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WILL THE U.S. KEEP THE BEST AND THE BRIGHTEST (AS POST-DOCS)? CAREER AND LOCATION PREFERENCES OF FOREIGN STEM PHDS

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Will the U.S. Keep the Best and the Brightest (as Post-docs)? Career and Location Preferences of Foreign STEM PhDs

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ABSTRACT

We estimate the career and location preferences of students in U.S. doctoral programs in a major STEM field – chemistry. Our analysis is based on novel survey conducted in 2017 of 1,605 current Chemistry doctoral students enrolled in the top 54 U.S. research intensive universities. First, we estimate the career preferences of foreign and U.S. STEM students for different types of post-graduation jobs –postdocs, industry, or teaching positions – using both hypothetical choice methods and more standard Likert measures of preferences for different careers. We find that foreign students are generally more interested in academic careers than U.S. students, even when controlling for ability and comparing students from similar subfields and programs. Next, we estimate students' location preferences using a hypothetical choice method: we ask respondents to choose between two postdoc job offers, where one offer is in the U.S. and one is abroad. We find that foreign students have a stronger preference for U.S. locations even after controlling for ability and career preferences. Our results suggest the U.S. is managing to retain talented foreign graduate students for postdoc positions.

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I. Introduction

A key factor behind the emergence and persistence of U.S. leadership in STEM fields has been its ability to attract and retain top tier talent from other countries. Foreign students represent half or more of PhD students and they tend to be more productive during the PhD than natives (Gaule & Piacentini 2013). More generally, the foreign born make disproportionate contributions to U.S. science and engineering (Levin & Stephan 1999).

Talented foreigners have typically come to the U.S. as graduate students and stayed in the U.S. in academic or industry careers. An especially common career path among foreign PhD students is obtaining a postdoctoral position upon graduation. Postdocs, while an important part of the scientific labor force, are characterized by low-pay and uncertain career trajectories. The NSF estimates that over 57 percent of postdocs in STEM fields were in the U.S. on temporary visas in 2015; in chemistry, temporary visa holders were 64 percent of postdocs (NSF, 2017). Yet relatively little is known both about postdoc careers in general, and the transition from the doctoral program to postdocs for foreign students, in particular.

A few prior studies have used survey data collected at the end of the doctoral program to document the career and location choices of foreign STEM doctoral students. They show that individuals in U.S. graduate programs with foreign bachelor's degrees and/or on temporary visas are more likely to take postdoc positions after graduation compared to U.S. counterparts, likely because individuals in the U.S. on temporary visas are constrained in their employment opportunities due to visa restrictions (Stephan and Ma, 2005; Amuedo-Dorantes and Furtado, 2017). One reason foreign students may prefer and ultimately end up in postdoc positions is that academic institutions are not subject to H-1B visa caps. For example, Amuedo-Dorantes and Furtado (2017) provide evidence suggesting that visa restrictions lead students to 'settle' for

academia. Grogger and Hanson (2015) also show using the Survey of Earned Doctorates that the foreign-born STEM doctoral students who report that they are intending to stay in the U.S. in the year after they finish their degree are positively selected, measured indirectly through indicators such as having received fellowships during their studies. Finally, Finn (2010) measures stay rates of foreign-born doctorate recipients by country of origin and field of study using tabulated data from Social Security records.

An important aspect of using survey data collected only at the end of the PhD program and – as well as aggregate estimates – is that these measures are the result of both supply- and demand-side factors.[1] For instance, a student may plan to return to their home country because they have failed to secure a position in the U.S. Similarly, a student may report planning to do a postdoc because no industry position was actually available to that student. Thus, it is problematic to interpret these plans as necessarily reflecting preferences. By contrast, in this paper we analyze a novel survey of currently enrolled doctoral students using a hypothetical choice methodology in order to elicit preferences among a set of options that are assumed to be available.[2]

Our study thus contributes to the existing literature by focusing on the supply side of the market, by identifying and comparing the preferences of foreign and U.S. graduate students for an academic vs. industry career, and for a U.S. vs. foreign location for a postdoc position. We leverage

[1] A related literature has studied preferences for academic versus industry careers among currently enrolled doctoral students without focusing on differences between foreign and domestic students. See e.g. Roach & Sauermann (2010).

[2] Closest to the approach of our study is the work of Zeithammer & Kellogg (2013) who use conjoint analysis to study return migration preferences among U.S.-educated Chinese STEM doctoral students. They ask approximately 300 Chinese STEM doctoral students studying at U.S. universities a series of hypothetical job choices with varying jobs attributes such as salary, U.S. location, public versus private firm and the job role (e.g. scientist manager). They find that Chinese doctoral graduates tend to remain in the United States because of a large salary disparity between the two countries rather than because of an inherent preference for locating in the United States. In contrast to their work, we focus on choices among postdoctoral offers, varying only the employer (and implicitly location) on a larger sample covering both domestic and foreign students from different countries studying in the U.S. This enables us to directly compare the preferences of foreign students to those of U.S. domestic students.

data from an original survey we conducted in the fall of 2017 of 1,605 current doctoral students in a major STEM field – Chemistry – studying at 54 U.S. institutions about their career and location preferences.

First, we estimate the career preferences of foreign and US STEM students for different types of post-graduation jobs – postdocs, industry, or teaching positions – using both hypothetical choice methods and more standard Likert-scale measures of preferences for different careers. Using a large sample of students across a range of departments, we are able to compare the preferences of foreign and US students within the same PhD program and area of specialization. We find that foreign students are much more likely to prefer a postdoc position upon graduation, reporting a 11-percentage point higher likelihood of accepting a post-doc position at a top university compared to U.S. students on average. U.S. and foreign students both similarly place the highest preferences on industry jobs, but our results point to a notable difference in the types of academic jobs they prefer; foreign students value research-oriented academic careers more than US students (post-doc jobs), while US students value teaching more.

Since neither research nor teaching institutions would be subject to H-1B caps, it is unlikely that the difference in preferences for teaching vs. research are due to potential visa restrictions. A potential explanation of the preference of foreigners towards academic careers may be that they are more able (e.g. due to a differential selection mechanism). However, controlling for proxies for ability such as GRE scores or publications during the PhD does not noticeably affect the results.

Second, we examine students' location preferences using a novel revealed preference approach based on a hypothetical choice method. Here, we ask each respondent to report how likely (in terms of percent chances out of 100) they are to choose a postdoc position when given pairs of postdoc offers, where the offers include postdoc positions in top-50 Chemistry

departments in either U.S. or non-U.S. universities (based on the Shanghai ranking). Our empirical strategy is based on comparing foreign and domestic students who are presented with the same hypothetical choice. While respondents across the board have a strong preference for U.S. locations, foreign students are even more likely to prefer U.S. locations. We estimate that foreign students are 13 percentage points more likely to choose a (hypothetical) postdoc offer in the U.S. than in a non-U.S. department, even when controlling for the difference in the rank of the programs and baseline preferences for doing a postdoc, and when comparing students within the same PhD program.

In sum, our findings show that foreign and U.S. Chemistry Ph.D. students have significantly different preferences for careers, with foreign students being more likely to prefer academic careers and doing a postdoc. Foreign students also value a U.S. location more than U.S. students. Our results suggest that while the U.S. is currently managing to retain talented foreign graduate students as postdocs, it is important for future research to understand why foreign students have greater preferences for postdoc positions in the US than native students, and to what extent these preferences are driven by visa policies. We discuss possible explanations and directions for future research in our discussion in the final section of the paper.

II. Methodology

In this paper, we are interested in measuring graduate students' preferences for different careers and different locations through an original survey. To measure preferences for academic careers, we use two types of questions. First, we used more standard Likert measures by asking respondents to rate the attractiveness of academic and other careers 'leaving job availability aside'. This approach follows closely that of Sauermann & Roach (2010) in their study of PhD career preferences.

Second, we use a hypothetical choices methodology. This methodology echoes conjoint analysis in marketing (see Zeithammer and Kellogg 2013 as discussed earlier) and has recently been used in labor economics to measure preferences over job attributes (e.g. Wiswall and Zafar 2017, Mas and Pallais 2017). This methodology essentially presents respondents with sets of jobs that vary in their attributes and asks them to state their probabilistic choices. To measure career preferences, we ask students to imagine that they have three job offers and then select the percent chance (out of 100) they are to accept one offer over the other. Importantly, the total chances the student allocates to the three offers should add up to 100. This ensures that they can't report a preference for each type of career. The choices are: (1) Research Scientist/Engineer at Private Sector Firm (e.g. DuPont, Novartis); (2) Postdoctoral Research Fellow at Top U.S. university (e.g. Berkeley, MIT); (3) Assistant Professor at top liberal arts college (e.g. Swarthmore College). Here we will interpret choosing the option to do a postdoc as a preference for an academic career.[3] The exact wording of both questions are available in Appendix A. To estimate preferences for academia, we will run regression of the type:

$$PreferAcademia_i = \beta Foreign_i + \partial X_i + \varepsilon_i$$

Where i indexes students, $PreferAcademia_i$ is one of the three preferences measures as described previously, $Foreign_i$ is and indicator variable for foreign student and X_i is a vector of controls including graduate school fixed effects, gender, marital status, enrollment year and field of study.

[3] In many STEM fields, faculty placements out of graduate school are almost unheard of and postdocs are a necessary step in an academic career. While a sizeable number of students do postdocs and then go on to industry careers, we offer an industry career as an option in the counterfactual question. We thus interpret choosing a postdoc as a preference for an academic career since those who have a preference for industry can choose the industry research scientist job offer.

To measure preferences for different locations, we also use a hypothetical choices methodology. Here, we ask respondents to choose between two postdoctoral job offers that only differ in the employer (university), and hence location. We view STEM postdoctoral positions as being well suited for this type of analysis since these positions are very similar across universities in terms of content (heavy research focus) and salary.

We are interested in the choices that involve a U.S. university and a foreign university, and whether foreign students report different preferences than native students when confronted with such choices. More specifically, we are interested in the propensity of foreign and native students to choose the U.S. university when presented with the same two alternative choices. For instance, we might offer students a hypothetical choice between a postdoctoral position at Harvard and the University of Toronto; and then see whether foreign students are more or less likely to choose Harvard, holding the counterfactual opportunity set fixed. We will be running regressions of the following type:

$$PreferUS_{i,jk} = \beta Foreign_i + \partial X_i + \gamma_{jk} + \varepsilon_{i,jk}$$

Where *i* indexes students and *j* and *k* indexes the universities in the postdoc offers. $PreferUS_{i,jk}$ is an indicator variable for choosing the U.S. option with a high probability (70 percent or more), $Foreign_i$ is an indicator variable for foreign student, X_i is a vector of student characteristics (graduate school FE, gender, marital status, enrollment year, field of study), and γ_{jk} is a fixed effect for the university pair.

III. Data: Survey of Chemistry Doctoral Students

Our main data source is an original survey of U.S. chemistry PhD students conducted in the Fall of 2017. To construct our sampling frame, we first identified a set of 54 research-intensive U.S. universities that grant PhDs and are internationally renowned in the field of chemistry (see

list in Appendix C).[4] We gathered the names and emails of all individuals (approximately 9,000) that were listed as listed as graduate students in the chemistry departments of these universities either on graduate student directory websites or on individual laboratory websites.[5] We then sent email invitations to these students asking them to answer an online survey on the Qualtrics survey platform. To ensure a reasonable response rate, we sent two rounds of reminders and provided incentives to complete the survey in the form of a lottery to win Amazon gift certificates. We obtained approximately 1,600 complete responses corresponding roughly to a 18% response rate, which is quite consistent with survey response rates of this population (see e.g. Sauermann and Roach 2013). However, collecting survey data prior to graduation comes with a tradeoff, as we have lower response rates than the end-of-degree surveys.

The survey included a set of basic demographic questions, as well as questions on undergraduate education, year of enrollment in the PhD program, progress in the PhD program, field of specialization and career preferences questions discussed previously. Additionally, each respondent was presented with five consecutive hypothetical postdoc offer choices.

We coded each respondent as a foreign or a U.S. student using a question in the survey about the country of the respondent's undergraduate institution. If the country was in the U.S., we coded the student as U.S. and if not, as a foreign student. While we do not know the country of birth, the assignment of foreign status based upon the country of undergraduate studies is commonly done in the literature (see e.g. Gaule 2014, Kahn & MacGarvie 2016).[6]

[4] This set corresponds to all U.S. universities listed in the top 200 universities in the world according to the Academic Ranking of World Universities (Shanghai Ranking) in its Chemistry subject ranking.

[5] One issue we encountered is that some of the individuals we contacted reported having already graduated, reflecting e.g. the fact that some online directories and websites are not entirely up to date. We excluded such responses from our analysis sample.

[6] While there has been growing number of foreign students pursuing undergraduate studies in the U.S., the vast majority of foreign students enrolled in U.S. doctoral programs have a foreign undergraduate degree. For instance, Gaule & Piacentini (2013) report that in a large sample of chemistry PhD students graduating from a U.S. department between 1999 and 2008, 88% of students with Chinese first and last names had received their

(Insert Table 1 about here)

Table 1 provides summary statistics for the sample for U.S. and foreign students. Approximately 30% of the sample are foreign, and most of the foreign respondents are from China (30%) followed by India (13%) and then Canada (5%).

We find a few differences between the U.S. and foreign students in our raw data, with U.S. students having slightly more women (8% higher) and more likely to have enrolled in 2013. U.S. and foreign respondents are similarly distributed across subfields within chemistry.

To assess the representativeness of our sample, we can compare our data with data collected by the National Science Foundation and the National Institutes of Health through the 2016 Survey of Graduate Students and Postdoctorates in Science and Engineering, which is an annual census all U.S. academic institutions granting research-based graduate degrees (NSF, 2016), for Chemistry.[7] We find that our survey data includes somewhat fewer foreign students/temporary visa holders (33.6% vs. 37.6%) and slightly more female respondents (44.3% vs. 40.9%). Given that the NSF/NIH Survey includes students enrolled at all U.S. graduate degree-granting academic institutions, while our survey was limited to the top 54 Chemistry programs, the numbers are quite close.

For the location preferences, we offered each student five randomly selected counterfactual choices of postdoctoral positions. These choices were drawn from each possible pairwise combination of universities in the top 50 universities in the world in chemistry according to the Shanghai rankings (appendix C for a list). However, we focus here on the choices involving a

undergraduate degrees in China (and a further 5% in Taiwan). We additionally checked in our sample whether we are missing a large number of respondents who are international students but did their undergraduate degree in the US using a name matching algorithm. There are only a small number of respondents (18, or 1% of our sample) who have both a Chinese/Indian/Korean last name, a Chinese/Indian/Korean first name and reported a US undergraduate institution.

[7] In this survey, the academic departments complete the questionnaire.

foreign university and a U.S. university– 4,030 observations. We define 'Strongly Prefer the U.S. University' as selecting the chance of accepting the U.S. postdoctoral position with probability 70% or more. Conversely, 'Strongly Prefer the Foreign University' is defined as selecting the chance of accepting the foreign U.S. postdoctoral position with probability 70% or more. Table 2 presents descriptive statistics on the choice level data.

(Insert Table 2 about here)

We observe that both U.S. and foreign students tend to prefer the U.S. university (with a considerably higher mean for 'Strongly Prefer the Foreign University' compared to 'Strongly Prefer the Foreign University'). This may reflect some intrinsic preference for being located in the U.S., but it may also reflect a preference for higher ranked universities as the U.S. universities in the choices tend to have a lower (i.e. better) rank. Perhaps surprisingly, we observe that foreign students have a stronger preference for U.S. postdoctoral positions than U.S. students.

IV. Results

We first investigate whether foreign and domestic students have different career preferences using our three main measures of career preferences: (1) attractiveness of tenure-track faculty job on 1-5 Likert scale, (2) the overall percent chance they will do a postdoc after the PhD, and (3) the percentage chance of choosing a postdoc vs. an industry research position or teaching-focusing position in the hypothetical job offer question. In Figure 1, we show the raw means for US and foreign students for the third measure based on the three hypothetical job offers. While both US and foreign students overall prefer the industry choice, we can see that foreign students are more likely than U.S. students to choose the postdoc, and less likely to choose the teaching position.

Next, we regress our measures of preferences for academia on an indicator variable for whether the respondent is a foreign student, and control for a broad range of student characteristics including gender, marital status, enrollment year, field of study and graduate school. In Table 3, we show that foreign students consistently report finding tenure-track faculty jobs more attractive than U.S. students, and that they are 10 percentage points more likely to choose a postdoc option when being offered a choice between postdoc, an industry research position or a teaching-focused position. Foreign students also rate their chance of doing a postdoc overall as 12 percentage points higher.[8] These patterns hold both for Chinese students and other foreign students, although the effect is somewhat weaker for Chinese students (see Table 4).

(Insert Table 3 and 4 about here)

One possible explanation for the fact that foreign students are more interested in academic careers is that they may be of higher ability or more science-oriented due to selection into emigration or selection into U.S. PhD programs. To investigate this possibility, we first estimate whether foreign students in our sample appear to be higher ability or more-science oriented (Table 5). We find that even when controlling for student characteristics including gender, enrollment year, field of study and graduate school, foreign students have significantly higher (self-reported) GRE scores and are more likely to have already published during the PhD in one of the premier journals (Nature, Science or Cell). This finding is consistent with other studies finding that foreign students, particularly Chinese students, who make up the largest share of our foreign student sample, are higher ability and more productive in terms of publications during the PhD (see e.g. Gaule & Piacentini 2013).

[8] One should bear in mind that the self-assessed chance of doing a postdoc may already incorporate expectations about what type of options will be available.

Next, we repeat the regressions of academic career preferences in Table 4 and now control for ability, where we proxy for ability with the publications of the student and the self-reported GRE scores (see Table 6). While the inclusion of these controls somewhat weakens the point estimate for foreign students, the estimate remains large and significant. This suggests that other factors may play a role in the differing preferences for academic careers between foreign and native U.S. students. For instance, it may be the case that foreign students envision an academic career in their home country, or there may be important cross-cultural differences in the attractiveness of academic careers.

(Insert Table 5 and 6 about here)

Next, we turn to the analysis of location preferences, where we consider the hypothetical choices respondents made between pairs of postdoctoral offers described previously. Here, we regress whether the respondent reported a strong preference for the U.S. postdoctoral option on an indicator variable for whether the respondent is a foreign student, while controlling for student characteristics (gender, marital status, enrollment year, field of study, graduate school) as well as a fixed effect for the pair of universities that is being presented to the student (choice fixed effects). We are thus effectively comparing foreign and domestic students who are asked to choose between the exact same two postdoctoral options. We also report the results of another specification where the dependent variable indicates having a strong preference for the non-U.S. postdoctoral option.

(Insert Table 7 and 8 about here)

As was already the case in the raw descriptive statistics, foreign students have a *stronger* preference for U.S. universities (Table 7). This is especially true for Chinese students but also holds for other foreign students (Table 8).

Table 9 presents some heterogeneity analysis to try and shed light on why this difference in preferences may arise. Already having a publication is associated with a greater preference for the U.S. university (column 1) but does not have a differential effect for foreign and domestic students. There is some limited evidence that foreign students with high GRE scores are less likely to have a preference for the U.S. university (column 2) although the estimates are very noisy here. Interestingly, foreign students who have a stronger preference for an academic career are less likely to strongly prefer the U.S. university (column 3).

Finally, we examine whether foreign and U.S. students vary in their preferences depending on the difference in the Shanghai rankings of the institutions offered. In Figure 2, we show that foreign students strongly prefer the U.S. university across all ranks, and the difference in research rank between the domestic and foreign university does not seem to have a differential effect for domestic and foreign students (Table 9 column 4).

(Insert Table 9 about here)

V. Discussion

In this paper, we have reported the results of a novel survey of Chemistry doctoral students enrolled at the top 54 U.S. institutions aimed at understanding to what extent foreign and U.S. students differ in their career and location preferences. Unlike previous studies focused on estimating career and location choices of foreign and U.S. students, which have tended to rely on either survey data collected after students have completed their degrees or administrative data after students have obtained their first position, our data provides a measure of preferences before students are faced with demand-side factors.

We have documented that foreign and U.S. students indeed appear to have significantly different career preferences, with foreign students being much more likely to prefer doing a

postdoc and generally preferring academic careers more than U.S. students. We also show using a hypothetical choice method that foreign students also value a U.S. location more than U.S. students, even controlling for the ability and career preferences of the students.

One interpretation of our finding that foreign students have a stronger preference for U.S. postdocs is linked to the availability of subsequent career options. Industry careers are the most likely eventual outcome even for students who pursue postdocs, and it may be that access to industry careers in the U.S. is differently impacted by a foreign postdoc across foreign and domestic students. Specifically, foreign students may be concerned that a foreign postdoc will limit their subsequent access to the U.S. industry market if U.S. postdocs are preferred for the U.S. private sector. Conversely, U.S. students may perceive foreign postdocs as enhancing their C.V. without worsening their U.S. industry career options.

Foreign students may also believe that leaving the U.S. for a foreign post-doc will limit future private sector options due to visa concerns. Foreign students are potentially 'locked in' to a U.S. location as they have already incurred the costs of getting a visa or started the Green card application process in the U.S. If they would like to eventually return to the U.S., leaving the U.S. for a 2 or 3-year postdoc, even if at a higher ranked institution, may not be worth it if they eventually would like to pursue the U.S. immigration path.

Another potential explanation is that the foreign students have *ipso facto* experienced migration to another country while the U.S. students would typically not already have had such an experience. Having a second migration to a different country might be relatively less appealing than a first migration experience.

While we cannot distinguish between these explanations for why foreign students prefer U.S. locations for a postdoc more than U.S. students with the data we have collected, we believe

that our study points to important avenues for future research on these issues, particularly surrounding the role of visa policies in driving the preferences of foreign students. Moreover, the methodology we used in this paper could be used in future research to tackle a wider range of questions regarding the preferences of foreign and domestic students. Some of the important questions we see as extensions of our study include: What are the preferences of foreign students who have not yet arrived in the U.S.? How do location preferences evolve over time in the same set of students? Among students enrolled in doctoral programs in other countries, do they have preferences for being located in those countries? Or did they have a preference for U.S. doctoral programs, but did not have the opportunity to study there? The answers to such questions would shed further light on our understanding of the allocation of talented and skilled individuals across countries - the global ‘market for talent’.

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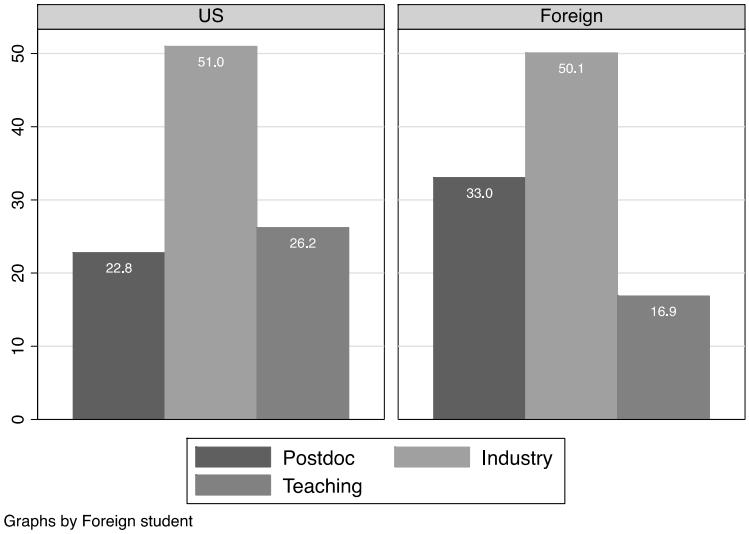
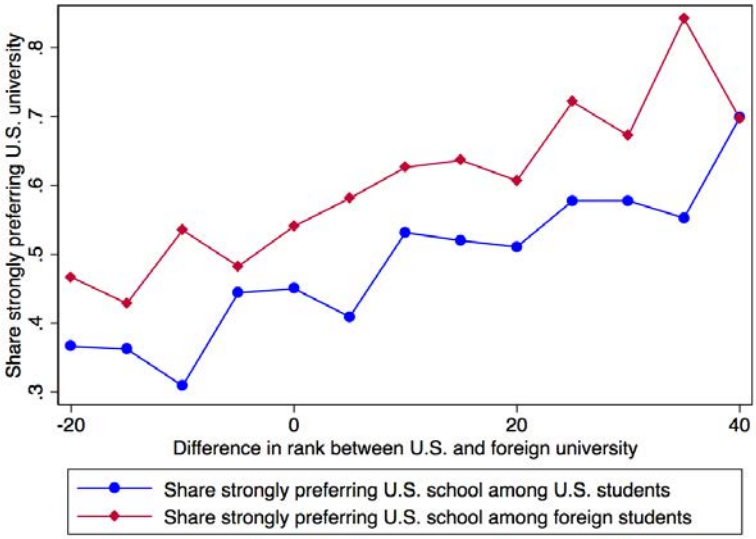
Tables and Figures

Figure 1. Career Preferences: Hypothetical Job Offer Question



Notes: See Appendix A for text of survey question. Respondents were asked to rate how likely they were to accept one of three hypothetical job offers, reporting the percent chance (out of 100) of choosing each one. The choices were: Research Scientist/Engineer at Private Sector Firm (e.g. DuPont, Novartis); Postdoctoral Research Fellow at Top U.S. university (e.g. Berkeley, MIT); Assistant Professor at top liberal arts college (e.g. Swarthmore College).

Figure 2. Preferences for U.S. Location and University Rank



Notes: Strongly preferring the U.S. university means choosing the U.S. option with a probability of 70 percent or more. The difference in rank of each pair of choices is calculated using the Shanghai rankings of the institutions. A positive difference in rank corresponds to the U.S. university having a better ranking than the foreign university.

Table 1. Summary statistics at the student level (Sample means)

	US Student	Foreign Student	Difference
Female	0.465	0.379	0.086**
Married	0.161	0.193	-0.032
Enrolled 2015	0.209	0.205	0.004
Enrolled 2014	0.187	0.210	-0.023
Enrolled 2013	0.187	0.131	0.056**
Enrolled 2012	0.101	0.082	0.019
Enrolled 2011	0.022	0.017	0.004
Field of Study			
Analytical	0.119	0.087	0.032
Biological/Biochemistry	0.168	0.193	-0.025
Inorganic Chemistry	0.172	0.146	0.025
Organic Chemistry	0.180	0.173	0.007
Physical	0.154	0.146	0.008
Polymer	0.046	0.047	-0.001
Theoretical/Computational	0.061	0.094	-0.033*
Other	0.101	0.114	-0.013
Country of Undergrad			
Canada		0.050	
China		0.302	
India		0.134	
Observations	1201	404	

Table 2. Summary statistics at the choice level (Sample means)

	US Student	Foreign Student	Difference
Strong Prefer U.S. University	0.481	0.605	-0.124***
Strong Prefer Foreign University	0.220	0.149	0.070***
Difference in University Rank Between U.S. University and Foreign University (lower rank corresponds to a better in the Shanghai rankings)	-6.93	-7.581	0.642
Location of Foreign University:			
Japan	0.277	0.277	-0.001
Germany	0.185	0.176	0.014
UK	0.130	0.128	0.012
Switzerland	0.099	0.121	0.011
China	0.085	0.083	0.010
Canada	0.047	0.040	0.007
France	0.049	0.045	0.008
Israel	0.047	0.035	0.008
Australia	0.042	0.045	0.007
Saudi Arabia	0.039	0.049	0.001
Observations	3,023	1,007	

Table 3. Estimates of Career Preferences

	(1) Attractiveness of TT faculty job (1-5 Likert)	(2) Chances of choosing postdoc option (among 3 choices)	(3) Likelihood of doing a postdoc
Foreign student	0.829***	9.864***	12.410***
	(0.081)	(1.504)	(1.962)
Mean of D.V.	2.971	25.283	54.017
Observations	1590	1585	1517

Controls: Graduate school FE, gender, marital status, enrollment year, field of study
Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4. Estimates of Career Preferences: Chinese vs. Other Foreign Students

	(1) Attractiveness of TT faculty job (1-5 Likert)	(2) Chances of choosing postdoc option (among 3 choices)	(3) Likelihood of doing a postdoc
Chinese Student	0.882***	6.724***	8.749***
	(0.129)	(2.379)	(3.175)
Other Foreign Student	0.804***	11.310***	13.964***
	(0.093)	(1.726)	(2.229)
Mean of D.V.	2.971	25.283	54.017
Observations	1590	1585	1517

Controls: Graduate school FE, gender, marital status, enrollment year, field of study. The number of observations may vary due to missing answers for some questions.
Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5. Ability Differences between Foreign and U.S. Students	(1) GRE score (self-reported)	(2) Pub in Nature/Science/Science	(3) Pub in top chemistry journal
Foreign student	82.838***	0.008***	0.006
	(5.424)	(0.003)	(0.012)
Mean of D.V.	770.461	0.004	0.095
Observations	1780	4030	4030

Controls: Graduate school FE, gender, marital status, enrollment year, field of study Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 6. Estimates of Career Preferences: Controlling for Ability

	(1) Attractiveness of TT faculty job (1-5 Likert)	(2) Attractiveness of TT faculty job (1-5 Likert)	(3) Likelihood of doing a postdoc	(4) Likelihood of doing a postdoc	(5) Chances of choosing postdoc option (among 3 choices)	(6) Chances of choosing postdoc option (among 3 choices)
Foreign student	0.829***	0.721***	12.410***	11.246***	9.864***	8.405***
	(0.081)	(0.085)	(1.962)	(2.059)	(1.504)	(1.585)
Publication in Nature/Science/Cell		0.636		22.426		24.470**
		(0.593)		(15.812)		(11.037)
Publication in top chemistry journal		0.295**		3.063		4.056*
		(0.118)		(2.927)		(2.206)
GRE dummies	No	Yes	No	Yes	No	Yes
Mean of D.V.	2.971	2.971	54.017	54.017	25.283	25.283
Observations	1590	1590	1517	1517	1585	1585

Controls: Graduate school FE, gender, marital status, enrollment year, field of study
Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 7. Estimates of Location Preferences

	(1) Strongly prefer U.S. university	(2) Strongly prefer foreign university
Foreign student	0.131***	-0.072***
	(0.023)	(0.017)
Mean of D.V.	0.512	0.202
Obs	4030	4030
R2	0.309	0.277

Controls: Choice FE, graduate school FE, gender, marital status, enrollment year, field of study.
Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 8. Estimates of Location Preferences: Chinese vs. Other Foreign Students

	(1) Strongly prefer U.S. university	(2) Strongly prefer foreign university
Chinese student	0.177***	-0.102***
	(0.037)	(0.027)
Other foreign student	0.111***	-0.059***
	(0.026)	(0.019)
Mean of D.V.	0.512	0.202
Obs	4030	4030
R2	0.310	0.277

Controls: Choice FE, graduate school FE, gender, marital status, enrollment year, field of study

Table 9. Estimates of Location Preferences: Controlling for Ability and Career Preferences

	(1) Strongly prefer U.S. university	(2) Strongly prefer U.S. university	(3) Strongly prefer U.S. university	(4) Strongly prefer U.S. university	(5) Strongly prefer U.S. university
Foreign student	0.132***	0.146***	0.137***	0.137***	0.131***
	(0.024)	(0.026)	(0.025)	(0.024)	(0.029)
Foreign student X has published	-0.022				0.001
	(0.073)				(0.073)
Has published	0.089**				0.080**
	(0.040)				(0.040)
Foreign X High GRE		-0.094*			-0.094*
		(0.056)			(0.055)
High GRE		0.067*			0.063
		(0.038)			(0.038)
Foreign X Academic Orientation			-0.111*		-0.151**
			(0.068)		(0.071)
Academic Orientation			0.111**		0.087*
			(0.044)		(0.047)
Foreign X rank difference between the two schools				0.001	0.001
				(0.001)	(0.001)
Mean of D.V.	0.512	0.512	0.512	0.512	0.512
Obs	4030	4030	4030	4030	4030
R2	0.311	0.311	0.311	0.310	0.320

Controls: Choice FE, graduate school FE, gender, marital status, enrollment year, field of study
Standard errors in parentheses. Academic Orientation is proxied by an indicator variable taking value one for those respondents rating 'faculty with research focus' as strictly more attractive than other career options. The main effect of rank difference between the two schools is not shown as it is absorbed into the fixed effect.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix A: Selected Survey Questions

Q. Putting job availability aside, how attractive do you personally find each of the following careers?

	Not at all attractive (1)	Mostly not attractive (2)	Neutral (3)	Mostly attractive (4)	Very attractive (5)
Academic faculty with an emphasis on research (1)	O	O	O	O	O
Academic faculty with an emphasis on teaching (2)	O	O	O	O	O
Government research and development position (3)	O	O	O	O	O
Government (other) (6)	O	O	O	O	O
Industry position with an emphasis on research and development (4)	O	O	O	O	O
Industry (other) (5)	O	O	O	O	O

Q. Now we want to ask you to do some simple evaluations of potential job offers. Imagine that you have just completed your dissertation and are looking for **a full-time position**.

First, suppose you have the following job offers and you need to choose between them. Please rate how likely you are to accept one of them rather than the other. For each job offer, choose the percent chance (out of 100) of choosing each one. **The total chances given to each offer should add up to 100.**

_____ **Job Offer #1:** Research Scientist/Engineer at Private Sector Firm (e.g. DuPont, Novartis) **Annual Salary:** $90,000 (1)

_____ **Job Offer #2:** Postdoctoral Research Fellow at Top U.S. university (e.g. Berkeley, MIT) **Annual Salary:** $50,000 (2)

_____ **Job Offer #3:** Assistant Professor at top liberal arts college (e.g. Swarthmore College) **Annual Salary:** $70,000 (3)

Q. Now, we will ask you to evaluate a series of job offers. Suppose you had the following two job offers. Please rate how likely you are to accept one of them rather than the other.

Job Offer #1
Employer: University X
Location: Location of University X
Job Title: Postdoctoral Research Fellow

Job Offer #2
Employer: University Y
Location: Location of University Y
Job Title: Postdoctoral Research Fellow

	Strongly Prefer Left (1)	Somewhat Prefer Left (2)	Indifferent (3)	Somewhat Prefer Right (4)	Strongly Prefer Right (5)
	0 10 20 30 40 50 60 70 80 90 100				
Which job offer do you prefer? (1)					

Note: University X and Y are two of the top 50 universities worldwide according to a bibliometric ranking of universities in chemistry (Shanghai ARWU ranking in chemistry). Each respondent was presented with five such choices with the choices randomly selected among all pairwise combinations of the top 50 universities in chemistry. The analysis focuses on the choices that involves one U.S. and one foreign university.

Appendix B: top 50 universities in the world in chemistry according to the Shanghai rankings

1	University of California, Berkeley	26	The University of Texas at Austin
2	Harvard University	27	University of California, Irvine
3	Stanford University	28	Georgia Institute of Technology
4	California Institute of Technology	29	University of Michigan-Ann Arbor
5	Northwestern University	30	University of Minnesota, Twin Cities
6	Massachusetts Institute of Technology (MIT)	31	Peking University
7	University of Cambridge	32	University of Wuerzburg
8	Swiss Federal Institute of Technology Zurich	33	University of Colorado at Boulder
9	Kyoto University	34	University of Illinois at Urbana-Champaign
10	University of Pennsylvania	35	Tohoku University
11	University of California, Los Angeles	36	King Abdulaziz University
12	Yale University	37	University of Florida
13	University of California, Santa Barbara	38	Zhejiang University
14	Technical University Munich	39	Osaka University
15	Cornell University	40	Texas A&M University
16	Columbia University	41	University of California, Riverside
17	University of Oxford	42	Weizmann Institute of Science
18	University of California, San Diego	43	University of Wisconsin - Madison
19	University of Strasbourg	44	Monash University
20	Purdue University - West Lafayette	45	University of Chicago
21	Heidelberg University	46	University of Muenster
22	Rice University	47	University of Southern California
23	Swiss Federal Institute of Technology Lausanne	48	Tokyo Institute of Technology
24	University of Toronto	49	Nagoya University
25	The University of Tokyo	50	Imperial College London

Appendix C: Universities included in the sampling frame

Arizona State University	Rice University	University of Houston
California Institute of Technology	Stanford University	University of Illinois at Urbana-Champaign
Carnegie Mellon University	State University of New York at Buffalo	University of Maryland, College Park
Colorado State University	Texas A&M University	University of Massachusetts Amherst
Columbia University	The Ohio State University	University of Michigan
Cornell University	The Pennsylvania State University	University of Minnesota
Duke University	The University of Texas at Austin	University of North Carolina at Chapel Hill
Emory University	University of California, Berkeley	University of Pennsylvania
Georgia Institute of Technology	University of California, Davis	University of Pittsburgh
Harvard University	University of California, Irvine	University of South Florida
Indiana University	University of California, Los Angeles	University of Southern California
Iowa State University	University of California, Riverside	University of Utah
Johns Hopkins University	University of California, San Diego	University of Virginia
Massachusetts Institute of Technology	University of California, Santa Barbara	University of Washington
North Carolina State University	University of Chicago	University of Wisconsin-Madison
Northwestern University	University of Colorado	Washington State University
Princeton University	University of Delaware	Washington University in St. Louis
Purdue University	University of Florida	Yale University