国立大学法人 一橋大学 森有礼高等教育国際流動化機構

Working Paper Series
Mori Arinori Institute for Higher Education and Global Mobility

No.WP2024-01

Stay, Return, or Relocate: Destination of Asian Ph.D. Graduates from the United Kingdom and the United States

Yukari Matsuzuka, Marcel Gérard, and Kazuhiro Fukazawa

2024年4月

HITOTSUBASHI UNIVERSITY

Stay, Return, or Relocate: Destination of Asian Ph.D. Graduates from the United Kingdom and the United States

Yukari Matsuzuka[1]*, Marcel Gérard,[2] and Kazuhiro Fukazawa[3]

April 10th, 2024

ABSTRACT

This study explores the career destinations of Asian students who obtained their Ph.D. degrees in the United States or the United Kingdom. Utilizing a unique dataset comprising the educational and career profiles of over 650 individuals from Korea, Japan, Southeast Asia, and China who completed their Ph.D. between 1986 and 2015, we found that: (1) mobility trends significantly vary by origin, with those sponsored by their home countries more inclined to return post-graduation; (2) recipients of Ph.D. degrees in the U.S. show a lower propensity to return to their home countries compared to their counterparts in the U.K.; and (3) aside from the U.S., countries financing their citizens' education abroad generally achieve social returns on their investment, aligning with the traditional human capital hypothesis.

JEL: F22, H52, I23

Keywords: mobility of highly skilled; career pathways; Asian doctoral degrees received in the U.S. and the U.K.; economic and social return on education

[1] Hitotsubashi University, Mori Institute for Higher Education and Global Mobility. E-mail address: y.matsuzuka@r.hit-u.ac.jp ORCID: 0000-0002-9262-4616 *Corresponding author
Address: Isono Bldg.#422, Hitotsubashi University, Naka 2-1, Kunitachi-city, Tokyo, Japan, 186-8601
Tel No.: +81 42 580 8861
[2] Université catholique de Louvain, Louvain School of Management and LouRIM, CESifo and JSPS. E-mail address: marcel.gerard@uclouvain.be
[3] Hitotsubashi University, Mori Institute for Higher Education and Global Mobility, Center for Global Online Education. E-mail address: k.fukazawa@r.hit-u.ac.jp

This study is supported by the Japan Ministry of Education, Culture, Sports, Science and Technology, through Kaken (17H02678 and 20H00097) and by the Japan Society for the Promotion of Sciences through JSPS Invitational Fellowships for Research in Japan (S19137).

1. Introduction

International institutions have observed three key trends concerning the mobility of higher education students and graduates who cross international borders for study or training. Firstly, this mobility is on the rise. According to the UNESCO Institute for Statistics (UIS), the population of mobile students enrolled in tertiary education programs has seen substantial growth over the past two decades. In 2000, the global count of international students stood at approximately 2.1 million. By 2019, this figure had escalated to 6.1 million, nearly tripling in two decades. Remarkably, even after the onset of the COVID-19 pandemic, the number of international students not only remained steady but increased to 6.36 million in 2020[4]. Predominantly, these international students are pursuing graduate-level education. On average, across the Organisation for Economic Co-operation and Development (OECD), 13% of master's and 22% of doctoral students are international, indicating a significant presence in graduate programs (OECD, 2019).

Secondly, the motivations behind migration are multifaceted, particularly among younger demographics. The United Nations, in its special issue titled "Youth and Migration" (2013), highlighted that youth migration stems from a complex mix of personal, socio-economic, and political factors from their countries of origin. While some migrations are forced, due to factors such as poverty, violence, or natural disasters, a large portion of international students migrate voluntarily for reasons tied to pivotal life transitions, including higher education and employment opportunities.

Thirdly, migration tends to have a positive impact on migrants, providing them with new opportunities for higher education, employment, professional development, and personal growth. This enhances not only their self-confidence but also their skill sets, benefiting both their home and host countries. The global knowledge economy intensifies competition for highly skilled workers, who are pivotal to knowledge creation, innovation, and economic growth. This context underpins our investigation into the interrelation between education and career mobility and its variation based on the origin and destination countries of international students and workers.

We focused on students originating from Asia and hosted by the United States (U.S.) or the United Kingdom (U.K.). The U.S. and U.K. are the top two recipients of international students worldwide, and have the largest Asian student enrollments, particularly in doctoral programs. In the *2017 Doctorate Recipients from U.S. Universities* report, the National Science Foundation (2018) reported that twenty of the top forty origin countries of temporary visa holders who earned doctorates from U.S. colleges and universities were Asian countries, with 12,391 of them representing 83% of all

[4] The data was extracted on March 21, 2023 from UIS Stat available at the following site: http://data.uis.unesco.org/ under the "Number and rates of international mobile students (inbound and outbound)" list.

doctoral recipients who were temporary visa holders.[5] According to the Institute of International Education (2019), during the 2018–2019 period, 279,766 Asian international students enrolled in graduate courses in the U.S., comprising 74% of all international students in graduate programs.[6] Although the share of Asian students in the U.K. is not as large as in the U.S., it is still substantial. According to the Higher Education Statistics Agency (2020), of the 46,470 non-EU students enrolled in U.K. postgraduate research programs in the 2018–2019 academic year, 14,535 (31%) were from Asia.[7] Of the top ten countries that sent students to the U.K., six were Asian (China, Hong Kong, India, Malaysia, Singapore, and Thailand).[8] These statistics moved us to investigate what happens to this large number of Asians following their U.S. or the U.K. studies.[9]

This study examines the destinations of Asian Ph.D. holders from U.K. or U.S. universities and the economic implications of their mobility. Our analysis is grounded in economic theories explaining the mobility of highly skilled individuals and examines the influence of educational funding on such mobility. We hypothesize, as per the human capital hypothesis, that investment in education and training yields returns, not only for the individual but also in the form of societal benefits, including economic growth and social welfare enhancements.

The paper is organized as follows: The next section reviews literature on global mobility and its economic impacts, and funding's effect on mobility, laying the groundwork for our analytical model. Section 3 describes our empirical analysis, utilizing a unique dataset to explore the educational and career pathways of Asian Ph.D. recipients from the U.S. and U.K., and the impact of funding on their careers. Section 4 discusses our findings within the context of existing literature, and Section 5 concludes with suggestions for future research.

2. Literature Review, Theoretical Frameworks, and Analytical Approach

The study of mobility within higher education has significantly evolved over recent decades, with numerous seminal works contributing to our understanding. Gürüz (2008) offered an extensive review of the international mobility of students, scholars, programs, and institutions within the global knowledge economy. Brooks and Waters (2013) discussed theoretical and empirical aspects of student

[5] Calculated by authors based on Table 25 of the National Science Foundation's (2018) report titled "Top 40 countries or economies of origin of temporary visa holders earning doctorates at U.S. colleges and universities, ranked by the number of doctorate recipients: 2017."
[6] Data available from the Institute of International Education's (2019) book titled "*2019 Open Doors"* under "International-Students-Places-of-Origin."
[7] See Table 28. Non-U.K. HE students by HE provider and country of domicile, available at the following link: https://www.hesa.ac.U.K./data-and-analysis/students/table-28.csv
[8] Computation based on Higher Education Statistics Agency (2020)
[9] Mobile Asian individuals are deemed to have a larger earning capacity than their immobile colleagues do. The strong positive effects on employability, earnings, and promotion have been reported in Japan by Yokota (2016). A theoretical and empirical study by Matsuzuka and Gérard shows that Japan loses approximately US$423,721 for each international student that remains in the host country for life (Matsuzuka & Gérard, 2022).

mobility, migration, and the globalization of higher education, including case studies from East Asia, mainland Europe, and the U.K. Streitwieser (2014) compiled a series of essays on the rapid internationalization of higher education, addressing trends, challenges, and implications. Chiswick (2011), and Chiswick and Miller (2014) emphasized the critical role of high-skilled immigration in the global labor market and highlighted higher education's contribution to this trend.

Higher education has increasingly served as a conduit for skilled migration, a phenomenon often described as "two-step migration" (Hawthorne, 2010; OECD, 2010). In several countries, this process forms part of a strategic approach to attract skilled individuals amidst a global competition for talent. Despite challenges posed by immigration policies and domestic labor conditions, English-speaking countries such as the U.S., the U.K., Canada, and Australia have developed distinct strategies to manage the influx of highly skilled migrants (Gregory, 2015; Harrap et al., 2021; She and Wotherspoon, 2013). Felbermayr and Reczkowski (2014) explored the benefits host countries gain from an increased pool of foreign talent, suggesting that the costs associated with educating international students are likely offset by the value these individuals bring.

The prospect of working in the host country post-graduation holds considerable appeal for international students. Through a survey conducted among students in three U.K. and two U.S. universities, Baruch, Budhwar, and Khatri (2007) identified the labor market perception in the host country, adjustment processes, and family ties in both host and home countries as pivotal factors influencing students' decisions to stay or return. Research on Chinese students by Cao, Zhu, and Meng (2016) further corroborated the significance of financial aid, employment prospects, and institutional quality in the host country as major determinants of international academic mobility. Similarly, Zhai, Gao, and Wang (2019) identified academic requirements, employment opportunities, environmental factors, and social connections as key motivators for Chinese students opting for education in Australia.The interaction between international students and their host countries and institutions has given rise to a marketplace dynamic, where the needs of both parties align. Findlay, King, and Stam (2016), and Findlay, McCollum, and Packwood (2017) emphasized the role of marketing and recruitment efforts by universities in shaping student mobility patterns. Van Bouwel and Veugelers (2012, 2014) observed that the most talented scholars, particularly those who pursued Ph.D.s in economics in the U.S., tend to remain in North America at prestigious institutions, illustrating an "elite brain drain" from Europe.

Our study also considers the impact of educational funding on mobility patterns. Gérard and Uebelmesser (2014b) gathered studies that covered various aspects of education funding and student mobility issues, including fiscal policy such as those concerning income-contingent loans (Barr, 2014; Del Rey and Racionero, 2014), migration, and brain gain (Haupt, Krieger, & Lange, 2014), and interrelation among financing, mobility and economic development (Gérard & Uebelmesser, 2014a). Usher et al. (2010) noted that while financial considerations might not influence the choice of study, they significantly affect decisions regarding the location of study. This observation raises complex

questions under the human capital hypothesis about the returns on investment in education, especially when students or workers choose to remain abroad. Demange, Fenge, and Uebelmesser (2014) highlighted the economic incentives for countries to attract skilled workers, noting the shifting dynamics of education cost and benefit realization. Gérard (2012) critiqued the sustainability of current financing models, proposing alternatives like origin-country financing through vouchers and inter-jurisdictional transfers. This body of work informs our exploration of how financial structures might influence the mobility of international students and workers.

2.1. The interplay at work and modeling "à la Borjas"

Figure 1 illustrates the dynamics between origin, host, and potential destinationfor internationally mobile students. Envision a scenario where a social planner relocates an individual from point *i* to point *j* to evaluate the impact on global welfare. This narrative initiates at the blue node on the left, signifying a graduate (holder of a B.A., B.Sc., or equivalent) faced with the prospect of pursuing advanced studies (Ph.D. or M.D.) abroad, represented by the upper green node in Figure 1. Alternatively, the individual might decline this opportunity or not pass the entry exam, leading to a pathway that doesn't involve further education abroad, indicated by the lower green node.
A student who successfully completes their doctoral studies abroad faces three potential paths: staying in the host country (*j)*, returning to their origin country, or moving to a third country for employment opportunities—depicted as the top, middle, and bottom orange nodes on the right of Figure 1, respectively.

This model, inspired by Borjas (1987), posits that potential migrants weigh the long-term returns against the costs of migration. It suggests that the social welfare of the origin country (*i*) can be optimized through the equation:

$$W^i = \theta f\left(n_{ji}\right) + q_{ji} n_{ji} - \gamma_{ji} n_{ji} - c n_{ji} - w n_{ji}, \tag{1.1}$$

Here, $f\left(n_{ji}\right)$ represents the productivity function of individuals *i* who completed their undergraduate studies in their home country, with $f'\left(n_{ji}\right)$ and $f''\left(n_{ji}\right)$ denoting the first and second derivatives, respectively, constrained to non-positive values. The model presupposes that $f\left(n_{ji}\right) = n_{ji}^{\sigma}, 0 < \sigma < 1$. This productivity function transforms individuals into specialists if they pursue advanced degrees abroad, incorporating international experience. The parameter θ is a scale factor on the production side: the gain from enlarged mobility is higher in industries that are less country-specific. Moreover, *q* is a positive externality delivered for free, γ is the excess of tuition fees over the real cost of studies *c* supported by the education producer, and *w* stands for the social opportunity cost, illustrating that

students do not contribute to GDP. All flows are discounted over a very long period and represented by perpetuities. It turns out that, under the supervision of the benevolent social planner, the efficient number of migrants becomes proportional to a series of variables.

$$n_{ji}^{E} \propto \left[\frac{\sigma\theta}{\gamma_{ji} + c + w} \right]^{\frac{1}{1-\sigma}} \tag{1.1}$$

The efficient number of migrants, as computed by the social planner, increases with incoming migrant productivity and the complementary nature of the excess tuition fees; but it decreases with the social opportunity cost, cost of delivering higher education, and excess tuition fees. Equation (1.2) can show *the effect of the economic institutions at stake* (i.e., to answer questions like "What is the respective effect of a change in *c* and/or a change in *w* on efficient migration*?"*). The answer is not obvious and refers to the meaning of the actual variables. When inspecting Figure 1 and Equation (1.1), it is important to distinguish which partner must support which cost to obtain which benefit.

2.2. Analyzing the Distribution of Costs and Benefits Across Destinations

The decision-making process illustrated in Figure 1, particularly at the brown nodes, underscores a complex interdependence among choices related to the origin, host, and potential destination countries of mobile students. A pivotal economic inquiry emerges from this scenario: How should the costs and benefits of the migration process be allocated among the student, origin, and host countries? This allocation might follow the principles of efficiency and equity, each bearing distinct implications. Efficiency suggests the creation of a system where the outcomes of decentralized decision-making mirror those of a centralized approach. Achieving this involves internalizing externalities, a challenging endeavor given the potential divergence between the objectives of students and countries. Equity, on the other hand, invokes social values in the distribution process, aligning with concepts such as those proposed by Bentham or Rawls[10].

Table 1 delineates the benefits and costs associated with different financing principles — namely, the host country principle, where the host country bears all costs of education, and the origin country principle, where the origin country assumes these costs. These costs encompass tuition, travel, living expenses abroad, and opportunity costs — the latter representing the economic loss a country incurs when its residents are students rather than contributing workers.

Under the host country principle, if an enriched graduate remains in the host country, it benefits from the individual's contributions, albeit at an opportunity cost to the origin country. Conversely, if the graduate returns, the host country forfeits its investment, while the origin country reaps the rewards of this 'enriched' individual. Adhering to the origin country principle entails the origin country bearing

[10] See Atkinson and Stiglitz (1976) and Gérard, Gilson, and Ruiz (2012) for detail.

all costs of study abroad, benefiting proportionally to the number of returnees. This framework positions the host country advantageously in attracting students, rendering the origin principle potentially more appealing to students and necessitating further econometric analysis to uncover the motivations behind the migration of highly skilled individuals.

3. Empirical Analysis

The majority of existing research on the impacts of studying abroad has predominantly focused on the enhancements to students' career prospects and personal development. Maddux et al. (2013) demonstrated the beneficial effects of multicultural engagement during international studies, particularly within Master of Business Administration (MBA) programs, on subsequent job market success. Similarly, Malony, Sowter, and Botts (2011) provided an insightful analysis from the perspective of employers, drawing on a survey of corporate recruiters to assess the value placed on skills and experiences acquired through overseas study. Notwithstanding, there has been limited investigation into the trajectories of individuals who have pursued their studies abroad, including their origins, destinations prior to studying abroad, and subsequent career paths. One of the notable studies in this vein is from the Academic Cooperation Association (2005), which conducted a survey among international students in the United States to gather information on their activities or status before their studies, alongside their demographic and regional backgrounds, and academic preparations prior to arriving in the United States[11]. Additionally, the National Science Foundation (NSF) in the U.S. periodically conducts surveys with doctoral recipients to collect comprehensive data on their educational histories, demographic details, and future plans post-graduation[12]. In the U.K., Universities UK International (2019) reported the medium-term destinations and career outcomes of EU and non-EU graduates of U.K. universities. They investigated these graduates' job types and wages and found that most international graduates return to their home country to work, finding clear evidence that U.K. graduates play an essential role in filling skill shortages in their home countries (p. 28).

While these studies provide valuable insights, they predominantly rely on self-reported data, recalling international students' and graduates' experiences and achievements. In contrast, the present study utilizes a distinct dataset comprising academic and career profiles of individuals who have completed doctoral studies in the U.S. or U.K., offering a more objective and comprehensive analysis of the pathways followed by these highly skilled individuals.

3.1. Data Collection and Sample Description

[11] Sourced from a U.S. country report on page 47 of *Perceptions of European Higher Education in Third Countries: Final Report,* authored by ACA.
[12] See the latest report for a survey of earned doctorates in National Science Foundation (2019), and for a survey of doctorate recipients in National Science Foundation (2020).

This study's dataset encapsulates the educational and professional trajectories of individuals who earned doctoral degrees from institutions in either the United States (U.S.) or the United Kingdom (U.K.). It includes detailed records ranging from bachelor's degrees to doctoral qualifications and encompasses current employment data, thereby constructing comprehensive career pathways of these highly skilled individuals. The methodology for assembling this dataset is inspired by the approach of Van Bouwel and Veugelers (2012), originally applied to investigate the academic trajectories of European economists with Ph.D.s from North American institutions.

To compile our dataset, we initially utilized the ProQuest Dissertation database to identify Ph.D. recipients in the field of economics. Subsequently, we expanded our search to include EBSCO Open Dissertations, enhancing our coverage of U.K.-based graduates. This approach enabled us to amass a larger sample size, crucial for a robust analysis of graduate outcomes. Our research mirrors Van Bouwel and Veugelers by concentrating on a single discipline — economics — to minimize the variability attributed to differences in academic and labor market dynamics across fields. The geographic focus was on East and Southeast Asia, targeting countries with significant student migration to the U.S. and U.K., namely China (including Taiwan, Hong Kong, and Macao), Japan, Korea[13], the ASEAN 10 nations, and East Timor. The dataset was constructed through the following steps:

- Identification of Asian Ph.D. graduates from the U.S. and U.K. within selected doctoral dissertations databases. The origin countries of these graduates were determined using a mix of indicators: nationality (as listed in their vitae), name and spelling analysis, and the location of their undergraduate education.
- Collection of public vitae and career profiles via internet searches, focusing on institutional or personal websites. This information was anonymized and systematically cataloged for subsequent analysis.[14]

Our sample predominantly includes individuals who completed their Ph.D.s between 2006 and 2010, facilitating a detailed examination of their career paths over a decade or more. Due to a lower number of Ph.D. recipients from countries other than China within this timeframe, we extended the period from 2005 to 2015 to ensure a robust sample size. This expansion was necessary to achieve statistically significant insights. Table 2 presents the distribution of our sample across origin countries and the years Ph.D.s were awarded.

[13] In our dataset, most students from Korea are estimated to come from South Korea, but some students from North Korea are possibly included because we use name and spelling analysis to determine their origin country.
[14] Although the vitae are all publicly available information, the names in the vitae and all other personally identifying information were removed from the database prior to analyses.

This methodical approach to data collection and analysis sets the stage for an in-depth exploration of the impact of international doctoral studies on the career outcomes of Asian graduates in the fields of economics.

3.2. Assumptions and Variable Identification

Our statistical analysis is structured around two primary explorative inquiries: (1) examining the mobility patterns, or "interplay," among origin, host, and destination countries within the context provided by Figure 1, and (2) investigating the relationship between these mobility patterns and the nature of doctoral study sponsorship, as informed by the financing principles outlined in Table 1. This approach is inherently exploratory, eschewing rigid hypotheses in favor of more flexible assumptions to dissect the following dimensions:

1) **Mobility Patterns by Origin and Host Countries** We postulate the existence of discernible mobility patterns among doctoral students, influenced by their countries of origin and the countries that host their studies. Upon completing their doctoral degrees, these individuals might opt to either remain in their host country, return to their country of origin, or relocate to a third country. For this analysis:
   a) Origin countries are defined as Japan, China, Korea, and nations within Southeast Asia.
   b) The U.S. and U.K. are considered as host countries.

2) **Influence of Funding on Mobility Patterns** Furthermore, we hypothesize that the mobility patterns of doctoral graduates are significantly shaped by the source of their funding. The financing principles depicted in Table 1 suggest that under the host country principle—where the host country bears the costs of education—the host nation has an incentive to retain graduates, particularly those who significantly contribute to its economy. Conversely, the origin country principle posits that the country of origin, being the funder, aims to ensure the return of its educated individuals, expecting them to enhance the domestic economy with their acquired skills. Therefore, our analysis incorporates variables related to:

   a) Instances where students received funding from their country of origin.

   b) Instances where students were funded by their host country.

3.3. Estimation

3.3.1 Mobility Patterns: Interplay Among Origin, Host, and Destination Countries

To delve into the mobility patterns of doctoral graduates, we first delineated their origin countries (identified by the location of their bachelor's degree), host countries (where they completed their Ph.D.s), and destination countries (post-Ph.D. work and residence). Origin countries were ascertained using a

mix of indicators: (a) listed nationalities in the vitae, (b) analysis of names and spellings, and (c) the location of the institution awarding their first undergraduate degree.

As illustrated in Table 3, our dataset included graduates from Japan (99), China (156), Korea (193), and Southeast Asian countries (108), all of whom earned their doctoral degrees in economics from either the U.S. or the U.K. The subsequent job locations of these individuals post-graduation revealed distinct patterns: those from China and Korea exhibited a higher propensity to stay in their host countries, especially in the U.S., while graduates from Japan and Southeast Asia were more likely to return to their countries of origin.

To statistically validate the observed mobility patterns, we employed Probit regression analyses to estimate the likelihood of graduates returning to their origin countries versus staying in the host country or moving to a third country. The regression formula is as follows:

$$Pr.\left(Y = 1 \mid X\right) = \Phi(X^T b),$$

where *Pr.* denotes probability, supposing variable Y is binary with two possible outcomes (1=return to origin country to work, and 0=stay in host country or move to a third country to work). X denotes a vector of the regressor(s) that is/are assumed to influence the outcome Y (i.e., the origin countries and the host countries of mobile students), Φ is the cumulative distribution function of the standard distribution, and the parameter(s) b are estimated by maximum likelihood.

Table 4 presents the regression results, exploring the effects of studying in the U.S. versus the U.K. (Regression 1), the impact of the graduates' origin countries (Regression 2), and a combined analysis incorporating both host and origin country variables (Regression 3).

The findings confirm a significant host country effect, with those studying in the U.S. less likely to return to their origin countries. The origin country also plays a critical role; graduates from China show a lower propensity to return, whereas those from Japan and Southeast Asia demonstrate a higher likelihood of returning to work in their countries of origin. Interestingly, the impact of Korean origin becomes less pronounced in the combined regression model.

These insights, framed within the context of Figure 1, elucidate the nuanced dynamics of doctoral graduate mobility and highlight the significant influence of both the host and origin countries on post-graduation career paths.

3.3.2 Mobility Pattern and Funding: The Impact of Sponsorship

In line with the financing principles delineated in Table 1, we hypothesized that the sponsorship source—whether the origin country (origin country principle) or the host country (host country

principle)—significantly influences where international doctoral students choose to work post-graduation. To explore this, we examined the career trajectories of doctoral students in relation to their funding sources, focusing on whether sponsorship affects the likelihood of students staying in the host country, returning to their origin country, or moving to a third country.

Using data from personal profiles detailing grants, scholarships, and funding received after their bachelor's degree and before completing their doctoral studies, we categorized funding sources and analyzed their impact on post-Ph.D. job locations. Table 5 and Table 6 present the distribution of funding sources by origin country and the sponsor country's role (host, home, or third country), indicating a diverse array of funding paths. They revealed that Students from Japan, China, Korea, and Southeast Asia displayed varied propensities for receiving funding from different sources, with a notable portion of funding originating from host countries, especially for those studying in the U.S.

The core of our investigation, represented in Table 8, examines the relationship between funding sources and doctoral graduates' employment locations, emphasizing the distinctions between the host and origin country principles. Our findings suggest:

- Graduates sponsored by the host country are more inclined to work within that country, aligning with the host country principle.
- Conversely, those funded by their origin country tend to return there for employment, consistent with the origin country principle.

Table 9 quantifies these associations, showing statistically significant correlations between sponsorship sources and job locations. Notably, sponsorship by U.S. and U.K. organizations strongly correlates with employment in these countries, underscoring the influence of funding on mobility patterns.

Further probing these relationships through regression analysis (detailed in Table 10), we discovered:

- Sponsorship by the origin country significantly increases the likelihood of graduates returning to work there, as indicated by a positive coefficient in both regression models.
- Interestingly, U.S. sponsorship emerged as a positive factor for staying or returning, suggesting a nuanced role of host country funding in shaping career paths.

These results affirm the pivotal role of sponsorship in determining the mobility and employment outcomes of doctoral graduates, highlighting a complex interplay of financial support, personal choices, and national policies. They suggest that while enriched individuals tend to gravitate towards the country financing their education, the dynamics of such movements are influenced by a multitude of factors, including the type of sponsor and the graduate's country of origin.

This section elucidates the significant yet varied impact of doctoral study sponsorship on post-graduation employment locations, contributing to a deeper understanding of the global flow of academic talent.

3.3.3 Employment Sectors of Asian Ph.D. Holders

Our investigation extended to the sectors that employ Asian Ph.D. holders, focusing on whether they find positions within universities, research organizations, or other types of institutions. The findings, summarized in Table 11, categorize employment by the origin countries of the Ph.D. holders and elucidate the predominant role of universities as employers.

Key Observations:

- Among 397 individuals who specified both their origin country and current place of employment, a significant majority (86%) are affiliated with universities. This trend is consistent across individuals from Japan, China, Korea, and Southeast Asian countries.
- Employment in research organizations accounts for a smaller fraction (4%), while other types of organizations employ 10% of the reported individuals.
- This pattern persists across all destination countries—whether the U.S., the U.K., their home countries, or elsewhere—with universities employing 81% of the 535 individuals who disclosed their job locations.

These results highlight the pivotal role of universities, particularly those in the U.S., as both sponsors and employers of international Ph.D. graduates. The strong alignment between sponsorship (as seen in Table 7) and employment sectors emphasizes universities' integral part in the academic and professional trajectories of these highly skilled individuals.

4. Results

Our analysis reveals pivotal insights into the mobility, funding, and employment patterns of highly skilled Asians with Ph.D.s from the U.S. and U.K.:

1) **Mobility Patterns:** There's a distinct variance in mobility patterns based on origin and host countries. Chinese and Korean Ph.D. holders tend to remain in their host countries, embodying "enriched stayers," while their Japanese and Southeast Asian counterparts are more inclined to return to their origin countries, becoming "enriched returnees." This propensity is influenced by whether they studied in the U.S. or the U.K., with the former seeing a lower rate of return to home countries.

2) **Impact of Sponsorship**: A significant correlation exists between the source of funding and post-graduation destination. Funding from the host country increases the likelihood of Ph.D. holders staying to work in the host country, whereas funding from the origin country tends to pull them back home. This underscores the strategic role of sponsorship in guiding the global flow of talent.

3) **Employment Sectors**: Predominantly, Asian Ph.D. holders, irrespective of their staying or returning, find employment within universities and research-related organizations. This highlights the academic sector, especially in the U.S., as a crucial stakeholder in attracting, training, and employing international talent.

4) **Complex Dynamics of Funding and Mobility**: Our findings suggest nuanced interactions between funding sources and mobility choices. While economic logic might predict straightforward outcomes, the actual dynamics reflect a blend of strategic interests, national policies, and personal decisions.

5. Conclusions

This study aimed to shed light on the post-Ph.D. mobility patterns of highly skilled Asians, focusing on the implications of their choices for themselves, their origin countries, and their host countries. Our findings indicate significant divergence in destination: The choice of post-graduation destination significantly varies by origin country, influenced by a combination of personal, economic, and policy-related factors. We also found that the source of doctoral study funding plays a critical role in determining these mobility patterns, with both host and origin countries leveraging scholarships and grants to retain or repatriate talent. Also the academic sector emerges as the primary employer of Asian Ph.D. holders, underscoring its central role in the ecosystem of international education and research.

Our exploration into these patterns introduces a novel approach to understanding the mobility of international students and highlights the intricate relationship between investment in education and the global allocation of talent. While our focus has been on East and Southeast Asians, extending this research to include a broader array of nationalities and disciplines could offer more comprehensive insights into the dynamics at play.

Looking forward, as the dataset expands and more nuanced analyses become possible, we anticipate deeper investigations into how external factors—such as immigration policies, economic conditions, and institutional strategies—affect the mobility and career trajectories of international Ph.D. recipients. This ongoing research will not only enhance our understanding of the global education

market but also inform policies and practices aimed at optimizing the benefits of international talent mobility.

This study marks a step toward a more nuanced understanding of how highly skilled individuals navigate the complex landscape of global education and employment, contributing to the strategic discussions on harnessing global talent in an increasingly interconnected world.

References

Academic Cooperation Association (ACA). (2005). *Perception of European Higher Education in Third Countries: Final Report.* Brussels: ACA.

Atkinson, A. B., and Stiglitz, J. E. (1976). The Design of Tax Structure: Direct versus Indirect Taxation. *Journal of Public Economics, 6*(1-2), 55-75.

Barr, N. (2014). Financing Higher Education. In M. Gérard, and S. Uebelmesser, *The Mobility of Students and the Highly Skilled: Implications for Education Financing and Economic Policy* (p. Chapter 7 (in Adobe Digital Edition)). MIT Press.

Baruch, Y., Budhwar, P. S., and Khatri, N. (2007). Brain Drain: Inclination to Stay Abroad After Studies. *Journal of World Business 42*, 99-112.

Borjas, G. (1987). Self-selection and the Earnings of Immigrants. *American Economic Review, 77*(4), 531-553.

Brooks, R., and Waters, J. (2013). *Student Mobilities, Migration and the Internationalization of Higher Education.* Palgrave Macmillan.

Cao, C., Zhu, C., and Meng, Q. (2016). A Survey of the Influencing Factors for International Academic Mobility of Chinese University Students. *Higher Education Quarterly, 70(2)*, 200-220.

Chiswick, B. R. (2011). *High-Skilled Immigration in a Global Labor Market.* Washington DC: American Enterprise Institute.

Chiswick, B. R., and Miller, P. W. (Eds.). (2014). *Handbook of the Economics of International Migration.* North Holland/Elsevier.

Del Rey, E., and Racionero, M. (2014). Choosing the Type of Income-Contingent Loan. In M. Gérard, and S. Uebelmesser, *The Mobility of Students and the Highly Skilled: Implications for Education Financing and Economic Policy* (p. Chapter 8 (in Adobe Digital Edition)). MIT Press.

Demange, G., Fenge, R., and Uebelmesser, S. (2014). Financing Higher Education in a Mobile World. *Journal of Public Economic Theory, 16*, 343-371.

Felbermayr, G. J., and Reczkowski, I. (2014). International Student Mobility and High-Skilled Migration: The Evidence. In M. Gerard, and S. Uebelmesser, *The Mobility of Students and the Highly Skilled: Implications for Education Financing and Economic Policy, CESifo Seminar Series* (pp. 15-56). Cambridge and London: MIT Press.

Findlay, A. M., McCollum, D., and Packwood, H. (2017). Marketization, Marketing and the Production of International Student Migration. *International Migration, 55(3)*, 139-155.

Findlay, A., King, R., and Stam, A. (2016). Producing International Student Migration: An Exploration of the Role of Marketization in Shaping International Study Opportunities. In M. van Riemsdijk, and Q. Wang, *Rethinking International Skilled Migration (Chapter 2)* (pp. 19-35 in Kindle). London: Routledge.

Gérard, M. (2009). Financing Bologna: Which Country Will Pay for Foreign Students? In M. Dewatripont, F. Thys-Clément, and L. Wilkin, *Higher Education in a Globalized World: Governance, Competition and Performance* (pp. 71-84). Bruxelles: Editions de l'Université de Bruxelles.

Gérard, M. (2012). Who is to Pay for Mobile Students? In A. Suraj, P. Scott, L. Valjean, and L. Wilson, *European Higher Education at the Crossroads: Between the Bologna Process and National Reforms* (pp. 727-748). Dordrecht: Springer.

Gérard, M., Gilson, N., and Ruiz, F. (2012). Higher Education and Firms: on the Interaction between Research and Regional Policies. *International Tax and Public Finance, 19*, 338-67.

Gérard, M., and Sanna, A. (2020). Postgraduate Mobility and the War for Talents, the Ecuadorian Origin Country Constraind Scholarship. *Proceeding for 76th On-line Annual Congress of the International Institute of Public Finance, Reykjavik, Iceland (August 2020)*.

Gérard, M., and Uebelmesser, S. (2014a). Financing Higher Education When Students and Graduates are Internationally Mobile. In M. Gérard, and S. Uebelmesser, *The Mobility of Students and the Highly Skilled: Implications for Education Financing and Economic Policy* (p. Chapter 6 (in Adobe Digital Edition)). MIT Press.

Gérard, M., and Uebelmesser, S. (Eds.). (2014b). *The Mobility of Students and the Highly Skilled: Implications for Education Financing and Economic Policy (CESifo Seminar Series).* Massachusetts: MIT Press.

Gnrnz, K. (2008). *Higher Education and International Student Mobility in the Global Knowledge Economy.* Albany.

Gregory, R. G. (2015). Two-Step Australian Immigration Policy and its Impact on Immigrant Employment Outcomes. In B. R. Chiswick, and P. W. Miller, *Handbook of the Economics of International Migration, Volume 1* (pp. 1421-1443). Elsevier.

Harrap, B., Hawthorne, L., Holland, M., McDonald, J. T., and Scott, A. (2021). Australia's Superior Skilled Migration Outcomes Compares with Canada's. *International Migration*, 1-17.

Haupt, A., Krieger, T., and Lange, T. (2014). Education Policy, Student Migration, and Brain Gain. In M. Gérard, and S. Uebelmesser, *The Mobility of Students and the Highly Skilled: Implications for Education Financing and Economic Policy* (p. Chapter 10 (in Adobe Digital Education)). MIT Press.

Hawthorne, L. (2010). How Valuable is "Two-Step Migration"? Labor Market Outcomes for International Student Migrants to Australia. *Asian and Pacific Migration Journal*

Higher Education Statistics Agency. (2020). *Table 11 - HE student enrolments by domicile and region of HE provider 2014/15 to 2019/20*. Retrieved from https://www.hesa.ac.uk/data-and-analysis/students/table-11

Institute of International Education. (2019). *2019 Open Doors.* Washington D.C.: IEE.

Maddux, W. W., Bigolaru, E., Hafenbrack, A. C., Tadmor, C. T., and Galinsky, A. D. (2013). Expanding Opportunities by Opening Your Mind: Multicultural Engagement Predicts Job Market Success Through Longitudinal Increases in Integrative Complexity. *Social Psychological and Personality Science, 5*(5), 608-615.

Malony, J., Sowter, B., and Botts, D. (2011). *QS Global Employer Survey: How Employers Value an International Study Experience.* London: QS Intelligence Unit.

Matsuzuka, Y., and Gérard, M. (2022). Student Mobility and Social Welfare: Am Empirical and Theoretical Inquiry into the Social Impact of Skilled Migration. *Hitotsubashi Journal of Social Studies, 53*, 19-36.

National Science Foundation. (2018). *2017 Doctorate Recipients from U.S. Universities.* Alexandria, VA: National Center for Science and Engineering Statistics, Directorate for Social, Behavioral and Economic Sciences.

National Science Foundation. (2019). *Women, Minorities, and Persons with.* Alexandria, VA: National Center for Science and Engineering Statistics (NCSES).

National Science Foundation. (2020). *Doctorate Recipients from U.S. Universities: 2019.* Alexandria, VA: National Center for Science and Engineering Statistics (NCSES), Directorate for Social, Behavioral and Economic Sciences, NSF.

OECD. (2010). *International Migration Outlook 2010: SOPEMI 2010.* OECD Publishing.

OECD. (2019). *Education at a Glance 2019* OECD Indicators.*

She, A., and Wotherspoon, T. (2013). International Student Mobility and Highly Skilled Migration: A Comparative Study of Canada, the United States, and the United Kingdom. *SpingerPlus, 2(132)*, http://www.springerplus.com/content/2/1/132.

Streitwieser, B. (2014). *Internationalisation of Higher Education and Global Mobility.* Oxford: Symposium Books.

United Nations. (2013). *World Youth Report: Youth and Migration.* New York: United Nations Publication.

Universities UK International. (2019). *International Graduates Outcomes 2019: What Do International Graduates Do?* London: Universities UK.

Usher, T., Baldwin, S., Munro, M., Pollard, E., and Sumption, F. (2010). *The Role of Finance in the Decision-making of Higher Education Applicants and Students. In BIS Research Paper No. 9.* Institute for Employment Studies and BIS (Department for Business, Innovation and Skills).

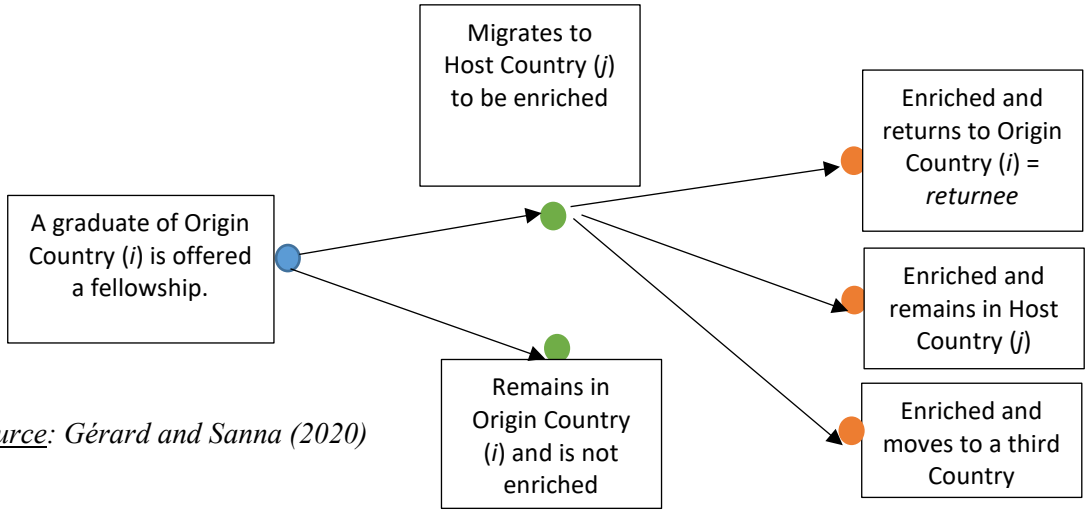
Van Bouwel, L., and Veugelers, R. (2012). An "Elite Brain Drain": Are Foreign Top PhDs More Likely to Stay in the U.S.? Available at SSRN: https://ssrn.com/abstract=2109278 or http://dx.doi.org/10.2139/ssrn.2109278.

Van Bouwel, L., and Veugelers, R. (2014). The Effects of International Mobility on European Researchers: Comparing Intra-EU and U.S. Mobility. *Research in Higher Education, 56*, 360-377.

Yokota, M. (2016). *Gurobaru Jinzai Ikusei to Ryugaku no Chokiteki na Inpakuto ni Kansuru Chosa (Written in Japanese).*

Zhai, K., Gao, X., and Wang, G. (2019). Factors for Chinese Students Choosing Australian Higher Education and Motivation for Returning: A Systematic Review. SAGE Open, *9*(2).

Figure 1. The Dynamics of International Student Mobility



Source: Gérard and Sanna (2020)

Table 1. Benefits, costs, and alternative financing principles

Country / Financing Principle	Origin/Home Country	Host of Higher Education	Destination for Work Purposes
Host Country Principle	Benefit = returning graduates Cost = opportunity	Benefit = remaining graduates Cost = opportunity	Benefit = attracted graduates No cost
Origin Country Principle	Benefit = returning graduates All costs	Benefit = remaining graduates No cost	Benefit = attracted graduates No cost

Table 2. Distribution of Ph.D. Recipients by Origin Country and Year

Ph.D. year	Countries				Total
	China	Japan	Korea	S. East Asia	
1986-1990	0	5	30	9	44
1991-1995	0	7	44	6	57
1996-2000	0	11	27	18	56
2001-2005	19	29	24	25	97
2006-2010	122	40	73	36	271
2011-2015	40	40	11	53	144
Total	181	132	209	147	669

Table 3. Origin country, host country, and job location

Origin country=Japan (Bachelor's degree in Japan: 99)				
Host Country		Job Location		Percentage
U.S.	43	U.S.	10	23.3%
U.S.	43	Origin	23	53.5%
U.S.	43	Others	4	9.3%
U.K.	56	U.K.	3	5.4%
U.K.	56	Origin	44	78.6%
U.K.	56	Others	4	7.1%
Origin country=China (Bachelor's degree in China: 156)				
Host Country		Job Location		Percentage
U.S.	133	U.S.	63	47.4%
U.S.	133	Origin	12	9.0%
U.S.	133	Others	7	5.3%
U.K.	23	U.K.	5	21.7%
U.K.	23	Origin	5	21.7%
U.K.	23	Others	9	39.1%
Origin country=Korea (Bachelor's degree in Korea: 193)				
Host Country		Job Location		Percentage
U.S.	181	U.S.	72	39.8%
U.S.	181	Origin	18	9.9%
U.S.	181	Others	4	2.2%
U.K.	12	U.K.	3	25.0%
U.K.	12	Origin	6	50.0%
U.K.	12	Others	1	8.3%
Origin country=Southeast Asia (Bachelor's degree in S.E. Asia: 108)				
Host Country		Job Location		Percentage
U.S.	33	U.S.	5	15.2%
U.S.	33	Origin	9	27.3%
U.S.	33	Others	1	3.0%
U.K.	75	U.K.	6	8.0%
U.K.	75	Origin	56	74.7%
U.K.	75	Others	3	4.0%

Table 4. Probability of returning to the origin country by host and origin countries

	Regression 1		Regression 2		Regression 3	
	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
Intercept	.094	.086	-.710***	.129	-.425***	.148
Ph.D. in U.S.	-.984***	.110			-.481***	.130
Bachelor in China			-.522***	.186	-.417**	.188
Bachelor in Japan			1.168***	.184	1.109***	.185
Bachelor in Korea			-.444**	.174	-.293	.179
Bachelor in SEA			.968***	.178	.839***	.181
Chi-Squared	669.000		669.000		670.144	
No. observation	669		669		669	

*** p<0.01, ** p<0.05, * p<0.1

Table 5. Number of scholarship/grants received by Asian students from their host and origin countries

Countries	Total Scholarships/ Grants	Scholarships/Grants for the Same recipients				Sponsor Country				
		One	Two	Three	More Than Four	U.S.	U.K.	Home	Others	Unknown
Japan	80	8	4	7	9	43	5	16	3	13
China	111	15	17	10	6	64	10	16	5	16
Korea	63	10	6	3	6	49	0	9	0	5
S.E. Asia	58	4	6	2	6	12	5	13	6	22

Table 6. Number of scholarships/grants by sponsor country

	Degrees awarded per country		
Sponsor country	USA	GBR	Total
Host	161	20	181
Home	23	31	54
Third Country	10	11	21
Unknown	33	23	56
Total	227	85	312

Table 7 outlines the sponsorship types, highlighting universities and other educational institutions as the predominant funders, followed by government or national research institutions.

Table 7. Number of scholarships/grants by sponsor type

	Countries degree awarded		
Sponsor type	U.S.	U.K.	Total
University or school	152	35	187
Government or national research institution	15	17	32
Company or private organization	7	3	10
Academic society	8	1	9
Charity fund or NPO	5	4	9
International organization	4	1	5
Indistinguishable	36	24	60
Total	227	85	312

Table 8. Benefit and cost for the origin, host, and destination countries

Country / Financing Principle	Origin/Home Country	Host of Higher Education	Destination for Work Purposes
Host Country Principle	Benefit = returning graduates Cost = Opportunity	Benefit = remaining graduates Cost = Opportunity	Benefit = attracted graduates No Cost
Origin Country Principle	Benefit = returning graduates All Costs	Benefit = remaining graduates No Cost	Benefit = attracted graduates No Cost

Table 9. Correlation between funding locations and job locations

	Job in U.S.	Job in U.K.	Job in Origin Country	Job in Other Countries
Scholarship/grant by U.S.	**.234*****	**-.082****	.034	-.003
Scholarship/grant by U.K.	**-.080****	**.158*****	.073*	.054
Scholarship/grant by Origin Country	.046	.042	**.162*****	-.020
Scholarship/grant by Other Countries	.004	-.021	-.035	**.144*****

*** p<0.01, ** p<0.05, * p<0.1, by Pearson's estimation

Table 10. Probability of returning to the origin country by sponsor, host, and origin country

	Regression 1		Regression 2	
	Coefficient	S.E.	Coefficient	S.E.
Intercept	-.582***	.159	-.550***	.160
Scholarship/grant by U.S.	-.040	.159	.416**	.187
Scholarship/grant by U.K.	.316	.314	.002	.355
Scholarship/grant by origin country	.829***	.223	.773***	.245
Scholarship/grant by other country	-1.010	.644	-1.056	.682
Ph.D. in U.S.			-.617***	.143
Bachelor in China			-.336*	.197
Bachelor in Japan			1.193***	.192
Bachelor in Korea			-.133	.188
Bachelor in SEA			.949***	.189
Chi-Squared	666.985		676.286	
No. observation	699		699	

*** p<0.01, ** p<0.05, * p<0.1

Table 11. Employment Breakdown
by origin country

	Japan	China	Korea	S.E. Asia	Total	Percentage
University	74	96	98	73	341	86%
Research organization	9	2	2	2	15	4%
Other organization	11	16	7	7	41	10%
Total (of those reporting origin country and job)	94	114	107	82	397	100%

By job location

	U.S.	U.K.	Home	Other	Total	Percentage
University	166	25	173	69	433	81%
Research organization	6	0	12	5	23	4%
Other organization	0	0	0	79	79	15%
Total (of those reporting job and location)	172	25	185	153	535	100%