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Abstract

Information about 586 individuals who matriculated into 27 economics Ph.D. programs in Fall 2002 is used to estimate first and second year attrition rates. After two years, 26.5 percent of the initial cohort had left, equally divided between the first and second years. Attrition varies widely across individual programs. It is lower among the most highly rated 15 programs, for students with higher verbal and quantitative GRE scores, and for those on a research assistantship. Poor academic performance is the most cited reason for withdrawal. About 15 percent transfer to other economics programs because they are dissatisfied with some aspect of the particular program where they first enrolled.

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ATTRITION IN ECONOMICS PH.D. PROGRAMS

Remarkably little is known about the timing and extent of attrition of doctoral students from economics Ph.D. programs, its variation across universities, its association with program and student characteristics, and the reasons why students withdraw. Earlier estimates of the attrition rate in economics exceed the rate in physics and mathematics, and are much higher than in professional programs such as management and law (William G. Bowen and Neil L. Rudenstine, 1992). Attrition generates opportunity costs for universities in financial aid and faculty time, and for students in foregone earnings and delayed entry into alternative career tracks that better fit their talents and interests, as well as psychic costs for students whose previous academic achievement was exemplary (Scott Smallwood, 2004).

The literature on attrition includes studies of completion rates of U.S. economics Ph.D. students at a single university (W. Lee Hansen and Judith S. Craig, 1975; Ronald G. Ehrenberg and Panagiotis G. Mavros, 1995; and Alan B. Krueger and Stephen Wu, 1998), from matched pairs of universities (Barbara E. Lovitts, 2001), and from other countries (Anne D. Boschini et. al., 2004; Alison L. Booth and Stephen E. Satchell, 1995; Jan C. van Ours and Geert Ritter, 2003). A major study of attrition in the humanities and some social science disciplines (but not economics) in the United States is underway (Jeffrey Groen et al., 2004). Bowen and Rudenstine (1992) explored outcomes for Ph.D. programs in six disciplines, including economics, at ten U.S. universities over twenty years.[1] They found that about half of entering students eventually earn a Ph.D. (p. 105), with completion rates being higher at smaller programs (after controlling for selectivity and financial aid).

In spite of these efforts, there has been little systematic analysis of attrition across the spectrum of U.S. economics Ph.D. programs. Accordingly, we have followed 586 individuals who entered one of 27 economics Ph.D. programs in Fall 2002 in order to estimate dropout rates, discover student and program characteristics related to attrition, and reasons for withdrawals.

I. Data Sources and Variables

In 2003-04, we collected baseline program-level attrition information from department representatives[2] at 27 U.S. economics Ph.D. programs, including 15 of the 22 largest, and 12 others, each averaging at least 5 Ph.D.s per year.[3] The programs are diverse in terms of 1993 National Research Council (NRC) ratings (Marvin Goldberger et al., 1995). Three are Tier 1, six Tier 2, seven Tier 3, six Tier 4, and four Tier 5. One is unranked.[4] Together the 27 produced 42 percent of the Ph.D.s issued by U.S. programs awarding at least one degree from 1998 to 2001.[5] They probably accounted for a smaller proportion of dropouts, however. Higher-ranked programs are over-represented: 22 of the 27 are among the top rated 48 programs. Because these programs recruit more qualified students, help them finish faster, and place them in better jobs, our data may understate attrition for the entire population of economics Ph.D. producing programs.

Program information includes the number of graduate faculty, 1993 NRC ranking, the size of the first-year class, the faculty-student ratio, and indicators of university control (private or public), whether a terminal master's degree is offered, and whether first-year students must pass some written exams before starting their second year. Following Chris M. Golde (2000) and Lovitt (2001), who argue that much Ph.D. student attrition arises from the failure of programs to integrate students academically and socially into graduate study, we also collected measures of three possible indications of integration—whether first-year students must attend

seminars, whether shared offices are provided for students on financial aid, and whether students are assigned individual faculty advisers. We also obtained data from the programs about each of the 586 Ph.D. students who first enrolled in Fall 2002, including demographic information (sex, date of birth, and citizenship), educational background (fields of study, GPAs, names of schools awarding degrees), Graduate Record Examination (GRE) and Test of English as a Foreign Language (TOEFL) scores, information about financial aid the students received while enrolled, and the field(s) of interest within economics that students listed on their applications.

The baseline data were supplemented annually with information from each department on students who left their programs during each of the first two years of graduate study. Of the 586 entering students from Fall 2002, 77 did not return for a second year of graduate study and 78 more did not return for a third year. We have information from the programs on each dropout's academic progress, when and why they left, and what they were doing afterward (if known).

Finally, in early 2004 (for first-year dropouts) and early 2005 (second-year dropouts), we mailed surveys to each dropout, asking about the timing and reasons for their withdrawal, their current activities (e.g., graduate study in another school or discipline, job, etc.), and career goals.[6] Twenty-six first-year and 31 second-year dropouts responded, yielding response rates of 34 and 40 percent, respectively. Because the survey respondents may be a non-random sample of all dropouts from the 27 programs, we rely on department-provided data, where possible. We also compare the replies from survey respondents to the replies from departments.

II. Attrition and Program Characteristics

Table 1 reports attrition rates by program characteristics for the whole sample and by 1993 NRC quality tiers. The first-year attrition rate for the full sample is 13 percent and the second-year attrition rate is 15 percent of first year survivors; the cumulative two-year attrition

rate is 26.5 percent of the initial class.[7] Nearly complete reports for Fall 2005 indicate a *much* smaller third year attrition rate—about 3 percent of the initial cohort. Students in Tier 1 and Tier 2 programs had significantly lower two-year attrition rates than those enrolled elsewhere.[8]

Groen et al. (2004) report that the eventual attrition rate for humanities disciplines is about double the rate experienced during the first two years. On that basis, we predict that just under half of the initial cohort will eventually earn a Ph.D. in economics, a fraction similar to that reported for economics by Bowen and Rudenstine (1992).

Higher-ranked programs have larger entering cohorts, but contrary to the findings of Bowen and Rudenstine (1992), who argued that attrition might be lower at smaller programs because they can offer more personal attention to students, we find attrition unrelated to program size. Lower-ranked programs have more faculty per student than higher ranked programs. Students at universities with above-average faculty-student ratios experienced attrition rates of 30 percent, compared to 23 percent at schools with below-average ratios—a statistically significant difference. This association disappears, however, once other factors are controlled in a probit regression. Attrition among students attending the 12 private schools in our sample was only two-thirds as high (20 percent) as among those in the 15 public institutions (31 percent), but this significant difference also evaporates when we control for other variables. Two-year attrition is not significantly related to other program features.

Not revealed by Table 1 is the striking variation in attrition across Ph.D. programs. The ten programs with the lowest two-year attrition rates lost only 11 percent of their entering class, while the nine programs with the most attrition lost a staggering 43 percent of their entering cohort. Between them are eight that, on average, lost 24 percent of their entering class. Eight of

the nine programs with the highest attrition rates are in Tiers 3 and 4, and seven of them are in public universities.

III. Attrition and Student Characteristics

Characteristics of the 586 students in the entering class of Fall 2002 are reported in Table 2 for the entire cohort and by tier. The three GRE scores generally decline monotonically with program tier. Dropout rates are significantly lower for students with above average GRE scores. There are no differences in raw attrition rates by demographic characteristics. Neither those with a prior advanced degree, nor those holding undergraduate degrees in economics or mathematics, had statistically significantly lower attrition rates than their counterparts. Students in Tier 1 programs more often earned their undergraduate degrees from U.S. universities that offer a Ph.D. in economics, Top-50 U.S. liberal arts colleges,[9] or Top-50 foreign institutions[10] than did those at lower-tier programs, although attrition rates do not vary much across students on the basis of type of undergraduate institution. Attrition is higher among those (primarily American) students whose undergraduate degree is from a U.S. public institution that does not offer a Ph.D. in economics than among other students, and is lower among those (mostly foreign) students whose undergraduate degree is from a Top-50 rather than a non-Top-50 foreign institution.

Financial aid is related to both the tier of a student's Ph.D. program and to attrition rates. Securing some form of aid and receiving a fellowship (absent a work requirement) are more common among students enrolled at top-tier programs, and attrition is significantly lower among students with some form of aid, especially among those holding fellowships. Of course, departmental decisions to award aid and scarce fellowships will be affected by the academic promise of the applicants, and so the *net* influence of aid on attrition can be ascertained only if academic credentials are held constant, as we do below.

IV. Predicting Attrition

Probit estimates of the dropout decision as a function of program (P) and student-level (S) characteristics are reported in Table 3, where

$$Pr\ (dropout_t = 1) = \Phi(\beta_0 + \beta_1 P + \beta_2 S),$$

and Φ is the standard normal cumulative density function. We estimate first-, second-, and two-year attrition. From 10 to 15 percent of the variation in student attrition can be explained by program-level and ex-ante application information alone.

Students at Tier 1 or 2 and Tier 5 Ph.D. programs experienced lower two-year attrition than those at Tiers 3 or 4 programs, ranked 16 through 48 (the omitted category). Neither the presence of a terminal master's program nor the control of university attended is associated with attrition. Second-year attrition is higher where there is an exam requirement (at the marginal 0.104 level), as would be expected if exams winnow out students with low completion prospects.

Consistent with the predictions of Golde (2000) and Lovitts (2001) about early integration of students into a graduate student culture, attrition is markedly lower at programs that assign shared offices to students on financial aid.[11] Our other integration measures, seminar attendance and individual faculty advisers, are unrelated to dropping out. Unlike earlier findings that women drop out more often than men, that Americans withdraw more frequently than foreign students (Smallwood, 2004), and that personal characteristics matter more for attrition than for time-to-degree (Ehrenberg and Mavros, 1995), we find that no demographic measure is significantly related to attrition; nor does a prior graduate degree, an undergraduate degree in economics or math, or a dual major in both seem to matter.[12]

Raw attrition rates were negatively related to all three GRE scores, but the relationship for the analytical score disappears in the probit estimates.[13] Higher verbal and quantitative GRE

scores are related to lower attrition once other factors are controlled. Although one might expect less first- and second-year attrition among students with an interest in micro theory, macro theory, or econometrics (the core of the first-year curriculum), that does not appear to be the case. Raw attrition was lower for students who were awarded fellowship aid, and higher for students who received no financial aid in their first year of Ph.D. study. Our probit estimates, however, reveal that once other factors are controlled, only research assistant status relates to attrition, reducing it, as is found commonly in research on Ph.D. attrition (Smallwood, 2004).[14]

Because dropout behavior may differ by demographic characteristics, we estimated two-year attrition separately by sex and citizenship (results are available from the authors). The sex-specific runs show that the negative relation between *shared office availability* and attrition is driven by the behavior of women. Dropouts decline as the GRE analytical score rises for men, but not for women. In contrast, dropouts decline as the GRE quantitative score rises for women, but not for men. American women are more likely to drop out than female international students, but there is no corresponding difference between United States and foreign men.

V. Reasons for Attrition

We sent surveys to departments and to dropouts, offering a list of possible reasons for withdrawal.[15] Respondents were asked to identify both primary and secondary reasons. Table 4 presents the primary reasons reported by departments for each of the 155 students who left. Unsatisfactory academic progress accounted for 59 percent of all departures—far ahead of personal and family reasons (12 percent) or lost interest in graduate study (10 percent). Program dissatisfaction and financial reasons were rarely mentioned. Fewer students in Tiers 1 and 2—and in Tier 5—left because of academic problems than did students in Tiers 3 and 4.

Departmental responses have the advantage of covering all dropouts and are probably more objective, but they also may be less informed, especially about students who leave after a year or less of graduate study, or who leave for subjective reasons that are often unknown to departmental representatives. Student responses, on the other hand, may be influenced by after-the-fact rationalizations and selection bias. Although not reported in our tables, there is, in fact, evidence of selection bias with respect to responses to our dropout surveys. We find that U.S. citizens, those who earned undergraduate degrees from economics-Ph.D.-granting universities, and those who enrolled in Tier 1 or Tier 2 Ph.D. programs are significantly over-represented among respondents, while those with a prior advanced degree in some other field or who enrolled in a Tier 5 school are under-represented. It is thus reassuring that the distribution of *department-reported* reasons for the 57 respondents returning mailed surveys is strikingly similar to that for all 155 dropouts reported in Table 4.[16] Evidently, the sources of selection bias do not significantly influence the program representatives' views of why students leave.

Unfortunately, there are differences in the reasons for attrition cited by departments and by the dropouts who returned our surveys. Table 5 cross-classifies the primary reasons given by both sets of respondents. The total distribution of reasons cited by departments is reported in the last row of the table; the distribution cited by students is reported in the last column. Cases where departments and students agree are in the diagonal cells. Agreement occurred in only 22 of the 57 cases, the great majority of which cited unsatisfactory academic achievement.[17]

Among the 25 dropouts who indicated unsatisfactory academic work as a primary or secondary reason, 14 cited "insufficient mathematical preparation" as the root of their problem. Six cited "difficulty mastering economic theory," and four students cited both. Of the 31 dropouts reporting program dissatisfaction as a primary or secondary reason, 13 identified poor

advising and lack of faculty interest in students' academic progress, 10 cited a mismatch between students' fields of interest and courses offered or research interests of the faculty, and 7 alleged poor teaching. Twenty-three dropouts said they lost interest in getting an economics Ph.D. The leading cause of their lost interest, cited by nine of them, was a curriculum lacking relevance to real world economic problems and/or policies.

VI. Transfers to Other Ph.D. Programs, Other Enrollments, and Career Plans

We asked dropouts what they had done since their withdrawal and, for those not planning to resume economics Ph.D. study, what were their career goals. By Fall 2004, 11 of the 57 respondents had transferred to other economics Ph.D. programs. Nine more reported plans to resume economics doctoral studies. Based on leads from program representatives, a Google search, and reviews of university websites, we found nine transfers among nonrespondents to our survey.[18] In view of the limits of departmental information, non-responses to our survey of dropouts, and our inability to track every dropout who may have enrolled in another economics Ph.D. program, total transfers must exceed 20. Fully adjusting for them might reduce the 26.5 percent two-year attrition rate from economics in general by four or five percentage points.

In the Fall after dropping out, 10 of the 57 respondents were enrolled in M.A. degree programs in economics, 2 were seeking degrees in finance, and 2 were in law school. Of the 15 not enrolled in any degree program or planning to resume doctoral studies in economics, three-fourths contemplated careers as financial or economic analysts or consultants.

VIII. Conclusion

Economics Ph.D. programs lose about 13 percent of their entering class during each of the first two years, thereby limiting eventual program completion rates to less than 75 percent.

Because some dropouts during the first two years transfer to other economics Ph.D. programs, discipline-wide attrition is less than the sum of individual program attrition.

Attrition is higher at institutions ranked 16-48 by the NRC than at either top-15 programs or programs ranked 49 or lower. Students with higher verbal and higher quantitative GRE scores are less likely to drop out during the first two years. Those holding a research assistantship and those with access to shared office space during their first year also experienced significantly lower attrition, probably reflecting greater integration into the life of a professional economist.

Endnotes

[1] Eight of the ten economics departments in Bowen and Rudenstine's study were among the top 15 in the National Research Council's 1993 faculty rankings; thus, its findings do not represent the average economics Ph.D. program.

[2] Often the information comes from an administrative assistant rather than from the director of graduate studies (DGS). To simplify exposition, we use the term program representative" regardless of the information source.

[3] Each of the 22 programs with the most degrees awarded from 1998 through 2001 was invited to participate; 15 accepted. The remaining 12 programs were selected randomly from the 45 smaller programs that averaged at least 5 Ph.D.s annually from 1997-98 through 2000-01.

[4] The first tier of NRC rankings consists of Chicago, Harvard, MIT, Princeton, Stanford, and Yale (three of which are included in our study). The second tier is California-Berkeley, Columbia, Michigan, Minnesota, Northwestern, Pennsylvania, Rochester, UCLA, and Wisconsin. The third tier is programs ranked 16-30; fourth tier programs are ranked 31-48. We included in the fifth tier the remainder of programs, including one not ranked by the NRC.

[5] Based on tabulations from listings in December issues of the *Journal of Economic Literature.*

[6] Nonrespondents were sent one or two follow-up surveys. We continue to track the cohort through graduate school.

[7] We did not ask for annual information on *all* Ph.D. students in our cohort—requesting data only on dropouts. We know of two students who withdrew from their program but who later returned. Although likely rare, such temporary leaves imply that our measured dropout rate is biased upward.

[8] Although the Tier 1 students' second-year attrition rate is not lower than that of students in Tier 2, it is lower than that of all students outside of Tier 1 taken together.

[9] The Top-50 liberal arts colleges are identified annually by *U.S. News and World Report*. We added Dartmouth, Miami (Ohio), Richmond, Trinity University, Tufts, and William and Mary (selective institutions with few graduate programs, but not classified as private liberal arts colleges) to the group.

[10] The top-50 foreign schools are identified by Kalaitzidakis et al. (2001, Table 2).

[11] It is possible that universities with sufficient resources to provide offices to Ph.D. students also attract academically stronger Ph.D. students by awarding larger amounts of financial aid. If this occurs, the correlation between office space and attrition may be spurious.

[12] For U.S. citizens, holding an undergraduate degree from a non-Ph.D. granting U.S. public university is positively related to attrition relative to those whose bachelor's degree is from a U.S. university offering an economics Ph.D.

[13] The GRE Analytic exam was discontinued in 2003.

[14] Concern about potential endogeneity of the financial aid variables led us to follow Ehrenberg and Mavros (1995) and re-estimate the regression in column 2 of Table 3 excluding financial aid variables. The estimated coefficients on the remaining variables (especially those on the GRE exam scores) did not change much from those in Table 3.

[15] These surveys were nearly identical, with the exception that we omitted "Don't know" from the student survey so as not to insult their intelligence. Surprisingly, only one departmental representative checked this box.

[16] This similarity can be seen by comparing the percentage distribution of department-reported reasons from the frequencies in Table 5 with the full sample figures in Table 4.

[17] Not surprisingly, the incidence of agreement for dropouts who left in year two was almost three times larger than for those who left in the first year. Those leaving earlier are less well-known to departmental representatives, and fewer of them leave because they have exhausted allowed attempts at preliminary or comprehensive exams.

[18] Of the sixteen students known to have transferred to other domestic programs (four went overseas), six moved upstream as judged by NRC tiers, nine downstream, and one horizontally.

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Table 1 - Ph.D. Program Characteristics and Attrition Rates by Program Rank

	Program Rank					*Full*	*Two-year attrition rate by row variable*[d]	
	1-6	*7-15*	*16-30*	*31-48*	*>48*	*sample*	*1*	*0*
Number of programs	3	6	7	6	5	27	-	-
Number of students	103	149	142	128	64	586	-	-
Number of dropouts	15	27	42	50	21	155	-	-
First-year attrition rate	**0.04**[c]	0.13	**0.07**	**0.23**	**0.23**	0.13	-	-
Second-year attrition rate[a]	**0.11**	**0.06**	**0.24**	**0.20**	0.13	0.15	-	-
Two-year attrition rate	**0.15**	**0.18**	0.30	**0.39**	0.33	0.26	-	-
First-year class size (# of students)	**37**	27	**22**	25	**18**	26	0.29	0.23
Faculty-student ratio	**0.20**	**0.29**	**0.29**	0.26	**0.32**	0.27	**0.30**	**0.23**
Private university[b]	**1.00**	**0.25**	**0.36**	**0.20**	**0.55**	0.43	**0.20**	**0.31**
Terminal master's degree offered[b]	**0.00**	0.14	0.17	0.16	**0.41**	0.16	0.29	0.26
Seminar attendance required[b]	**0.23**	0.58	**0.45**	**0.84**	**0.89**	0.58	0.29	0.23
Core exam pass required[b]	**0.77**	0.62	**0.58**	**0.73**	**0.38**	0.63	0.27	0.26
Shared offices available[b]	**0.54**	**1.00**	0.83	**1.00**	**0.45**	0.82	0.26	0.30
Individual advisers assigned[b]	0.31	**0.52**	0.35	**0.21**	**0.00**	0.32	0.25	0.27

Source: Authors' surveys of graduate programs in economics. The denominator in each column is the number of students (not the number of programs) in each tier.

[a] Computed as (number of dropouts during year 2)/(number of students in entering class - number of dropouts during year 1).

[b] Proportions

[c] Numbers in bold are those for which the mean value for the tier is statistically higher or lower than for the rest of the sample at the 0.10 level (two-tailed tests).

[d] For continuous variables, the "1" column reports the mean attrition rate for students from programs with variable values above the mean for the sample and the "0" column reports the mean attrition rate for students from programs with variable values below the mean of the sample. Numbers in bold are those for which the means across the two groups (those with variable = 1 and those with variable = 0) are statistically different at the 0.10 level (two-tailed tests).

Table 2 - Student Characteristics by Ph.D. Program Rank

	Program Rank					*Full*	*Two-year attrition rate by row variable*[d]	
	1-6	*7-15*	*16-30*	*31-48*	*>48*	*sample*	*1*	*0*
Number of students	103	149	142	128	64	586	-	-
GRE analytical score	**752**[c]	**737**	716	713	**667**	722	**0.22**	**0.33**
GRE verbal score	575	**547**	573	577	**517**	562	**0.22**	**0.32**
GRE quantative score	**785**	**782**	**765**	771	**738**	772	**0.20**	**0.39**
U.S. Citizen[a]	0.32	**0.26**	**0.39**	0.34	0.38	0.33	0.30	0.25
Male[a]	0.72	0.66	0.67	**0.58**	0.67	0.66	0.25	0.29
Median age at entry to program	**24.6**	24.7	24.6	25.0	**26.5**	24.8	0.28	0.26
Hold prior graduate degree[a]	**0.38**	0.48	0.44	0.47	**0.58**	0.46	0.25	0.28
Hold undergraduate degree in economics[a]	0.73	0.69	**0.78**	0.65	**0.58**	0.70	0.26	0.27
Hold undergraduate degree in economics/math[a]	**0.10**	0.08	0.04	0.05	**0.00**	0.06	0.17	0.27
Hold undergraduate degree in math[a]	**0.08**	0.03	0.01	0.02	0.03	0.03	0.16	0.27
Median years since undergraduate degree	**1.3**	2.3	2.2	2.3	**3.2**	2.3	0.27	0.26
Theory field interest	**0.42**	0.37	0.33	0.38	**0.13**	0.34	0.23	0.28
Other field interest	0.41	**0.34**	0.46	**0.49**	**0.30**	0.41	0.28	0.26
No specified field of interest	**0.17**	0.29	0.20	**0.13**	**0.58**	0.24	0.29	0.26
Type of Undergraduate Institution Attended[b]								
U.S. economics Ph.D.-granting[a]	**0.33**	0.21	0.24	0.21	0.25	0.24	0.26	0.29
U.S. top-50 liberal arts[a]	0.08	0.05	0.07	0.05	0.02	0.06	0.21	0.27
Other U.S. public[a]	0.02	**0.01**	0.06	**0.09**	0.08	0.05	**0.50**	**0.25**
Other U.S. private[a]	**0.00**	0.03	0.04	0.03	**0.08**	0.03	0.28	0.26
Top-50 foreign[a]	**0.13**	0.04	0.02	**0.02**	0.02	0.04	**0.12**	**0.27**
Other foreign[a]	**0.45**	**0.66**	0.57	0.59	0.56	0.58	0.25	0.29
Type of Financial Aid During First Year of Study								
Fellowship[a]	**0.93**	**0.56**	**0.34**	**0.27**	**0.22**	0.47	**0.24**	**0.30**
Research assistantship[a]	**0.00**	**0.01**	0.06	**0.16**	0.02	0.05	0.17	0.27
Teaching assistantship[a]	**0.00**	**0.23**	**0.40**	**0.42**	0.31	0.28	0.28	0.26
No aid[a]	**0.07**	0.21	0.20	0.15	0.45	0.20	**0.36**	**0.24**

Source: Authors' surveys of graduate programs in economics. Means are computed at the student-level by tier; the denominator for each column is the number of students in the tier.

[a] Proportions

[b] See text for description of categories.

[c] Numbers in bold are those for which the mean value for the tier is statistically higher or lower than for the rest of the sample at the 0.10 level (two-tailed tests). For variables for which we report the median, we tested the differences in means.

Table 3 - Predicting Attrition, probit regressions

(Dependent Variable = 1 if student dropped out)

	1	*2*		*3*		*4*	
	mean	*dropout either year*		*dropout first-year*		*dropout second-year*	
Program Characteristics		*dY/dX*[a]	*z-stat.*	*dY/dX*[a]	*z-stat.*	*dY/dX*[a]	*z-stat.*
Tier 1 or 2	0.44	**-0.163**	-3.18	-0.006	-0.18	**-0.168**	-4.29
Tier 3 or 4	0.46	-	-	-	-	-	-
Tier 5	0.09	**-0.132**	-2.04	-0.021	-0.43	**-0.100**	-2.53
First-year class size	26.49	-0.001	-0.17	-0.002	-0.61	0.000	-0.08
Faculty-student ratio	0.27	-0.014	-0.05	**0.419**	2.00	**-0.361**	-1.66
Private university	0.42	-0.105	-1.59	-0.032	-0.73	-0.062	-1.15
Terminal master's degree offered	0.15	-0.045	-0.59	-0.051	-1.18	0.014	0.19
Seminar attendance required	0.58	0.065	1.38	0.042	1.26	0.029	0.79
Core exam pass required	0.65	0.059	1.30	0.002	0.07	**0.065**	1.99
Shared offices available	0.83	**-0.220**	-2.16	-0.064	-0.93	**-0.179**	-2.08
Individual advisers assigned	0.32	0.039	0.82	0.039	1.17	-0.004	-0.11
Student Characteristics							
GRE analytical score ($*10^{-1}$)	72.28	-0.004	-1.40	-0.002	-0.95	-0.002	-0.99
GRE verbal score ($*10^{-1}$)	56.26	**-0.003**	-2.16	-0.001	-0.45	**-0.003**	-2.48
GRE quantative score ($*10^{-1}$)	77.20	**-0.010**	-2.08	**-0.006**	-1.68	-0.005	-1.37
U.S. Citizen	0.33	0.024	0.49	0.041	1.16	-0.028	-0.76
Male	0.65	-0.050	-1.19	-0.016	-0.54	-0.025	-0.80
Age at entry to program	25.44	-0.001	-0.08	0.006	0.90	-0.009	-1.05
Hold prior graduate degree	0.45	-0.018	-0.37	0.020	0.60	-0.041	-1.22
Hold undergraduate degree in economics	0.70	-0.060	-1.24	-0.049	-1.43	-0.024	-0.64
Hold undergraduate degree in economics/math	0.06	-0.102	-1.23	-0.030	-0.54	-0.047	-0.66
Hold undergraduate degree in math	0.03	-0.114	-1.05	-0.076	-1.10	-0.040	-0.52
Years since undergraduate degree	2.69	-0.016	-1.44	**-0.017**	-2.19	0.000	0.04
Theory field interest	0.34	-0.024	-0.55	-0.011	-0.35	-0.014	-0.42
Other field interest	0.41	-	-	-	-	-	-
No specified field of interest	0.25	-0.024	-0.50	-0.012	-0.36	-0.016	-0.45
Type of Financial Aid During First Year of Study							
Fellowship	0.47	0.043	0.79	-0.011	-0.29	0.050	1.22
Research assistantship	0.05	**-0.155**	-1.77	-0.020	-0.31	**-0.114**	-2.12
Teaching assistantship	0.28	-	-	-	-	-	-
No aid	0.20	0.081	1.39	0.057	1.43	0.046	0.96
Number of Observations	572	572		572		498	
Pseudo R-squared		0.105		0.099		0.147	

Source: Authors' surveys. See Tables 1 and 2.

[a] Reports predicted change in the probability for a one-unit change in the independent variable at the mean. Numbers in bold are statistically different from zero at the 0.10 level or better (two-tailed tests).

Table 4 - Department-reported Primary Reasons for Attrition, by Program Rank

Reasons for dropout (percent distribution)	*Program Rank*					*Full Sample*
	1-6	*7-15*	*16-30*	*31-48*	*>48*	
Personal/family	13.3	18.5	9.5	6.0	19.1	11.6
Unsatisfactory academic work/asked to leave	46.7	40.7	78.6	64.0	38.1	58.7
Dissatisfied with graduate program	13.3	7.4	0.0	0.0	0.0	2.6
Lost interest in graduate study	6.7	11.1	9.5	12.0	4.8	9.7
Financial	6.7	3.7	0.0	2.0	4.8	2.6
Other	13.3	18.5	2.4	16.0	33.3	14.8

Source: Authors' surveys of graduate programs in economics. The number of dropouts represented in the table is 155.

Table 5 - Student- and Department-reported Primary Reasons for Attrition

	Department-reported reason						
Student-reported reason	Personal/ family	Unsatisfactory academic work/asked to leave	Dissatisfied with graduate program	Lost interest in graduate study	Financial	Other	Total
Personal/family	2	3	1	1	0	0	7
Unsatisfactory academic work/asked to leave	1	17	1	0	1	1	21
Dissatisfied with graduate program	2	2	0	2	0	1	7
Lost interest in graduate study	0	6	1	3	0	1	11
Financial	0	3	0	0	0	0	3
Other	1	3	0	2	0	2	8
Total	6	34	3	8	1	5	57

Source: Authors' surveys of graduate programs in economics and dropouts from graduate programs. Numbers in cells are frequencies and are reported only for dropouts who returned a survey questionnaire.

Appendix Table A - Probit regressions for alternative samples

(Dependent Variable = 1 if student dropped out in either year)

	females			*males*		
Program Characteristics	*mean*	*dY/dX*[a]	*z-stat.*	*mean*	*dY/dX*[a]	*z-stat.*
Tier 1 or 2	0.40	**-0.170**	-2.03	0.46	**-0.184**	-2.94
Tier 3 or 4	0.51	-		0.45	-	
Tier 5	0.09	**-0.242**	-2.50	0.09	-0.112	-1.39
First-year class size	26.33	-0.010	-1.32	26.58	0.003	0.65
Faculty-student ratio	0.27	0.363	0.70	0.27	-0.049	-0.14
Private university	0.44	**-0.245**	-2.06	0.41	-0.038	-0.46
Terminal master's degree offered	0.12	-0.139	-1.18	0.16	0.019	0.18
Seminar attendance required	0.61	0.117	1.53	0.57	0.059	0.96
Core exam pass required	0.66	0.041	0.49	0.64	0.029	0.53
Shared offices available	0.87	**-0.484**	-2.19	0.81	-0.112	-0.98
Individual advisers assigned	0.34	0.028	0.34	0.32	0.025	0.42
Student Characteristics						
GRE analytical score ($*10^{-1}$)	73.62	0.006	1.21	71.56	**-0.006**	-2.19
GRE verbal score ($*10^{-1}$)	58.45	-0.004	-1.38	55.10	-0.003	-1.41
GRE quantative score ($*10^{-1}$)	77.13	**-0.020**	-2.26	77.23	-0.009	-1.53
U.S. citizen	0.29	**0.202**	2.15	0.35	-0.017	-0.28
Age at entry to program	24.65	0.018	0.73	25.86	-0.007	-0.61
Hold prior graduate degree	0.42	0.019	0.20	0.46	0.000	0
Hold undergraduate degree in economics	0.64	-0.138	-1.62	0.73	-0.021	-0.34
Hold undergraduate degree in economics/math	0.08	**-0.250**	-2.61	0.05	0.037	0.29
Hold undergraduate degree in math	0.04	-0.085	-0.52	0.03	-0.137	-0.98
Years since undergraduate degree	2.30	**-0.048**	-2.06	2.90	-0.009	-0.67
Theory field interest	0.30	-0.088	-1.16	0.37	0.004	0.09
Other field interest	0.46	-		0.39	-	
No specified field of interest	0.25	0.052	0.64	0.25	-0.028	-0.46
Type of Financial Aid During First Year of Study						
Fellowship	0.47	0.025	0.26	0.47	0.045	0.65
Research assistantship	0.06	-0.191	-1.35	0.05	-0.102	-0.86
Teaching assistantship	0.28	-		0.28	-	
No aid	0.19	0.058	0.56	0.20	0.115	1.58
Number of Observations		199			373	
Pseudo R-squared		0.216			0.099	

Source: Authors' surveys. See Table 3.

[a] Reports predicted change in the probability for a one-unit change in the dependent variable at the mean. Numbers in bold are statistically different from zero at the 0.10 level or better (two-tailed tests).

Appendix Table B - Probit regressions for alternative samples

(Dependent Variable = 1 if student dropped out in either year)

	non-citizens			*citizens*		
Program Characteristics	*mean*	*dY/dX*[a]	*z-stat.*	*mean*	*dY/dX*[a]	*z-stat.*
Tier 1 or 2	0.47	**-0.216**	-3.72	0.37	0.004	0.04
Tier 3 or 4	0.45	-	-	0.52	-	-
Tier 5	0.08	**-0.141**	-1.96	0.11	-0.120	-0.88
First-year class size	27.31	-0.003	-0.62	24.85	0.002	0.31
Faculty-student ratio	0.27	-0.071	-0.23	0.28	-0.205	-0.35
Private university	0.44	-0.100	-1.26	0.38	-0.180	-1.51
Terminal master's degree offered	0.13	0.013	0.13	0.18	-0.125	-0.99
Seminar attendance required	0.57	0.083	1.48	0.60	0.118	1.41
Core exam pass required	0.65	0.009	0.16	0.64	**0.174**	2.07
Shared offices available	0.80	**-0.295**	-2.40	0.89	-0.114	-0.59
Individual advisers assigned	0.30	**0.095**	1.66	0.38	-0.108	-1.43
Student Characteristics						
GRE analytical score ($*10^{-1}$)	71.78	-0.004	-1.45	73.27	0.001	0.17
GRE verbal score ($*10^{-1}$)	54.23	-0.003	-1.44	60.35	-0.003	-0.66
GRE quantative score ($*10^{-1}$)	78.09	-0.011	-1.34	75.39	**-0.015**	-1.99
Male	0.63	0.021	0.43	0.69	**-0.184**	-2.18
Age at entry to program	25.84	-0.002	-0.16	24.62	-0.015	-0.82
Hold prior graduate degree	0.60	-0.034	-0.69	0.14	0.002	0.02
Hold undergraduate degree in economics	0.71	-0.081	-1.59	0.68	0.054	0.53
Hold undergraduate degree in economics/math	0.04	-0.148	-1.29	0.10	-0.009	-0.05
Hold undergraduate degree in math	0.03	-[b]	-	0.04	0.203	0.82
Years since undergraduate degree	3.01	-0.015	-1.01	2.06	-0.005	-0.22
Theory field interest	0.37	-0.033	-0.68	0.29	-0.021	-0.22
Other field interest	0.40	-	-	0.43	-	-
No specified field of interest	0.23	0.041	0.69	0.28	-0.106	-1.17
Type of Undergraduate Institution Attended						
U.S. economics Ph.D.-granting	0.06	-		0.62	-	-
U.S. top-50 liberal arts	0.03	-0.117	-0.85	0.12	-0.114	-1.10
Other U.S. public	0.003	-[b]	-	0.15	**0.243**	2.20
Other U.S. private	0.01	-0.069	-0.31	0.07	-0.059	-0.45
Top-50 foreign	0.06	-0.156	-1.34	0.00	-[c]	-
Other foreign	0.84	-0.134	-1.13	0.03	-[c]	-
Type of Financial Aid During First Year of Study						
Fellowship	0.49	0.055	0.85	0.43	0.037	0.40
Research assistantship	0.05	**-0.155**	-1.68	0.05	-0.128	-0.61
Teaching assistantship	0.27	-	-	0.30	-	-
No aid	0.19	0.013	0.19	0.22	**0.217**	2.08
Number of Observations		382			190	
Pseudo R-squared		0.129			0.210	

Source: Authors' surveys. See Table 3.

[a] Reports predicted change in the probability for a one-unit change in the dependent variable at the mean. Numbers in bold are statistically different from zero at the 0.10 level or better (two-tailed tests).

[b] None of the 11 non-citizens who held undergraduate degrees in math dropped out, and only one non-citizen attended an *other U.S. public* institution as an undergraduate. These two variables were thus excluded from the analysis for non-citizens.