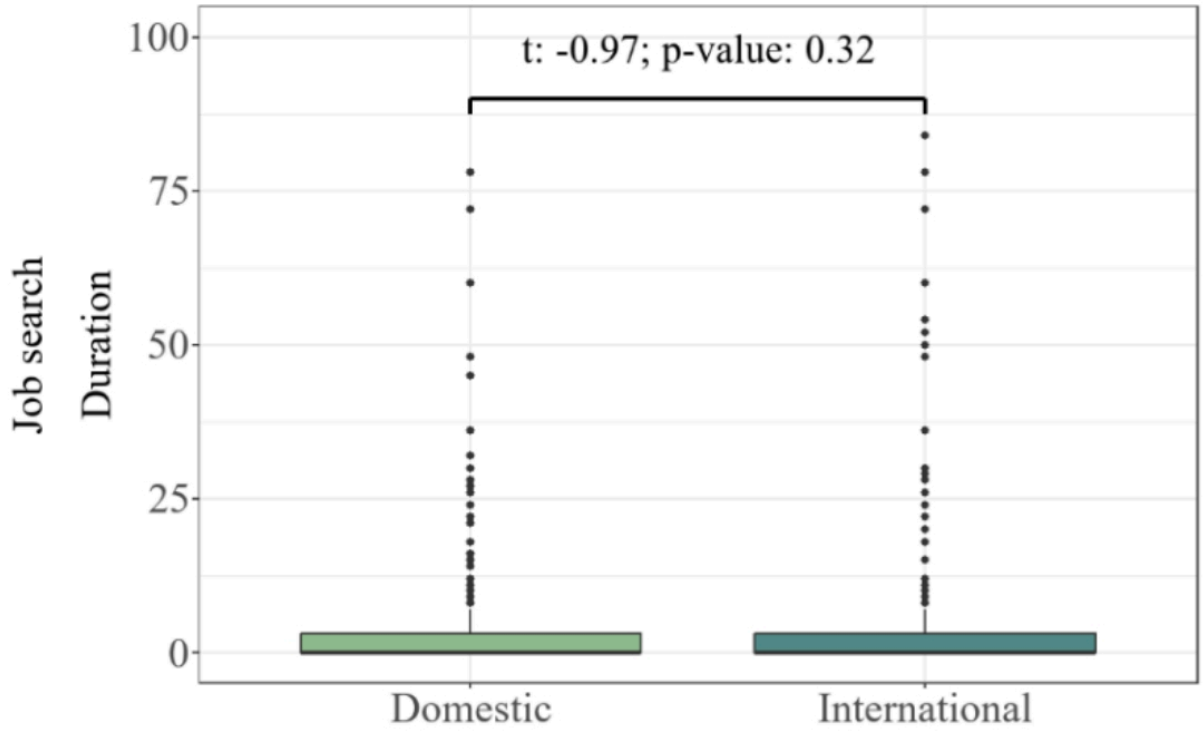


Figure 2

Distribution of job search (in months) by PhD program. The T-test statistics and p-value comparing mean durations are displayed.

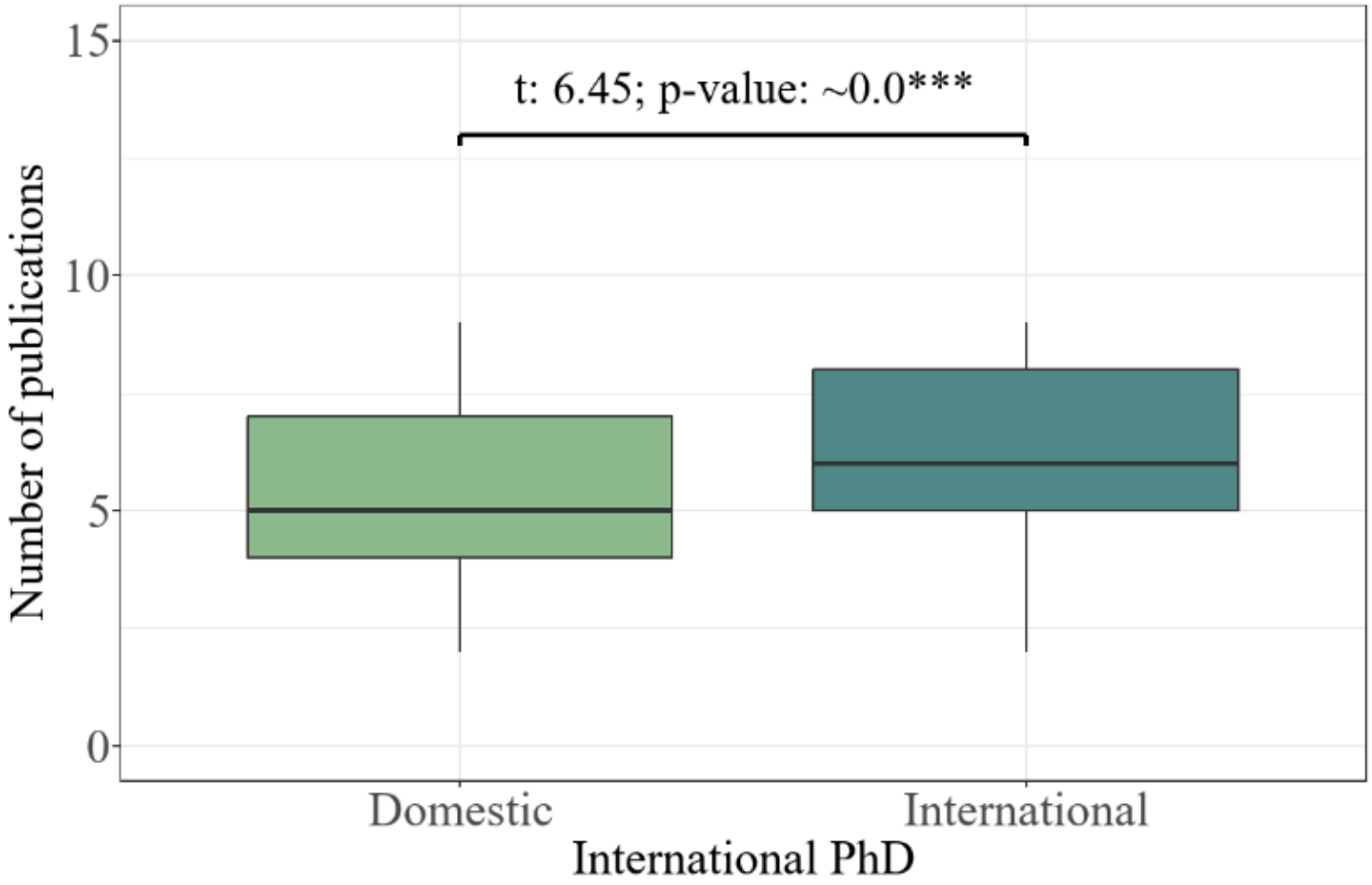


Figure 3

Distribution of the number of publications per PhD program type. The T-test statistics and p-value comparing the means are shown with the mark * denoting statistical significance.**

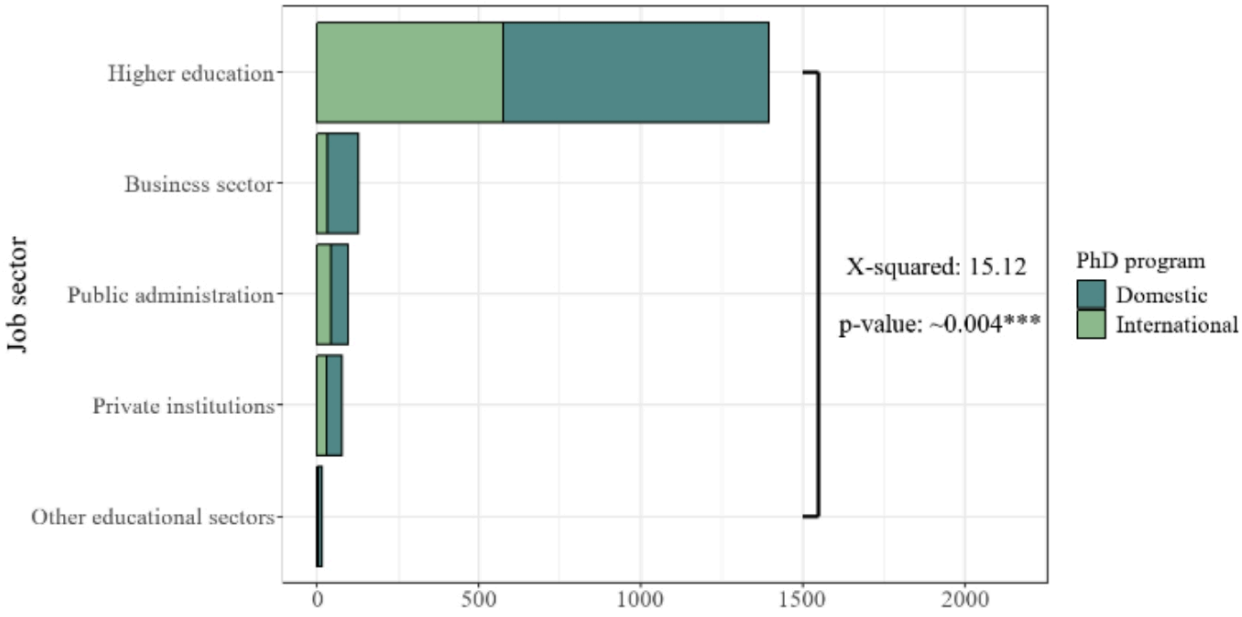


Figure 4

Distribution of job sectors among domestic and international PhD graduates. Results of the Chi-square test are shown with the mark * denoting statistical significance.**