Lost in Translation?
The Economics Ph.D. Pipeline for U.S. versus Foreign Applicants

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ABSTRACT

Because the success of Ph.D. programs and their graduates is one of the major criteria by which Economics departments are evaluated externally, it is important to study the determinants of success for prospective candidates. To address this issue, we analyze factors affecting attendance, graduation, and job placement of Ph.D. applicants using a unique dataset from a single top five Economics program in 1989. Using the entire sample of applicants, we find that three predictor variables—GRE scores, the quality of the reference writers, and having a foreign undergraduate education—predict attendance, completion, and initial job placement. When we split the samples according to whether the undergraduate education occurred in the U.S. or abroad, the determinants of success at each stage differ entirely by type of applicant, with the exception of the consistent role played by quantitative GRE scores. Our results have important implications for effective applicant selection criteria used by the graduate search committees.

I. Introduction

Many organizations in their search for the most qualified talent face the dilemma that the underlying skills and abilities of the candidates are not observable. Economics Ph.D. programs, as a case in point, seek doctoral candidates with quantitative skills and aptitude as well as non-observable characteristics such as diligence, perseverance, and creativity. Whereas GRE scores provide a standardized indicator of the former, the latter must be inferred from letters of reference and information about past educational experiences based either on detailed knowledge of particular schools, programs, curriculum and faculty or due to a trusted network relationship.[1] Since applications come overwhelmingly from abroad, admission committees must either have such detailed knowledge or a trusted network relationship for schools from all parts of the globe.[2] In fact, foreign applicants send much weaker signals of their "economics potential," despite better graduate school and early job placement outcomes. Our key finding is that graduate school application information differently predicts attendance, completion, and initial job placement for domestic and foreign applicants; hence, each group of applicants should be analyzed separately.

The considerable literature regarding economics pipeline outcomes primarily consider one stage at a time. For example, Ault, (1979 and 1983) and Eider, Brewer, and Ehrenberg (1998) have shown that undergraduate quality influenced graduate school quality and Freeman, Chang and Chiang (2005) find that letters of reference predict NSF Graduate Research Fellowship awardees. Our interest is in using graduate school or fellowship selection criteria to predict

[1] Perhaps with consistent admission committee members and a steady flow of applicants from a "feeder school" and the same letter writer, it would be possible to learn how to interpret a professors' letters in light of past recommendations and student outcomes. For a detailed description of this type of practice between high school guidance counselors and college admission officers, read Mitchell Stevens's insight account in *Creating a Class: College Admissions and the Education of Elites* (2007).

[2] Foreign applicants have dominated the applicant pool of U.S. economics doctoral programs since the mid-1980s (Bound et al., 2008, Figure 3).

graduate school enrollment, degree attainment and job placement. While some studies exclusively analyze U.S. citizens (McMillen and Singell, 1994; Stock and Siegfried, 2006;), most evaluate whether or not foreign and domestic citizens differ in regard to admission (Attiyeh and Attiyeh, 1997; Krueger and Wu, 2000), degree completion (Ehrenberg and Mavros, 1997; Espenshade and Rodriquez, 1997) and job placement (Krueger and Wu, 2000; Athey et al., 2007).[3] While there is mixed evidence of preference for domestic over foreign applicants,[4] most studies find that foreign students are more likely to complete or take less time to do so (i.e., Ehrenberg and Mavros, 1997; Espenshade and Rodriquez, 1997; Grove and Wu, 2007) but do not differ in their eventual job placements (Athey et al., 2007).

The two purposes of this paper are (1) to analyze what predicts three pipeline outcomes of economics doctoral applicants: program attendance, doctoral degree completion, and initial job market success, and (2) to test whether selection criteria differentially predict outcomes for domestic and foreign candidates. For the analysis we use information from all 344 application files to a top 5 economics Ph.D. program in 1989. Although doctoral student applications contain richly detailed individual data, we have only the following information: demographic data, GRE scores, possession of a prior graduate degree, and quality measure of the undergraduate institutions and of letter of reference writers. Since we have no access to college transcripts or the actual content of the letters of reference, we use quality codes. Whereas quality-coding of applicants'

[3] Stock and Siegfried (2006) examined the early career outcomes of U.S. matriculants. Bowen and Rudenstine (1992) analyzed data for U.S. citizens and permanent resident aliens but excluded non-U.S. residents. McMillen and Singell (1994) only consider the initial job placement of native-born economics Ph.D.s. Finegan, Stock, and Siegfried (2006) examined the nonmatricultion of U.S. and Canadian applicants admitted to U.S. economics Ph.D. programs, while Buchmueller et al, (1999) do not distinguish between foreign and native born economics doctorates in their study of early career productivity.

[4] Regarding determinants of admission to economics Ph.D. programs, Attiyeh and Attiyeh (1997), in a study of 48 different institutions, found that admission committees gave substantial preference to U.S. citizens over foreign applicants not from western Europe, Latin America, or English-speaking countries. In contrast, based on an earlier version of the data set used in the current study, Krueger and Wu, (2000) found no significant differences for admission of any of the citizenship groupings identified by Attiyeh and Attiyeh (1997).

alma maters is common, doing so for letter of reference writers is novel.[5] For example, in our data set, 6 times as many domestic as foreign economics Ph.D. applicants had prominent research economists write them a letter of reference and half again as many domestic as foreign applicants graduated from one of the world's top research universities. Because the success of Ph.D. programs and their graduates is one of the major criteria by which Economics departments are evaluated internally and externally, it is important to assess the efficacy of the selection criteria used to predict applicants' graduate school and early career success.

The results of regressions on the entire sample of applicants show that that three predictor variables—GRE scores, the quality of the reference writers, and having a foreign undergraduate education—predict attendance, completion, and initial job placement. In addition, the quality of the undergraduate institution also influences labor market outcomes. Strikingly, though, when we split the samples according to whether the undergraduate education occurred in the U.S. or abroad, the determinants of success at each stage differ entirely by type of applicant, with the exception of the consistent role played by quantitative GRE scores. Thus, we find that application information for foreign students is usually more difficult to use in predicting their success, and that sometimes their potential may be misjudged as a result.

II. Data and Estimation

Our main sample consists of all 344 applicants to a particular top 5 economics Ph.D. program in 1989. For each of these applicants, we were able to obtain information on several relevant predictor variables from summaries of the applicants' admissions files. Most importantly, we were able to obtain data on the applicants' age, gender, country of origin, other graduate degrees obtained, Quantitative and Verbal GRE scores, and undergraduate college. For a subset of

[5] This coding of reference letter writers also has been used by Krueger and Wu (2000) and Grove and Wu (2007).

applicants, we also had the Analytical and Economics Subject GRE score.

Table 1a shows the means of some key variables for the entire sample, as well as for the subsamples of domestic undergraduate and foreign undergraduates. Approximately 48 percent of the sample completed their undergraduate studies abroad. Foreign baccalaureates have slightly higher quantitative GRE scores than domestic baccalaureates (747 versus 738), but significantly lower verbal scores (501 vs. 631). Although females comprise a quarter of the overall applicants, a third of the domestic candidates were women compared to only 17 percent from abroad. Foreign applicants were both older and more likely to possess prior graduate degrees. T-tests show that the differences in means are statistically significant for many of these variables.

Unfortunately, some pertinent information was not retained in the department's files, such as the students' undergraduate GPA, relevant coursework, and letters of references. The folders did list the name of the applicants' reference writers, however, so we categorized the letter of references into three admittedly subjective groups: (1) at least one reference writer was a prominent research economist (i.e., someone who we deemed to be a well-known and respected researcher in the profession); (2) at least one was an active economist (i.e., an economist who had published in the not too distant past or was known for other reasons); and (3) the reference writers were unknown to us.[6] As a result the missing information on a few independent variables we have full information in 302 cases.

A striking difference exists between reference writers status by applicants undergraduate location. The share of domestic applicants that have a prominent economist or an active economist as a reference writer are 20 and 24 percent, respectively. For foreign applicants, only

[6]These groups were mutually exclusive. References writers could only be classified in group 2 if they were not in group 1. Also note that we classified the reference writers without knowing the name or placement of the applicant.

3 percent have at least one recommendation from a prominent letter writer and 12 percent have at least one reference from an active economist. Once again, the differences in means for the quality of reference writer variables are statistically significant.

To categorize the quality of the undergraduate institution, we use a global ranking of the top 200 economics departments as compiled by Kalaitzidakis et al.'s (2003). For institutions ranked outside the top 200, we give them the highest (worst) rank of 201. In the entire sample 63 percent of respondents received their baccalaureates from a university ranked in the top 200. In the subgroup of students who received their bachelor's degree in the U.S. there were 64 percent of graduates from a ranked school, but for those graduating from institutions abroad this figure is only 43 percent.

In examining the economics Ph.D. pipeline, we study three main outcomes: attending a doctoral program (attend_whether), completing the Ph.D. (complete), and initial job placement (topjob). Initial job placements were obtained through internet searches and combing through vitaes available through the web. We rank initial job placement using Christian Roessler's econPh.D..net rankings of 433 economics research institutions based on "equivalent papers," (http://www.econPh.D..net/rank/rallec.htm), which takes into account the number and length of articles published as of September 2006. Universities are ranked 1 to 321 and other organizations from 1 to 112. We follow Oyer's (2006) approach of coding the universities as 1 to 321, other organizations' as their rank times 2 plus 50, and then all others as 350, the highest (worst) rank possible. For example, the top non-academic institution, the World Bank, has a non-academic ranking of 1 and an adjusted ranking of 52 (1*2 = 50) which positions it as comparable to having a job at Rutgers University. In our primary analysis of job placement, we use a dichotomous variable that is equal to one if the individual is initially placed in a top-100 job.

A number of individuals may have finished a Ph.D., even though we were unable to locate the place of their initial job. To find these additional doctoral degree recipients, we searched the on-line EconLit and Dissertation Abstracts database, as well as the June issues of *Economic Journal*, which list the year's dissertations completed in the United Kingdom, and two databases (www.mcu.es/teseo/index.html and www.mec.es clic tesis doctorales teseo) for finding Spanish dissertations. Finally, some individuals may have enrolled in a doctoral program, but not completed the degree, and therefore would not be found in any of these databases. In the summer of 2006 we conducted a follow-up survey for as many of the 344 applicants that had valid addresses or e-mails. This allowed us to obtain information on individuals that started, but did not complete, a Ph.D. program. In addition, we contacted 50 of the top economics Ph.D. programs to determine whether any of the survey non-respondents without a doctorate might have enrolled but not completed the program. About half of these Ph.D. programs provided this information.

From Table 1a, we see that 75 percent of the sample began an economics doctoral program, 64 percent completed the Ph.D., and 24 percent were initially placed in a job ranked in the top 100, as ranked by the Roessler-Oyer scheme described above. However, these numbers vary by undergraduate origin. Tables 1b and 1c show that more foreign applicants attended a doctoral program (81 percent versus 70 percent), completed a Ph.D. (72 percent versus 57 percent) and obtained a top-100 job (30 percent versus 20 percent) than domestic applicants.

III. Results

For our main analysis, we conduct probit regressions to estimate the probability of attending a doctoral program and completing a Ph.D. For initial job placement, we estimate probits for being placed in a top-100 job. Given the focus of our paper, we conduct the analysis on

for the entire sample, as well as separately for domestic and foreign undergraduates.

We begin our analysis by looking at the results for the entire sample. In column 1 of Table 2.1, the dependent variable is equal to one if an applicant is known to have enrolled in (though not necessarily completed) a Ph.D. program. The results show that those with higher quantitative GRE scores, prominent or active researchers as references, and foreign baccalaureate degrees are more likely to attend a doctoral program. The marginal effect evaluated at the mean values (shown in column 1 of Table 3.1) suggest that a 50 point increase in the GRE score increases the probability of attending by 7 percent. Applicants with prominent letter writers are 16 percent more likely to enroll as a doctoral student, while applicants with an active researcher as a reference are 15 percent more likely to matriculate. Meanwhile, foreign applicants are 18 percent more likely to attend a Ph.D. program, *ceteris paribus*.

In modeling completion using probit regressions, we see similar results. The results in column 2 of Table 2.1 show that the coefficients for quantitative GRE scores, reference writers, and foreign undergraduates are all positively and significantly related to doctoral completion. The marginal effects (column 2, table 3.1) resemble magnitudes from the attendance regression with a notable increase for the effect of a foreign undergraduate degree. In addition, to whatever non-observable factors may account for these differences, this outcome probably reflects the fact that foreigners have limited job market opportunities in the U.S. outside of the graduate program due to visa restrictions. Thus, foreign doctoral candidates may be more determined to finish the degree even if the cost of completion exceeds their initial expectations anticipated, while domestic students, generally speaking, have a wider set of job market opportunities outside of continuing the graduate program. Finally, verbal GRE scores are now marginally significant in predicting completion (p-value of 0.1), but both the coefficients and marginal effects are

relatively low for all stages.

We should note, of course, that part of the reason that these variables predict completion is that they predict admission and attendance. This may explain the discrepancy between our results and those of Ehrenberg and Mavros (1995), who find that GRE scores do not predict either time-to-degree or graduation rates for 24 years of economics Ph.D. students at Cornell University.[7] In contrast to Ehrenberg and Mavros (1995), we use an entire sample of applicants to one program but who pursued Ph.D.s at over 50 schools, of which seven were abroad.

Finally, the last column of Table 2.1 shows results for a regression where the dependent variable is equal to one if the individual initially placed into a top-100 job. Higher quantitative GRE scores, prominent reference writers, and more highly ranked (where a lower rank is "higher") undergraduate institutions are positively correlated with getting a top-100 job. Marginal effects estimated at mean values (table 3.1 column 3.1c) suggest that a 50-point increase in the quantitative GRE score translates to a 5 percent increase in the probability of landing a top-100 job, while having a prominent reference writer increases this probability by 28 percent. The results are consistent with the notion that research focus becomes more important in the latter stages in careers of the Ph.D. graduates (Grove et al 2007). Once again, the coefficient on foreign undergraduates is positive and significant. Foreigners are 27 percent more likely to be placed in a top-100 job, holding other things constant.

Overall, we see a fairly consistent set of results for the sample of all applicants to this particular top-5 graduate program. Quantitative GRE scores, reference writers, and undergraduate origin (foreign versus domestic) are strong predictors of doctoral program attendance, completion, and initial job placement. Meanwhile, the rank of the undergraduate

[7] Ehrenberg and Mavros (1995) separately analyze Ph.D. students in english, mathematics and physics, along with economics.

institution also predicts job placement which may suggest that it is a good early indicator of both the talent and aspirations of each individual. However, as discussed earlier, there are reasons to believe that there may be differences in the relative importance of various success predictors between domestic and foreign undergraduates. One aspect already mentioned is limited job market opportunities for foreign students outside the graduate program and lower initial costs incurred by domestic students associated with graduate program application and attendance. Next, we estimate these same regressions separately for the two groups.

Table 2.2 shows the results for enrollment in the Ph.D. program, doctoral completion, and initial job placement for both the sample of domestic and foreign students. Here we find striking differences between the two groups. In the probit regressions for attendance (first two columns of Table 2.2) in both cases the only variable that is significant at the 5 percent level is quantitative GRE. However, the marginal effect of a 50 point increase is almost twice as big for domestic students than for foreign students (10 percent vs. 6 percent in column 1of Table 3.3 and column 1 of Table 3.2, respectively). Meanwhile, U.S.-educated females are 16 percent more likely to enroll in a doctoral program.

Interestingly, for those applying to graduate school from U.S. undergraduate schools the quality of reference writers does not significantly predict enrollment in a Ph.D. program. On the other hand, when we look at the sample of foreign undergraduates, the two variables representing the quality of an applicant's reference writers drop out because they perfectly predict enrollment in a Ph.D. program. All foreign students that have either a prominent or active economist as a reference writer end up enrolling in a Ph.D. program. The result is consistent with the notion that the opportunity cost of applications for non-US students is low enough that they are more likely to accept offers below their potential applicant-market value. Quantitative GRE scores continue

to be significant predictors of enrollment for foreign undergraduates.

Columns 3 and 4 of Table 2.2 show the results for the completion regression. For domestic undergraduates, a number of applicant characteristics significantly predict doctoral completion. Female students, those with higher quantitative GRE scores, those with prominent or known reference writers, and those with a graduate degree have higher likelihoods of degree completion. However, for foreign-trained students only GRE scores significantly predict completion. We should note that for foreign students, both the quantitative *and* the verbal GRE scores are strong predictors of Ph.D. completion. It is unsurprising that verbal aptitude is more important predictor of Ph.D. completion for foreign undergraduates than for domestic undergraduates given the language barriers some foreign students might face in the process of completing their degrees.[8]

Finally, we look at the results for initial job placement in the last two columns of Table 2.2. For students who complete college in the United States, having a prominent reference writer increases the likelihood of receiving a top-100 job. Also, having an active research economist as a reference and having higher quantitative GRE scores also predict placement in a top job, though these latter two coefficients are only marginally significant (p-values of 0.087 and 0.078, respectively). No other variables in the regression are significant for post-Ph.D. employment. For foreign undergraduates, only gender and rank of undergraduate institution significantly predict job placement. For the pool of foreigners, females are 24 percent less likely to obtain a top-100 job than males *ceteris paribus*, while those who attended better ranked undergraduate schools are more likely to land a highly ranked job. Attending an undergraduate school that is ranked 100 places better increases the probability of initially placing in a top-100 job by 27

[8] When we split the sample into those from English speaking countries and those from non-English speaking countries, we continue to find similar difference in the impact of the verbal GRE score.

percent.

Taken together, we see an interesting set of results when comparing the sample of foreign and U.S. baccalaureates. While the importance of quantitative GRE scores consistently appears for both samples, other differences are quite prominent. Reference writers strongly predict attending a Ph.D. program for foreign applicants, but not for domestic applicants, whereas the quality of reference writers better predict completion and job placement for domestic students than for foreign students. For foreign undergraduates, undergraduate rank strongly predict initial job placement.

These results suggest that admissions committees might do well to place more weight on the identity of reference writers for domestic but not foreign applicants, and to spend more time evaluating the quality and rankings of foreign undergraduate colleges. Admissions committees may not be in a good position to assess those trained in foreign countries, so when they see a reference writer that is known to them, they may be more likely to admit that applicant. As to why we can only speculate. For example, might cultural norms dictate that foreign professors always write letters when asked whereas U.S. faculty only do so for students who they perceive have economics Ph.D. potential?

Finally, in additional analysis not shown here, we split the sample in two additional ways: by country of origin (U.S. and foreign) to probe the role of culture and nationality and by English-speaking countries versus non-English-speaking countries. When we split the sample by country of origin, we find similar results to the case where we split the sample by country of undergraduate school. Foreign nationals that come to the United States to pursue undergraduate studies seem to be more similar to other U.S. undergraduates than to foreigners who remain abroad for college. Likewise, we do not find noticeable differences when we split the sample by

language of the country of origin. [, we also conducted additional analysis where we compared results for individuals from English speaking countries and those from non-English speaking countries (not reported).]

IV. Limitations of the Research

Of course, these findings are subject to the limitations of our study. Since our data come from the applicant pool to a single top-5 economics department in 1989, our results apply to that particular group of aspiring economists in that year who sought training at one of the most elite economics doctoral programs. We quantify the information value of letters of reference and undergraduate experience in specific ways.

As discussed earlier, there are many reasons to believe that there will be differences in the predictors of doctoral attendance, completion and job placement. In particular, there may be differences in the ability of admissions committees to evaluate these different pools of applicants, different alternative job prospects for the two groups, and disparities in the undergraduate training and experience. Naturally, it would be desirable for further research to evaluate more fully the value of information contained in college transcripts, letters of reference, and the personal essay. Generalization of our findings is left for future research.

V. Implication for graduate search committees

Although the applicant pool has become increasingly dominated by aspiring economists from outside the U.S., the doctoral application contains the same information it has for decades. The primary challenge is for U.S. admission committees to translate foreign undergraduates' signals from abroad to better predict various outcome measures. Aside from GRE scores,

admission committees seek evidence of what it takes to be a successful economist from transcripts, quality of undergraduate school, letters of reference, and the personal essay. Because assessing applicants' prior educational experiences and interpreting reference letters requires intimate knowledge of hundreds of undergraduate institutions or an established "feeder" relationships, we label as parochial these doctoral selection criteria. Not surprisingly, then, more variables explain U.S. than foreign pipeline outcomes. What explains the difference in the predictive powers of these characteristics between foreign and domestic undergraduates? To some degree, applicants with foreign undergraduate degrees must send "noisier" signals of their potential ability.

The first challenge for the admission committee is to compare the quality of schools and applicants' transcripts from around the world. The decentralized U.S. system of higher education has spawned a cottage industry of publications ranking colleges and universities in the U.S.[9] While the lack of a "global college guide" in 1989 may seem less surprising, apart from few notable attempts, still none exists today (see Liu and Cheng's "Academic ranking of world universities" published annually since 2003, or the London *Times Higher Education Supplement*, which since 2004 produces annually a list of the top 200 universities in the world, of which in 2007 only four were in less developed countries). Given the strong predictive power of undergraduate ranking on the job placement of foreign undergraduates, admission committees might find it worthwhile to have a more comprehensive ranking of foreign undergraduate institutions than currently exists.

Surprisingly, the graduate school office of recruitment at a major research university we

[9] The EU is currently implementing the Bologna Process, a system to which aims to harmonize 40 different European higher education systems by creating a single system of degrees by 2010. The European Higher Education Area by 2010 will allow students to choose from a wide and transparent range of high quality courses and benefit from smooth recognition procedures (see the European Commissions webpage regarding the Bologna Process: http://ec.europa.eu/education/policies/educ/bologna/bologna_en.html).

contacted maintains no in-house ranking of world undergraduate universities or comparison of the success at that institution of students from undergraduate schools from abroad. Thus, each Ph.D. department's admission committee is left to their own judgment with typically a very small number of observations with which to make inferences. For example, the co-authors of present study graduated from Brown University, Illinois Wesleyan University, and Warsaw University in Poland. Although Brown and IWU can easily be compared on a variety of metrics and with numerous ranking systems, we know of no clear method of comparing the relative merits of all three institutions, much less of different transcripts and GPAs from each.[10]

The one significant result for having an undergraduate degree from a top 200 world university is the greater likelihood of top job placement for foreigners. Although we cannot explore it here, countries with centralized systems of higher education based on national merit exams may more clearly identify at least some aspects of career potential, perhaps persistence and diligence, if not creativity. For example, between 1997 and 2002, Seoul National University topped the list of undergraduate alma maters which produced the most economics Ph.D.s in the U.S. with 162—twice that produced by Harvard University (Siegfried and Stock, 2007). Of the top 25 undergraduate sources of eventual economics Ph.D.s, 13 are foreign institutions (ibid).

The second admission committee challenge pertains to letters of reference because the substantial literature on job references and the few studies of letters of reference generally find no predictive value. Feeder schools and networks of faculty recommenders willing to honestly and accurately assess the merits of their students can be very valuable if proven reliable over time. Naturally, new networks may emerge with foreign institutions and faculty but take time to develop, especially because the goal is not merely for students to complete the degree but to

[10] Although Brown is ranked 24th in Kalaitzidakis et al. (2003), neither of other schools is. Note, though, that a higher percentage of IWU graduates attain economics Ph.D.s than do Brown graduates (Siegfried and Stock 2007).

establish successful careers as professional economists.

For a variety of reasons, especially back in 1989 when the applications for this data were submitted, letters of recommendation from abroad may have less clearly identified economics talent. Whereas in 1989 maintaining such networks abroad was harder and newly-minted Ph.D.s' connections to their doctoral-degree granting programs and faculty deteriorated from lack of contact, the diffusion of the World Wide Web, ease of international travel, and political opening of many governments have increased the ease of establishing and maintaining such networks. According to Goyal et al. (2006), for example, the distance between economists has shrunk rapidly from 1970 to 2000, measured as the degrees of separation connecting the largest cluster of co-authoring economists.

VI. Conclusion

Although a number of articles have highlighted the career pathways of economics Ph.D.s, none have examined the admission committee's dilemma of predicting pipeline outcomes for foreign versus domestic applicants based on application file information.[11] Aside from quantitative GRE scores, which always matters for all applicants, and age, which never matters, the significance of the other application file variables in predicting graduate school and early career results depends both upon the particular stage of outcome as well as whether the individual is foreign or domestic.

Overall, we find that the predictors of each stage of the Ph.D. pipeline are quite different for foreign and domestically-trained students. For example, having a highly ranked reference letter writer predicts attendance for foreign, but not domestic students. On the other hand, the identity of reference writers predicts completion and job placement for U.S. baccalaureates, but

[11] See, for example, Bound et al., (2008), Siegfried and Stock (2007), and Attiyeh and Attiyeh (1997).

not foreign ones. We also find that American women are more likely to attend and to complete a Ph.D. program than American men, controlling for other applicant characteristics, but gender does not influence their labor market outcomes. On the other hand, for foreigners, gender does not affect attendance or completion, though foreign women are less likely to be placed in top jobs than foreign men. Finally, GRE verbal scores significantly predict only foreigners' likelihood of finishing the dissertation, whereas prior possession of a graduate degree increases U.S. undergraduates' chances of completing the doctorate.

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Table 1.1
Descriptive Statistics for Entire Sample

Variable	Obs	Mean	Std Dev	Min	Max
Top 100 Ranked Job	302	0.252	0.435	0	1
Completed Ph.D. Program	302	0.646	0.479	0	1
Attended Ph.D. Program	302	0.752	0.433	0	1
Quantitative/100	302	7.424	0.631	4.4	8
Verbal/100	302	5.687	1.237	2.6	8
Female	302	0.252	0.435	0	1
Age 25 Plus	302	0.483	0.501	0	1
Graduate Degree	302	0.384	0.487	0	1
Prominent Economist Reference	302	0.123	0.328	0	1
Active Economist Reference	302	0.182	0.387	0	1
Undergraduate Ranking	302	127.940	81.801	1	201
Undergraduate Ranking: Top 200	302	0.540	0.499	0	1
Foreign Undergraduate	302	0.480	0.500	0	1

Table 1.2
Descriptive Statistics: Sample of Students Who Completed Undergraduate Degrees in the U.S.

Variable	Obs	Mean	Std Dev	Min	Max
Top 100 Ranked Job	157	0.204	0.404	0	1
Completed Ph.D. Program	157	0.573	0.496	0	1
Attended Ph.D. Program	157	0.701	0.459	0	1
Quantitative/100	157	7.385	0.634	5.3	8
Verbal/100	157	6.313	0.896	3.8	8
Female	157	0.325	0.470	0	1
Age 25 Plus	157	0.338	0.474	0	1
Graduate Degree	157	0.217	0.413	0	1
Prominent Economist Reference	157	0.204	0.404	0	1
Active Economist Reference	157	0.242	0.430	0	1
Undergraduate Ranking	157	94.904	87.610	1	201
Undergraduate Ranking: Top 200	157	0.643	0.481	0	1

Table 1.3
Descriptive Statistics: Sample of Students Who Completed Undergraduate Degrees Outside the U.S.

Variable	Obs	Mean	Std. Dev.	Min	Max
Top 100 Ranked Job	145	0.303	0.461	0	1
Completed Ph.D. Program	145	0.724	0.448	0	1
Attended Ph.D. Program	145	0.807	0.396	0	1
Quantitative/100	145	7.466	0.627	4.4	8
Verbal/100	145	5.010	1.201	2.6	7.7
Female	145	0.172	0.379	0	1
Age 25 Plus	145	0.641	0.481	0	1
Graduate Degree	145	0.566	0.497	0	1
Prominent Economist Reference	145	0.034	0.183	0	1
Active Economist Reference	145	0.117	0.323	0	1
Undergraduate Ranking	145	163.710	56.510	20	201
Undergraduate Ranking: Top 200	145	0.428	0.496	0	1

Table 2.1. Probit estimates for whether candidate attended Ph.D. Economics program, whether completed the degree, and whether received a job in the top 100 ranking institution.

	Attend Ph.D. program	Complete Ph.D.	Top-100 job
	(1)	(2)	(3)
Quant QRE	.461***	.441***	.312*
	(.140)	(.135)	(.165)
Verbal GRE	.133	.132*	.110
	(.087)	(.080)	(.084)
Female	.182	.207	-.140
	(.201)	(.188)	(.210)
Age25+	-.033	.028	-.099
	(.191)	(.181)	(.203)
Grad deg.	.157	.236	.160
	(.198)	(.187)	(.208)
Ref Group1	.661**	.732**	.802***
	(.323)	(.293)	(.279)
Ref Group2	.606**	.459**	.273
	(.249)	(.218)	(.234)
Under rank/100	.173	-.002	-.349***
	(.123)	(.116)	(.132)
Foreign Under	.602***	.681***	.917***
	(.225)	(.210)	(.239)
Pseudo R-square	.105	.106	.133
Observations	302	302	302

Notes: Standard errors in parentheses; * Significant at 10%; ** Significant at 5%; *** Significant at 1%; all regressions include constant term which is not reported.

Table 2.2. Probit estimates for whether candidate attended Ph.D. Economics program, whether completed the degree, and whether received a job in the top100 ranking institution, by undergraduate degree source (foreign vs. domestic).

	Attend Ph.D. program		Complete Ph.D.		Top-100 job	
	Foreign Undergrad	Domestic Undergrad	Foreign Undergrad	Domestic Undergrad	Foreign Undergrad	Domestic Undergrad
	(1)	(2)	(3)	(4)	(5)	(6)
Quant QRE	.433**	.619***	.422**	.618***	.250	.468*
	(.207)	(.206)	(.193)	(.205)	(.223)	(.266)
Verbal GRE	.191	.070	.232**	-.132	.143	-.069
	(.125)	(.140)	(.108)	(.139)	(.104)	(.173)
Female	-.350	.521*	-.440	.790***	-.930**	.268
	(.338)	(.273)	(.305)	(.264)	(.399)	(.286)
Age25+	.313	-.178	.210	.065	.061	-.106
	(.324)	(.251)	(.295)	(.248)	(.297)	(.315)
Grad deg.	-.076	.308	.010	.634**	.203	.277
	(.295)	(.292)	(.272)	(.286)	(.280)	(.347)
Ref Group1	------	.509	.318	1.039***	.496	1.226***
	------	(.360)	(.756)	(.346)	(.636)	(.373)
Ref Group2	------	.346	.525	.559**	-.189	.559*
	------	(.291)	(.401)	(.279)	(.407)	(.327)
Under rank	-.001	.001	-.002	.0003	-.008***	-.0008
	(.003)	(.001)	(.002)	(.001)	(.002)	(.002)
Pseudo R-square	.080	.116	.107	.154	.162	.1825
Observations	123	157	145	157	145	157

Notes: Standard errors in parentheses; * Significant at 10%; ** Significant at 5%; *** Significant at 1%; all regressions include constant term which is not reported.

Table 3.1. Marginal effects for probit estimates for whether candidate attended Ph.D. Economics program, whether completed the degree, and whether received a job in the top 100 ranking institution.

	Attend Ph.D. (1)	Complete Ph.D. (2)	Top-100 job (3)	Mean values (4)
Quant/100	.138	.161	.092	7.424
Verbal/100	.040	.048	.032	5.687
Female	.053	.0738	-.040	.252
Age25+	-.010	.010	-.029	.483
Grad deg.	.047	.085	.048	.384
Ref Group1	.159	.227	.279	.123
Ref Group2	.154	.155	.085	.182
Und. Rank/100	.022	-.001	-.103	1.28
Foreign Under	.178	.244	.269	.480

Table 3.2. Marginal effects for probit estimates for whether candidate attended Ph.D. Economics program, whether completed the degree, and whether received a job in the top 100 ranking institution. FOREIGN

	Attend Ph.D. (1)	Complete Ph.D. (2)	Top-100 job (3)	Mean values (4)
Quant/100	.125	.135	.082	7.466
Verbal/100	.055	.074	.047	5.010
Female	-.110	-.153	-.241	.172
Age25+	.094	.069	.0201	.641
Grad deg.	-.022	.003	.066	.566
Ref Group1		.092	.182	.034
Ref Group2		.144	-.059	.117
Und. rank/100	-.031	-.051	-.273	1.630

Table 3.3. Marginal effects for probit estimates for whether candidate attended Ph.D. Economics program, whether completed the degree, and whether received a job in the top 100 ranking institution. DOMESTIC

	Attend Ph.D. (1)	Complete Ph.D. (2)	Top-100 job (3)	Mean values (4)
Quant/100	.207	.240	.114	7.385
Verbal/100	.023	-.051	-.017	6.313
Female	.163	.288	.069	.325
Age25+	-.061	.025	-.025	.338
Grad deg.	.097	.229	.073	.217
Ref Group1	.153	.347	.387	.204
Ref Group2	.109	.205	.155	.242
Und. rank/100	.027	.011	-.018	.940