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The Process of Research Internationalization in the Georgian Higher Education System and Its Impact on Research Productivity

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ARTICLE INFO ABSTRACT

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The aim of this study is to examine the factors determining the internationalization of research and to assess its impact on research productivity. The study employs a cross-sectional survey methodology and includes data from 332 members of academic staff at Georgian universities. Ordinal logistic regression and Hayes' PROCESS Model 4 were used for the mediation analysis.

The results identify five statistically significant predictors of research internationalization. Professional contacts with foreign researchers emerged as the strongest factor, followed by access to international grants, education obtained abroad, research skills, and institutional support provided by universities. The model explains 33.7% of the variance in international research collaboration. Mediation analysis indicates that international co-authorship and engagement in research activities conducted in foreign languages play a significant mediating role in the relationship between research skills, grant availability, and research productivity. Specifically, the effect of grant availability on productivity is mediated almost entirely through international research activities, with an indirect effect accounting for 87% of the total effect. These findings contribute to the theoretical framework of research internationalization in post-Soviet higher education systems and offer evidence-based guidance for policymakers seeking to enhance academic research capacity through targeted international engagement strategies.

კვლევის ინტერნაციონალიზაციის პროცესი საქართველოს უმაღლესი განათლების სისტემაში და მისი გავლენა სამეცნიერო პროდუქტიულობაზე

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სტატიის შესახებ	აბსტრაქტი
საკვანძო სიტყვები:	კვლევის მიზანია უმაღლესი განათლების ინტერნაციონალიზაციის განმსაზღვრელი ფაქტორების შესწავლა და მათი გავლენის შეფასება სამეცნიერო პროდუქტიულობაზე. კვლევა ეფუძნება ჯვარედინი

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საერთაშორისო თანამშრომლობა
კვლევის პროდუქტიულობა
უმაღლესი განათლება

გამოკითხვის მეთოდოლოგიას და მოიცავს საქართველოს უნივერსიტეტების აკადემიური პერსონალის 332 წევრისგან შეგროვებულ მონაცემებს. მედიაციური ანალიზისთვის გამოყენებულ იქნა ორდინალური ლოგისტიკური რეგრესია და ჰეისის (Hayes) PROCESS მაკროსის მე-4 მოდელი.

შედეგები ავლენს კვლევის ინტერნაციონალიზაციის ხუთ სტატისტიკურად მნიშვნელოვან პრედიქტორს. ყველაზე ძლიერ ფაქტორად უცხოელ მკვლევრებთან პროფესიული კონტაქტები გამოვლინდა, რასაც მოსდევს საერთაშორისო გრანტებზე წვდომა, საზღვარგარეთ მიღებული განათლება, კვლევითი უნარები და უნივერსიტეტის მიერ გაწეული ინსტიტუციური მხარდაჭერა. აღნიშნული მოდელი საერთაშორისო კვლევით თანამშრომლობაში არსებული დისპერსიის (ვარიაციის) 33.7%-ს ხსნის. მედიაციური ანალიზი მიუთითებს, რომ საერთაშორისო თანაავტოროზა და უცხოურენოვან სამეცნიერო აქტივობებში ჩართულობა მნიშვნელოვან შუამავლურ (მედიატორის) როლს ასრულებს კვლევით უნარებს, გრანტების ხელმისაწვდომობასა და კვლევის პროდუქტიულობას შორის არსებულ კავშირებში. კერძოდ, გრანტების ხელმისაწვდომობის გავლენა პროდუქტიულობაზე თითქმის მთლიანად საერთაშორისო კვლევითი საქმიანობით არის განპირობებული, სადაც არაპირდაპირი ეფექტი მთლიანი ეფექტის 87%-ს შეადგენს.

1. Introduction

International research collaboration now plays a key role in higher education, influencing both individual researchers and the wider scientific community in today's competitive global environment. This process encompasses international cooperation, cross-border research activities, and the integration of scientific work into global knowledge networks, thereby fostering innovation and scientific advancement (Horta & Santos, 2020). The in-depth examination of research internationalization is particularly relevant in post-Soviet countries such as Georgia, where the higher education system is undergoing a complex phase of transformation and striving to integrate into the European and global educational spaces (Silova, 2018).

Over the past two decades, Georgia's higher education system has experienced substantial reforms aimed at aligning with international standards and strengthening integration with the European Higher Education Area (Dobbins & Kwiek, 2017). Despite these efforts, Georgian higher education institutions remain predominantly teaching-oriented, resulting in an imbalance between teaching and research activities. A considerable proportion of academic staff is minimally involved in research, while the quality and academic impact of publications produced by the relatively small group of active researchers have shown a declining trend (Gagnidze, 2020). Evidence from major international academic databases, such as Google Scholar and Scopus, further highlights the limited volume of scientific publications

authored by Georgian scholars. According to existing studies, this situation is largely attributable to ineffective mechanisms for stimulating research activity (Gagnidze, 2020; Tabatadze, 2023).

These challenges are compounded by a range of structural and contextual constraints, including limited financial resources, institutional barriers, language-related obstacles, and Georgia's historical isolation from international academic networks (Chankseliani, 2016; Chachkhiani & Tabatadze, 2024; (Tavadze, Lekishvili, & Zurabishvili, 2025). Moreover, notable disciplinary differences exist in both the level and form of research internationalization, reflecting the varying capacities and specific needs of different academic fields. Against this background, it is increasingly important to identify the factors that determine the success of research internationalization and to examine how this process influences researchers' scientific productivity. Prior research suggests that internationalization plays a crucial role in enhancing research quality, fostering innovation, and supporting the professional development of academics (Franzoni et al., 2021). Nevertheless, these relationships are complex and highly context-dependent, necessitating empirical investigation within specific national settings.

The core problem addressed in this study is the insufficient examination of how various factors interact to shape research internationalization and how these interactions affect research productivity in the Georgian context. While the general literature acknowledges the importance of internationalization, the interplay between individual, institutional, and systemic factors remains underexplored in Georgia.

Accordingly, the aim of this study is to systematically analyze the determinants of research internationalization within the Georgian higher education system and to assess their impact on researchers' academic performance and productivity. The analysis considers factors operating at the individual level to provide a comprehensive perspective.

The findings of this study are expected to contribute to both theoretical understanding and practical policy development. They aim to inform evidence-based recommendations for policymakers and university leadership, facilitate Georgia's deeper integration into the international scientific community, and ultimately enhance the quality and impact of academic research.

2. Literature Review

The conceptualization of internationalization of research in contemporary academic discourse is a multidimensional construct encompassing various forms of international collaboration, transnational research activities, and global knowledge exchange. De Wit and Hunter (2015) note that internationalization is not merely a process of geographical expansion; it also represents a profound transformation at all levels of academic culture and practice. This transformation includes internationally collaborative research projects, overseas mobility, international publications, joint supervision of doctoral students, and a variety of other activities that link researchers and institutions across national borders.

The theoretical framework of research internationalization is often structured around three main approaches (Knight & Trivett, 2019). The **institutional perspective** emphasizes organizational structures and policies that support international engagement. The **resource-based approach** focuses on

the material, human, and social capital necessary for internationalization. Finally, network theory conceptualizes internationalization as a social process shaped by interactions between researchers and institutions.

At the individual level, international research collaboration (IRC) can be explained through the concept of self-organization, which posits that researchers in academic networks follow implicit rules to regulate their actions (Coleman, 1999). Melin (2000) identifies both cognitive and material motives for collaboration—such as access to expertise, data, and equipment—as well as social factors. The benefits of collaboration include enhanced knowledge and higher scientific quality, although personal chemistry and professional relationships often play a critical role in successful outcomes. Several scholars have applied the self-organization framework to analyze academic collaboration (Kwiek, 2020; Melin, 2000; Wagner, 2018; Wagner & Leydesdorff, 2005), highlighting that academics independently determine their professional trajectories, driven by motivations to enhance reputation and acquire resources (Wagner & Leydesdorff, 2005).

IRC is thus a process of self-organization within dynamic networks, where individual initiative generates opportunities for collaboration, such as participation in international conferences (Wagner, 2018). Finkelstein, Walker, and Chen (2013) argue that internationalization is closely linked to the value systems and priorities of individual academics. Given the personalized nature and professional skills of the academic profession, top-down directives alone may not suffice to shift researchers' focus from local to international engagement. Moreover, IRC provides improved opportunities for publication and prestige, which can, in turn, enhance academics' positions within the global stratification of the scientific community (Hoekman, Frenken, & Tijssen, 2010).

To analyze the individual dimension of international research collaboration, it is essential to consider several key factors that influence the involvement of academic staff in international research activities. Among individual-level factors, a researcher's propensity for the internationalization of research is particularly important. Gouldner's (1957) classic typology distinguishes between two types of scientists: **"locals,"** who are less research-oriented and more loyal to their employing organization, and **"cosmopolitans,"** who prioritize research activities and engagement with the broader scientific community. Similarly, Merton's sociology of science theory suggests that prominent scientists tend to adopt a more "cosmopolitan" orientation, focusing on both national and transnational scientific environments rather than solely on their local academic community (Merton, 1973; Kwiek, 2020).

At the individual level, personal characteristics such as stage of academic career, prior international experience, language competence, and motivation have been identified as important predictors of international collaboration (Froese & Kishi, 2021). Franzoni, Schreck, and Stefanelli (2021) find that researchers who have studied or worked abroad are significantly more likely to engage in international research collaboration and demonstrate higher research productivity. Early career stages are often critical for the formation of international networks; however, younger researchers may face greater barriers due to limited resources and experience. Stroebe (2010) notes that the intensity of research activity varies across the academic life cycle and generally decreases with age.

Empirical studies further indicate that middle-aged male academics in senior positions tend to exhibit higher engagement in international research collaboration (Kwiek, 2018, 2020; Rostan, Ceravolo, & Metcalfe, 2014). Kwiek (2020) characterizes internationalists as predominantly male academics with extensive experience and high academic rank, who prioritize research and administrative duties over teaching, and aim to generate knowledge for both local and international academic markets.

Language competence is another critical individual factor in international collaboration. Ferguson and Peach (2019) highlight that the dominance of English in academia creates an unequal playing field for non-English-speaking researchers, limiting their international visibility. This language barrier is especially relevant in post-Soviet contexts, where older researchers often lack sufficient English proficiency for publishing and communication in international settings.

In addition to language skills, researchers' motivation and attitudes toward international collaboration significantly influence the internationalization process. Zivkovic and Ailon (2020) find that researchers who view international collaboration as essential for professional development are more proactive in seeking partnership opportunities and more successful in establishing and sustaining these connections.

Gender also plays a role in international research collaboration. Fox and Mohabatra (2007) note that gendered divisions of labor between research and teaching can create potential inequalities in women's access to international networks. Empirical evidence, however, is mixed: Bozeman and Gaughan (2011) report that women tend to collaborate less than men, indicating persistent gender barriers.

As noted in the literature, international research collaboration serves as a key source of academic reputation, professional recognition, and prestige (Kwiek, 2016, 2020; Wagner & Leydesdorff, 2005). It also facilitates the attraction of additional resources and represents a decisive factor in the stratification of researchers. However, according to Eimers, external factors are as crucial as individual motivation in sustaining scientific engagement. These external factors are primarily institutional in nature and include leadership, material support, and systems of recognition and rewards (Eimers, 1997; Kezar, Maxey, & Holcombe, 2015) (see Figure 1).

Hypotheses

Individual Factors

- *H1: Research skills positively influence the degree of research internationalization.*
- *H2: Professional contacts with foreign researchers positively influence the degree of research internationalization.*
- *H3: Education received abroad positively influences the degree of research internationalization.*
- *H4: Language barriers negatively influence the degree of research internationalization.*
- *H5: Prior international research experience positively influences the degree of research internationalization.*

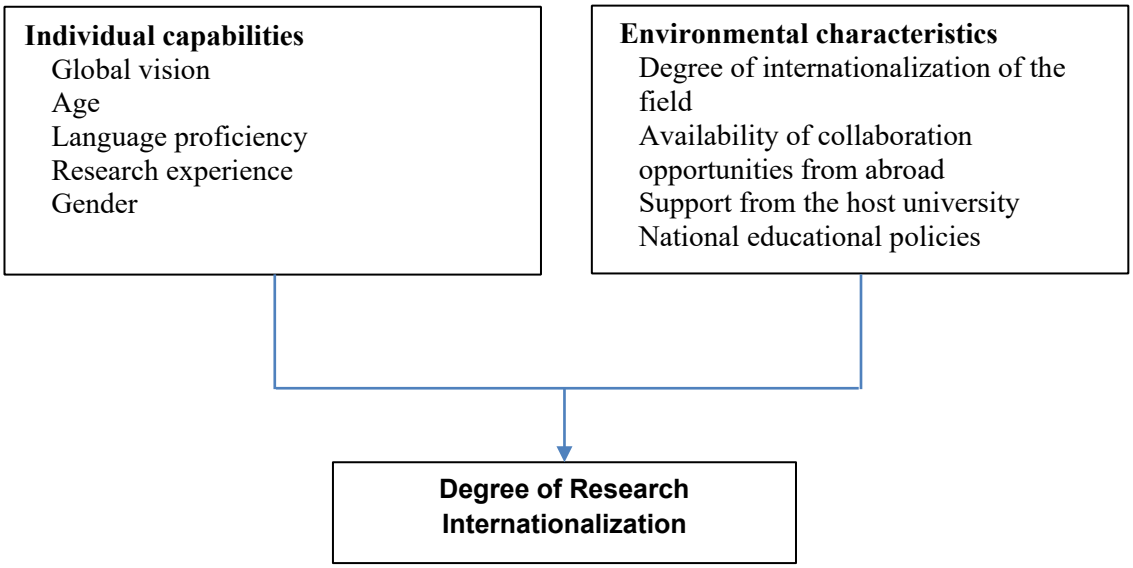
Institutional Factors

- *H6: University support for professional development positively influences the degree of research internationalization.*

External Opportunities

- *H7: Availability of collaboration opportunities from abroad positively and significantly influences the degree of research internationalization.*

Figure 1. Determinants of Individual Research Internationalization



The Impact of Research Internationalization on Research Productivity

The impact of research internationalization on researcher productivity and academic performance is widely studied in the literature, although findings are sometimes divergent and context dependent. Levis, Glena, and Muse (2019) argue that international collaboration is positively correlated with research productivity, as measured by publication volume and citation indices. Bibliometric studies further confirm that articles with international co-authorship receive significantly more citations, although the magnitude of this effect varies across disciplines (Adams et al., 2018).

A study by Kwiek (2016) across 11 European systems found that "internationalization and collaboration" was the strongest statistical predictor of research productivity among highly productive academics. Similarly, Abramo et al. (2011a) report that the volume of international collaboration is positively associated with productivity, which in turn reinforces further collaboration and improves the quality of publications. Researchers occupying central positions in international collaboration networks tend to show higher productivity, creating a positive feedback loop; however, integration into these networks can be challenging for early-career researchers and academics from peripheral systems (Wagner et al., 2015). Additionally, researchers with international experience demonstrate higher productivity (Franzoni et al., 2021).

Despite these benefits, an excessive focus on international collaboration may have drawbacks, including potential academic identity crises and reduced engagement with locally relevant issues (Tienari & Mårss, 2021). Collaborating in culturally and geographically diverse contexts also requires additional time and effort (March & Olsen, 2020), although such investments are generally compensated in the long term. Horta and Santos (2020) highlight the complex impact of international collaboration on research agendas: while it fosters novel research questions and enhances global relevance, it may inadvertently lead to the neglect of locally important topics.

Disciplinary differences further shape the consequences of internationalization. In the natural sciences, such as physics and chemistry, the positive effects of international collaboration are particularly pronounced due to standardized methods and globally oriented research problems (Krebbels & Glaser, 2020). In contrast, in the social sciences and humanities, where cultural and contextual factors are crucial, the benefits of international collaboration are more nuanced. While it provides diverse perspectives (Inglehart & Baker, 2019), traditional metrics such as co-authorship may not fully capture its value in the humanities (Bryson & Rouse, 2017).

The effects of internationalization are especially pronounced in developing countries, where researchers gain access to resources and networks but often occupy subordinate roles within collaborations due to unequal power dynamics (Vishwanathan & Delabour, 2020). Based on this analysis, the following hypotheses were formulated:

Figure 2. The Impact of Research Internationalization on Research Productivity

Hypotheses:

- *H8: International co-authorship mediates the relationship between research skills and research productivity.*
- *H9: International research collaboration mediates the relationship between grant access and research productivity.*
- *H10: Research activities conducted in foreign languages mediate the relationship between grant access and research productivity.*

3. Research Methodology

3.1. Research Design and Approach

This study employs a cross-sectional survey methodology to examine, first, the process of research internationalization among academic staff in Georgian higher education institutions and, second, its

impact on research productivity. The survey was distributed electronically via institutional email lists and direct outreach to academic staff at both state and private universities across Georgia. Data collection took place during 10.05.2025 to 30.09.2025. A total of 530 questionnaires were distributed, of which 332 were completed and returned, yielding a response rate of approximately 62%. To minimize non-response bias, two follow-up reminders were sent to non-respondents at two-week intervals. Participants were selected using purposive sampling, targeting academic staff actively employed at Georgian higher education institutions at the time of data collection. Inclusion criteria required respondents to hold an academic position — ranging from assistant to full professor — and to be engaged in teaching and/or research activities. The anonymity of respondents was ensured throughout the process, and participation was entirely voluntary. A quantitative approach was adopted, utilizing structured measurement instruments to investigate the relationships among individual capabilities, institutional support, internationalization factors, and self-reported research productivity.

3.2. Sampling and Data Collection

Data were collected from 332 academic staff members employed at higher education institutions in Georgia. The sample includes academic staff from both state and private universities (see Table 1).

Table 1 Demographic Characteristics of Respondents

Variable	Category	N	%
Gender	Female	184	55.4%
	Male	148	44.6%
University Type	Private	123	37.3
	State	208	62.7
Academic experience	Less than 5 years	22	6.6
	5-9	40	12.0
	10-19	75	22.6
	20-29	89	26.8
	30-39	76	22.9
	40 and over	30	9.0
Academic position:	Professor	106	31.9
	Associate Professor	163	49.1
	Assistant Professor	36	10.8
	Assistant	14	4.2
	Scientific staff	13	3.9
Education	Georgia	281	84.6%
	Abroad	51	15.4%
Academic field	Hard sciences	107	32.2%
	Soft sciences	225	67.8%

3.3. Operationalization of Variables

International research collaboration (IRC) was measured using the question: “Please rate how often you engage in international research collaboration.” Respondents indicated frequency on a 5-point ordinal scale: 1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = always. The distribution showed that the modal response was “sometimes” (32.8%), followed by “often” (26.2%) and “rarely” (17.5%).

Predictors were selected based on theoretical relevance and preliminary analyses. The final model includes eight variables, grouped into **individual factors, institutional factors, and control variables**.

Individual Factors

1. **Professional contacts with foreign researchers (NETW):** Measured by the item "I have close professional contacts with foreign researchers" on a 5-point Likert scale (1 = strongly disagree; 5 = strongly agree). The mean value was 3.40 (SD = 1.00).

2. **Research skills (RS):** Assessed using the item "I can independently plan and implement research projects" on a 5-point Likert scale. The mean value was 4.04 (SD = 0.91), indicating a high self-assessment of research capabilities among respondents.

3. **Frequency of publication in impact factor journals (AF):** Measured by the question "How often do you publish articles in impact factor journals?" on a 5-point scale (1 = very rarely; 5 = very often). The mean value was 2.45 (SD = 1.09), with an approximately normal distribution (Skewness = 0.34; Kurtosis = -0.49).

Institutional Factors

1. **University support (PD):** Measured by the item "The university provides professional development opportunities for researchers" on a 5-point Likert scale. The mean value was 3.81 (SD = 0.98), reflecting a moderately positive perception of institutional support.

2. **Availability of international grants (OPORT):** Assessed using the question "Rate the possibility of obtaining international research grants from your perspective" on a 5-point scale (1 = very low; 5 = very high). The mean value was 3.30 (SD = 1.10).

Control Variables

1. **Language barrier (LANG):** Measured by the item "The language barrier makes it difficult for me to communicate effectively with foreign colleagues" (1 = strongly disagree; 5 = strongly agree). The mean value was 2.76 (SD = 1.23).

2. **Gender:** Coded as a binary variable (1 = female, 55.4%; 2 = male, 44.6%).

3. **Education received abroad (EDU):** Coded as a binary variable (1 = education received in Georgia, 84.6%; 2 = education received abroad, 15.4%).
4. **Academic field (Field):** Dichotomous variable (1 = hard sciences, 32.2%; 2 = social sciences and humanities, 67.8%).

(See Table 2 for a summary of descriptive statistics and operationalization details.)

Table 2. variables in the model

variables	Description	Scale
International research collaboration (IFC)	Frequency of international research collaboration	Scale: Please rate how often you engage in the following forms of scientific work on a scale from 1 to 5, where 1 = never, 2 = rarely, 3 = sometimes, 4 = often, and 5 = always.
Internationalization of Research (Inter 1)	A substantial proportion of research publications are co-authored with	Scale: Please rate how often you engage in the following forms of scientific work on a scale

	international colleagues (i.e., co-authors based outside the country)."	from 1 to 5, where 1 = never, 2 = rarely, 3 = sometimes, 4 = often, and 5 = always.
Internationalization of Research (Inter 2)	Research activities conducted in a foreign language	Scale: Please rate how often you engage in the following forms of scientific work on a scale from 1 to 5, where 1 = never, 2 = rarely, 3 = sometimes, 4 = often, and 5 = always.
Publication Frequency in Impact Factor Journals (AF)	I publish articles in international journals with an impact factor.	Scale**:** How often do you engage in the following scientific activities? 1 = Very rarely | 2 = Rarely | 3 = Occasionally | 4 = Often | 5 = Very often
Network (NetW)	I have close professional contacts with foreign researchers.	Likert Scale: 1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly agree
Research skills (RS)	I can independently plan and implement research projects.	Likert Scale: 1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly agree
Professional development (PD)	The university provides professional development opportunities for researchers.	Likert Scale: 1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly agree
Language (LANG)	The language barrier makes it difficult for me to communicate effectively with international colleagues.	Likert Scale: 1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly agree
University type (UT)	What type of university are you affiliated with?	Private 1 and Public 2
Academic Position (ACADPO)	Academic position:	1 = Professor 2 = Associate Professor 3 = Assistant Professor 4 = Lecturer/Assistant 5 = Research Staff / Scientific Staff
Opportunity (OPORT)	Access to international research grants:	*Please rate the availability of this opportunity from your perspective on a scale from 1 to 5, where:* 1 = Very low, 2 = Low, 3 = Moderate, 4 = High 5 = Very high
Academic experience (ACADEX)	Scientific experience:	*Please indicate your total years of research/scientific experience:* 1 = Less than 5 years, 2 = 5–9 years, 3 = 10–19 years, 4 = 20–29 years, 5 = 30–39 years, 6 = 40 years or more.
Education (EDU)	Knowledge acquired abroad	Knowledge acquired: 1 = Obtained in Georgia, 2 = Obtained abroad
Field (Field)		Hard - 1, Soft - 2

3.4. Statistical Analysis

To address the first research objective, data analysis was conducted using **Python 3.x** with the **statsmodels** package. A **proportional odds model (ordinal logistic regression)** was employed to identify predictors of international research collaboration. Prior to estimation, multicollinearity was assessed using the **Variance Inflation Factor (VIF)** indices. The maximum VIF value was 25.35 (C3.1), indicating the presence of some multicollinearity. Nevertheless, the main predictors remained highly statistically significant ($p < .001$), suggesting that the results are robust. Sensitivity analyses were performed using two approaches: (1) exclusion of eight outliers and (2) estimation with robust standard errors. In both cases, the results remained stable, further confirming the robustness of the findings. Hierarchical model comparisons were conducted using **likelihood ratio tests** to evaluate three nested

models: (1) a model including only control variables; (2) a model including individual-level factors; and (3) a full model incorporating both individual and institutional factors. Model fit was assessed using the **Akaike Information Criterion (AIC)**, the **Bayesian Information Criterion (BIC)**, and three pseudo R^2 measures (McFadden, Cox & Snell, and Nagelkerke). The level of statistical significance was set at **α = .05 (two-tailed)**.

4. Results

The final analytical sample consisted of **N = 332** academic researchers employed at Georgian universities. The gender distribution included **184 women (55.4%)** and **148 men (44.6%)**, indicating a slight predominance of female respondents. Regarding educational background, most participants (**n = 281; 84.6%**) obtained their higher education in Georgia, while **51 respondents (15.4%)** received higher education abroad. In terms of academic field, **107 respondents (32.2%)** represented the hard sciences, whereas **225 respondents (67.8%)** were affiliated with the social sciences and humanities.

Table 3 Descriptive Statistics for Continuous Variables

Variables	M	SD	Min	Median	Max	Skewness	Kurtosis
Dependent Variable							
International Cooperation (IFC)	3.17	1.16	1.0	3.0	5.0	-0.18	-0.71
Independent Variables							
Professional Contacts with Foreign Researchers (NETW)	3.40	1.00	1.0	3.0	5.0	-0.14	-0.40
University Support for Professional Development (PD)	3.81	0.98	1.0	4.0	5.0	-0.72	0.19
Research Skills (RS)	4.04	0.91	1.0	4.0	5.0	-0.89	0.67
Access to International Grants (OPORT)	3.30	1.10	1.0	3.0	5.0	-0.39	-0.27
Language Barrier (LANG)	2.76	1.23	1.0	3.0	5.0	0.09	-0.99

Note: *M = mean; SD = standard deviation*
Source: own elaboration

The dependent variable, Frequency of International Collaboration, has a mean value of M = 3.17 (SD = 1.16), corresponding to the category "sometimes," with a relatively symmetrical distribution. Professional Contacts show a mean value of M = 3.40 (SD = 1.00), also with an approximately symmetrical distribution. University Support has a relatively high mean of M = 3.81 (SD = 0.98) and a negative skewness (skewness = -0.72), indicating that most respondents agree on the availability of professional development opportunities. Research skills exhibit the highest mean, M = 4.04 (SD = 0.91), with a notable negative skew (skewness = -0.89), reflecting that the majority of respondents perceive themselves as capable of conducting independent research. Grant Availability has a mean of M = 3.30 (SD = 1.10), with a relatively symmetrical distribution. Finally, the Language Barrier shows a lower mean value of M = 2.76 (SD = 1.23), suggesting that respondents generally do not consider it a major obstacle.

Table 4. Distribution of International Cooperation by Demographic Variables (% of Row)

	1 = Never	2 = Rarely	3 = Sometimes	4 = Often	5 = Always
Gender					
Female	11.4%	16.8%	32.6%	21.2%	17.9%
Male	7.4%	18.2%	33.1%	32.4%	8.8%
Education					
Georgia	10.7%	18.9%	33.8%	23.5%	13.2%
Abroad	3.9%	9.8%	27.5%	41.2%	17.6%
Field					
Hard sciences	6.5%	19.6%	34.6%	31.8%	7.5%
Soft sciences	11.1%	16.4%	32.0%	23.6%	16.9%

Source: own elaboration

By gender, women were more likely to engage in international collaboration "always" (17.9% vs. 8.8%), whereas men were more likely to engage "often" (32.4% vs. 21.2%). However, this difference was not statistically significant in the subsequent multivariate analysis.

Differences by education are more pronounced: respondents who received their education abroad reported higher levels of collaboration. Among them, 41.2% reported collaborating "often," compared to only 23.5% of those educated in Georgia. Additionally, only 3.9% of respondents educated abroad reported "never" collaborating, whereas 10.7% of those educated in Georgia did so.

By academic field, 31.8% of respondents in the hard sciences reported collaborating "often," compared to 23.6% in the social sciences and humanities. Conversely, the percentage reporting "always" was higher in the social sciences/humanities (16.9% vs. 7.5%). Nevertheless, this difference was not statistically significant in the regression analysis.

Table 5. Correlations with the Dependent Variable (IFC)

Variables	Pearson r	p-value	Sig
Professional Contacts with Foreign Researchers (NETW)	0.468	<.001	***
Access to International Grants (OPORT)	0.417	<.001	***
Research Skills (RS)	0.318	<.001	***
University Support for Professional Development (PD)	0.243	<.001	***
Education Abroad (EDU)	0.153	.005	**
Academic Field (FIELD)	0.019	.734	ns
Gender (GENDER)	-0.002	.969	ns
Language Barrier (LANG)	-0.102	.063	ns

Note: ***p < .001; p < .01; ns = not significant
Source: own elaboration

Correlation analysis indicates that **professional contacts** have the strongest positive association with the dependent variable, **Frequency of International Collaboration** ($r = .468$, $p < .001$), followed by **access to grants** ($r = .417$, $p < .001$) and **research skills** ($r = .318$, $p < .001$). These correlations are moderate to strong and statistically highly significant.

The **language barrier** exhibits a weak negative correlation (r = -.102), which approached statistical significance (p = .063). This suggests that higher perceived language barriers are slightly associated with lower levels of collaboration, although the effect is not statistically significant.

Gender and **academic field** show virtually no correlation with the dependent variable (r ≈ 0), indicating that, at the bivariate level, international collaboration does not differ according to these characteristics.

Table 6. Results of Ordinal Logistic Regression: Predictors of International Research Collaboration

Predictors	B	SE	OR	95% CI	p
Individual Factors					
Professional Contacts with Foreign Researchers (NETW)	0.69	0.13	2.00***	[1.55, 2.57]	<.001
Research Skills (RS)	0.27	0.13	1.31*	[1.02, 1.68]	.038
Institutional Factors					
University Support for Professional Development (PD)	0.26	0.12	1.29*	[1.02, 1.64]	.032
Availability of International Grants (OPORT)	0.47	0.12	1.59***	[1.27, 2.00]	<.001
Control Variables					
Language Barrier (LANG)	-0.06	0.09	0.94	[0.79, 1.11]	.453
Gender (GENDER)	-0.16	0.21	0.85	[0.57, 1.29]	.452
Education Abroad (EDU)	0.57	0.28	1.77*	[1.01, 3.09]	.045
Academic Field (FIELD)	0.20	0.22	1.22	[0.80, 1.87]	.364

Note: ***p < .001, p < .05. OR = Odds Ratio; CI = Confidence Interval. Model fit: $\chi^2(8) = 128.45$, p < .001; McFadden $R^2 = .127$; Nagelkerke $R^2 = .337$; AIC = 905.3; BIC = 951.0.*
Source: own elaboration

Table 6 presents the results of the ordinal logistic regression analysis. The overall model is statistically significant ($\chi^2 = 128.45$, df = 8, p < .001), indicating that the set of predictors significantly explains variation in the frequency of international research collaboration. The model accounts for **33.7% of the variance** in the dependent variable (Nagelkerke $R^2 = .337$), which represents a satisfactory level of explanatory power for social science research (Nagelkerke, 1991; Hosmer et al., 2013).

Five of the eight predictors were statistically significant at the .05 level. The strongest predictor was **professional contacts with foreign researchers** (OR = 2.00, 95% CI [1.55, 2.57], p < .001), suggesting that a one-unit increase in this variable is associated with a twofold increase in the odds of more frequent international research collaboration. The **availability of international grants** emerged as the second strongest predictor (OR = 1.59, 95% CI [1.27, 2.00], p < .001), indicating that greater access to international funding increases the odds of collaboration by 59%.

Education received abroad also exhibited a statistically significant positive effect (OR = 1.77, 95% CI [1.01, 3.09], p = .045), underscoring the importance of international educational experience as a resource for research collaboration. In addition, **research skills** (OR = 1.31, 95% CI [1.02, 1.68], p = .038) and **university support for professional development** (OR = 1.29, 95% CI [1.02, 1.64], p = .032) demonstrated moderate yet significant positive effects on international research collaboration.

Contrary to expectations, **language barriers** (p = .453), **gender** (p = .452), and **academic field** (p = .364) did not exhibit statistically significant effects. These findings suggest that, in the Georgian context, structural and network-related factors may play a more decisive role in shaping international research collaboration than demographic characteristics or disciplinary affiliation.

Table 7 Comparison of Ordinal Logistic Regression Models

Model	Predictors	LL	AIC	BIC	R^2	$\Delta\chi^2$	df	p
M1: Control	4	-499.36	1014.7	1045.2	.011	-	-	-
M2: Individual	6	-455.12	930.2	968.3	.099	88.49	2	.001
M3: Full Model	8	-440.66	905.3	951.0	.127	28.91	2	<.001

Source: own elaboration

Hierarchical model comparisons indicated that each successive model significantly improved model fit relative to the preceding specification. The inclusion of individual-level factors (Model 2) resulted in a substantial and statistically significant improvement in fit ($\Delta\chi^2 = 88.49$, $p < .001$). The subsequent addition of institutional factors (Model 3) led to a further significant enhancement of the model ($\Delta\chi^2 = 28.91$, $p < .001$). Overall, the full model demonstrated the most favorable balance between explanatory power and parsimony, as indicated by the lowest AIC and BIC values

4.1. Sensitivity Analysis

Two independent sensitivity analyses were conducted to assess the robustness of the results. The first analysis involved the exclusion of eight outliers identified using Cook's Distance (Cook's D > .012). The results remained stable after outlier removal: **C4.1** (OR = 2.03, p < .001), **D3.1** (OR = 1.75, p < .001), **C3.1** (OR = 1.30, p = .047), and **D1.4** (OR = 1.39, p = .008). All main predictors retained their statistical significance, indicating that the findings were not driven by influential observations.

The second sensitivity analysis employed **robust standard errors (HC1)** to account for potential heteroskedasticity. The results again remained stable: **C4.1** (p < .001), **D3.1** (p < .001), and **AA3** (p = .021), with AA3 becoming more statistically significant. Together, these analyses confirm that the results are robust across alternative model specifications.

International Collaboration and Individual Research Productivity

To address the second research objective—examining the impact of international research collaboration on research productivity—**Hayes' PROCESS Model 4** (Hayes, 2018) was employed to conduct a **parallel multiple mediation analysis**. This approach allows for the simultaneous estimation of multiple mediating pathways while accounting for covariance among mediators. The mediation model tested whether the relationship between institutional factors (independent variables) and publication frequency (dependent variable) is mediated by international research activities.

Mediation effects were estimated using **ordinary least squares (OLS)** regression according to the following paths:

- **Path a:** Independent variable → mediator(s) (controlling for covariates)

- **Path b:** Mediator(s) → dependent variable (controlling for independent variables and covariates)
- **Path c:** Total effect of the independent variable on the dependent variable (controlling for covariates)
- **Path c′:** Direct effect of the independent variable on the dependent variable (controlling for mediators and covariates)
- **Indirect effects:** Product of paths a × b for each mediator

The proportion of the total effect mediated was calculated as (total indirect effect / total effect) × 100. Mediation was classified as **complete** when the direct effect (c′) became statistically insignificant while the total effect (c) remained significant, and as **partial** when both the direct and indirect effects were significant, with the direct effect reduced relative to the total effect.

Bootstrap Confidence Intervals

The statistical significance of indirect effects was assessed using **bias-corrected bootstrap confidence intervals**, following the recommendations of Preacher and Hayes (2008). A total of **1,000 bootstrap samples** were drawn with replacement from the original dataset. For each sample, path coefficients and indirect effects were estimated. A **95% confidence interval** was constructed using the 2.5th and 97.5th percentiles of the bootstrap distribution. An indirect effect was considered statistically significant if the confidence interval did not include zero. This nonparametric approach does not assume normality of the sampling distribution and provides more accurate Type I error control than traditional mediation tests (Shrout & Bolger, 2002).

Table 7 presents the **bivariate correlations** among the study variables. Publication frequency was significantly correlated with **international co-authorship** ($r = .339$, $p < .001$), **research activities conducted in foreign languages** ($r = .309$, $p < .001$), **international collaboration** ($r = .302$, $p < .001$), **research skills** ($r = .277$, $p < .001$), and **availability of international grants** ($r = .220$, $p < .001$). In contrast, **university support** exhibited a weak and statistically non-significant correlation with publication frequency ($r = .096$, $p = .081$).

Table 8. Correlation matrix

	AF	IFC	INTER 1	INTER 2	PD	RS	OPORT
AF	1.000						
IFC	0.302	1.000					
INTER 1	0.339	0.452	1.000				
INTER 2	0.309	0.542	0.354	1.000			
PD	0.096	0.243	0.116	0.139	1.000		
RS	0.277	0.318	0.207	0.299	0.284	1.000	
OPORT	0.220	0.417	0.370	0.352	0.383	0.265	1.000

Source: own elaboration

Regression diagnostics indicated an overall adequate model fit. Residuals were approximately normally distributed across most models (Shapiro–Wilk $p > .05$ or Jarque–Bera $p > .05$). Some degree of heteroscedasticity was detected (Breusch–Pagan tests), which is common in cross-sectional data;

therefore, the results should be interpreted with appropriate caution. Durbin–Watson statistics ranged from 1.97 to 2.00, indicating no evidence of problematic autocorrelation. Multicollinearity among the main predictors was within acceptable limits (VIF < 25), although several control variables exhibited moderate collinearity, as expected given the close relationships between age, experience, and academic rank. Additional sensitivity analyses (not reported) further confirmed the robustness of the main findings.

Mediation Analysis Results

Path c (total effect). Research skills significantly predicted publication frequency (B = 0.314, SE = 0.064, t(320) = 4.91, p < .001, 95% CI [0.188, 0.440], R^2 = .156), indicating that researchers with higher research skills tend to report higher publication output.

Path a (predictor to mediators). Research skills significantly predicted all three mediators: international collaboration (B = 0.364, p < .001), international co-authorship (B = 0.205, p = .002), and conducting research in foreign languages (B = 0.349, p < .001). Higher levels of skills were thus associated with greater engagement in international research activities.

Paths b and c′ (full model). When all three mediators were included simultaneously along with the predictor and control variables, two mediators—international co-authorship (B = 0.174, p = .002) and research conducted in foreign languages (B = 0.144, p = .024)—significantly predicted publication frequency. In contrast, international collaboration was not a significant predictor (B = 0.063, p = .290). The direct effect of research skills remained statistically significant after controlling for the mediators (c′ = 0.205, p = .002), indicating **partial mediation** (see Table 8).

Table 9. Mediation Analysis Summary

Predictor	Total_B	Total_p	Direct_B	Direct_p	Indirect	Prop_Mediated	Type
University support	0.061	0.380	0.014	0.826	0.046	0.000	NO SIGNIFICANT EFFECTS
Research skills	0.314	0.000	0.205	0.002	0.109	34.634	PARTIAL MEDIATION
Grant accessibility	0.179	0.003	0.023	0.713	0.155	86.921	FULL MEDIATION

Source: own elaboration

The **total indirect effect** was 0.109, accounting for **34.6% of the total effect**, as confirmed by bootstrap analysis (95% Boot CI [0.049, 0.172]). Significant indirect effects were observed through **international co-authorship** (0.036, 95% Boot CI [0.008, 0.072]) and **research conducted in foreign languages** (0.050, 95% Boot CI [0.004, 0.100]), whereas the pathway through international collaboration was non-significant. These findings indicate **partial mediation**, with research skills influencing publication output both directly (65%) and indirectly via international research activities (35%). The direct effect reflects the contribution of skills to enhancing research quality, topic selection, and time management, while the indirect effects suggest that researchers with higher skills are better positioned to engage in **international co-authorship** and produce research in **foreign languages**.

Table 10. Bootstrap Confidence Intervals

Predictor	Mediator	Indirect	CI_Lower	CI_Upper	Significant
Research skill	International collaboration	0.022	-0.022	0.067	No
Research skill	International co-authorship	0.036	0.008	0.072	Yes

Research skill	Research in a foreign language	0.048	0.004	0.100	Yes
Research skill	TOTAL	0.106	0.049	0.172	Yes
Research Grant accessibility	International collaboration	0.035	-0.018	0.086	No
Research Grant accessibility	International co-authorship	0.054	0.017	0.095	Yes
Research Grant accessibility	Research in a foreign language	0.062	0.013	0.109	Yes
Research Grant accessibility	TOTAL	0.153	0.092	0.222	Yes

Source: own elaboration

The availability of international grants significantly predicted publication frequency ($B = 0.179$, $p = .003$, $R^2 = .117$). Grant availability also strongly predicted all three mediators: international collaboration ($B = 0.425$, $p < .001$), international co-authorship ($B = 0.308$, $p < .001$), and research conducted in foreign languages ($B = 0.367$, $p < .001$).

In the full mediation model, international co-authorship ($B = 0.177$, $p = .002$) and research in foreign languages ($B = 0.176$, $p = .007$) significantly predicted publication frequency, whereas the direct effect of grant availability became non-significant ($c' = 0.023$, $p = .713$), indicating full mediation. The total indirect effect was 0.155, accounting for 87% of the total effect, with significant indirect effects through co-authorship (0.055) and research in foreign languages (0.065).

These results suggest that access to international grants influences publication output primarily by facilitating engagement in international research activities, rather than through a direct impact on research productivity.

Table 11. Regression results

Variable	B	SE	t	p	CI_Lower	CI_Upper	Sig
Intercept	0.547	0.538	1.017	0.310	-0.512	1.606	
Research skills	0.205	0.065	3.149	0.002	0.077	0.333	**
International collaboration	0.063	0.059	1.061	0.289	-0.054	0.179	
International co-authorship	0.174	0.056	3.115	0.002	0.064	0.283	**
Research in a foreign language	0.144	0.064	2.269	0.024	0.019	0.269	*
University type	0.171	0.127	1.340	0.181	-0.080	0.421	
Academic rank	-0.143	0.063	-2.256	0.025	-0.268	-0.018	*
Gender	-0.079	0.112	-0.701	0.484	-0.300	0.142	
Academic experience	0.087	0.067	1.292	0.197	-0.045	0.219	
Age	-0.063	0.040	-1.599	0.111	-0.141	0.015	
Institutional mechanisms	0.014	0.055	0.260	0.795	-0.094	0.122	
Education abroad	0.380	0.157	2.424	0.016	0.072	0.688	*
Academic field	-0.243	0.120	-2.018	0.044	-0.480	-0.006	*

Source: own elaboration

University-provided professional development support did not significantly predict publication frequency in the full-effects model ($B = 0.061$, $p = .380$). While institutional support was positively

associated with international collaboration ($B = 0.223$, $p = .002$) and research in foreign languages ($B = 0.147$, $p = .028$), its overall effect on publication outcomes was not significant. This null finding may reflect heterogeneity in the quality or relevance of professional development programs or suggest that generic institutional support is less effective than research-specific resources in promoting productivity.

5. Conclusion

This study examined the determinants of research internationalization among academic staff in Georgian higher education institutions and assessed its impact on research productivity. The findings identify five statistically significant predictors of international research collaboration: professional contacts with foreign researchers, access to international grants, education received abroad, research skills, and university support for professional development. Among these, professional networks and grant accessibility emerged as the most influential factors, underscoring the central role of social capital and financial resources in driving internationalization in resource-constrained academic environments.

The mediation analyses revealed that the relationship between institutional resources and research productivity operates primarily through specific international research activities — namely, international co-authorship and research conducted in foreign languages — rather than through direct pathways. Notably, access to international grants influenced publication output almost entirely via these mediating mechanisms, accounting for 87% of the total effect. These findings suggest that mere participation in international activities is insufficient; it is the tangible outputs of collaboration — co-authored publications and foreign-language research — that drive productivity gains.

Beyond the Georgian context, these findings carry broader theoretical implications for understanding research internationalization in post-Soviet and other transitional higher education systems. The results align with and extend the self-organization theory of international research collaboration (Wagner & Leydesdorff, 2005), demonstrating its applicability in peripheral academic environments characterized by structural constraints and historical isolation from global knowledge networks. The mediation patterns identified in this study are likely to operate similarly in comparable systems across Central and Eastern Europe, Central Asia, and the South Caucasus, offering a transferable analytical framework for future research.

From a policy perspective, the findings suggest that investments in international networking, grant accessibility, and overseas educational experiences yield greater returns for research productivity than generic institutional support programs. Universities and policymakers seeking to enhance research capacity should therefore prioritize targeted internationalization strategies — including support for international conference participation, visiting researcher programs, and grant application assistance — over broad professional development initiatives.

Future research should address the limitations of the current study by employing longitudinal designs to establish causal relationships, expanding the sample to include a broader range of institutions, and examining the role of disciplinary differences in shaping internationalization outcomes. Comparative studies across post-Soviet or transitional systems would further strengthen the generalizability of these

findings and contribute to a more comprehensive understanding of research internationalization as a global phenomenon.

Discussion

The study identified five significant predictors of international research collaboration among Georgian academic staff. The strongest predictor was professional contacts with foreign researchers, which doubled the likelihood of engagement in international collaboration, highlighting the central role of social capital and personal networks. Access to international grants also had a strong effect, underscoring the critical role of financial resources in facilitating international partnerships and creating a virtuous cycle for research engagement.

Education received abroad was associated with a 77% increase in the likelihood of collaboration, indicating the enduring value of international educational experiences in terms of network formation, language proficiency, and cross-cultural competence. Institutional factors, specifically university support and research skills, showed moderate but significant effects on internationalization. Unexpectedly, language barriers, gender, and academic field did not significantly affect collaboration, which may reflect the increasing prevalence of English in academia or relatively equal access to international collaboration across demographic groups.

The study also revealed a complex relationship between research internationalization and productivity in the Georgian context. Mediation analyses confirmed that internationalization affects research output through three channels: international co-authorship, research conducted in foreign languages, and formal international collaboration. Only the first two were statistically significant.

International co-authorship emerged as a strong mediator: researchers who publish with colleagues abroad achieve significantly higher productivity, consistent with prior findings (Kwiek, 2016; Adams et al., 2018). In the Georgian context, co-authorship provides access to quality resources, advanced methodologies, and pathways to international journals. Research conducted in foreign languages also proved important, enabling participation in international conferences, access to global literature, and publication in high-impact outlets. In contrast, formal international collaboration alone was not a significant predictor of productivity, suggesting that mere participation in international projects does not guarantee tangible output; specific co-authored publications are necessary to enhance research performance.

Two distinct mediation patterns were observed. For research skills, partial mediation (34.6%) was found: research skills influenced productivity both directly (65%) and indirectly through international activities (35%). The direct effect ($c' = 0.205$, $p = .002$) indicates that highly skilled researchers are successful independently as well. In contrast, for international grants, nearly full mediation (87%) was observed. Grant availability affects productivity almost entirely by promoting international research activities rather than directly improving output.

Finally, university professional development support did not significantly influence productivity ($B = 0.061$, $p = .380$), despite moderate institutional support scores. This may reflect heterogeneity in program

quality, limited implementation effectiveness, or the limited impact of generic professional development compared to research-specific resources.

Theoretical Contribution

This study extends the theory of self-organization (Wagner & Leydesdorff, 2005) and the pragmatism framework (Melin, 2000) to the post-Soviet higher education context. Kwiek's (2020) typology of internationalists and locals is largely confirmed, although in Georgia, internationalization appears to be an evolving process rather than an established distinction. The unique theoretical contribution of this study lies in the detailed examination of mediational mechanisms, demonstrating that the relationship between internationalization and research productivity is complex. Specifically, international co-authorship and research conducted in foreign languages serve as critical transformative pathways linking researcher capabilities and institutional resources to academic output.

Limitations

The study has several limitations. First, A central methodological limitation of this study is its cross-sectional design, which restricts the interpretation of findings to associations rather than causal relationships. Although the mediation analyses provide insights into potential mechanisms linking internationalization to research productivity, the absence of longitudinal data means that temporal precedence — a prerequisite for causal inference — cannot be established. Specifically, it is plausible that reverse causality operates in some pathways; for example, researchers with higher publication output may attract more international collaboration opportunities, rather than collaboration driving productivity. Future studies should employ longitudinal or panel data designs to disentangle these relationships and establish more robust causal claims.". Second, although the sample size meets minimum requirements, a larger sample would provide more stable estimates and allow examination of interaction effects. Third, some degree of multicollinearity remained among predictors (maximum VIF = 25.4), although sensitivity analyses confirmed the robustness of the main findings. Fourth, the proportional odds assumption could not be formally tested due to software limitations; future research should verify this using specialized tools. Finally, the focus on the Georgian context may limit generalizability to other national or regional settings.

Recommendations

Despite these limitations, the study offers practical insights for higher education policy and management. Universities should actively promote international professional networks, for example through support for international conference attendance, visiting researcher programs, and collaborative research initiatives. Institutional policies should facilitate access to international grants by raising awareness of funding opportunities and providing assistance in grant application preparation. The importance of international educational experience highlights the value of research visits abroad, particularly within PhD programs. Finally, institutional structures should ensure research skills and targeted professional development opportunities to maximize the potential benefits of internationalization on research productivity.

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All substantive content, analytical components, interpretations, and institutional judgments contained in this document were developed by the authors. The authors assume full responsibility for the accuracy, integrity, and authenticity of the information presented.

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Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request, subject to institutional data governance guidelines. The analytical scripts used for data processing and model estimation were developed in Python 3.x and are likewise available upon request.

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