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in Economics PhD Programs: Comment*

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## GROWING NEW PhD ECONOMISTS<sup>†</sup>

# Completion Rates and Time-to-Degree in Economics PhD Programs

By WENDY A. STOCK, JOHN J. SIEGFRIED, AND T. ALDRICH FINEGAN\*

With generous financial support from the Ford and Spencer foundations, for over eight years we have tracked the progress of 586 individuals who entered one of 27 economics PhD programs in fall 2002. In this final report on the project we describe the progress the students in this entering cohort had made by fall 2010, eight years after matriculating. Statistics describing the cohort's educational outcomes, subdivided into National Research Council (NRC) quality "tiers" (Marvin L. Goldberger, Brendan A. Maher, and Pamela Ebert Flattau 1995), are reported in Table 1. Tier 1 contains the six highest-ranked programs (three are in our sample), tier 2 the next nine (we have six), tier 3 the next 15 (we have seven), tier 4 the next 18 (we have six), and tier 5 the approximately

70 other programs (we have five, including one well regarded program that is unranked by the NRC because of its small size).

The PhD programs in our sample include 15 of the 22 largest in terms of PhDs awarded over the period 1998–2001, plus 12 others that each awarded, on average, at least five economics PhDs annually. Collectively, the sample programs produced 42 percent of the economics PhDs awarded from 1998 to 2001.

### I. Attrition and Completion

By October 2010, 59 percent of the fall 2002 entering cohort had earned a PhD in economics at the university where they initially matriculated, 37 percent had dropped out, and 4 percent were still writing their dissertations. The eight-year attrition rate of 37 percent could reach a maximum of 41 percent in the unlikely event that no one still writing ever finishes. If three-quarters of the 26 people still working toward their degree eventually finish, the final attrition rate will be about 38 percent.

Attrition is lowest at the highest ranked programs and climbs to over half of the entering class at the lowest ranked programs. Attrition occurring after the second year constitutes less than a third of the cumulative eight-year attrition rate. Because we have analyzed attrition rates for this sample in earlier papers (Stock, Finegan, and Siegfried 2006; 2009), and because the vast majority of attrition occurred during or immediately after the first two years of study, we do not discuss attrition further in this report.

Using data from earlier empirical studies of *completion* cohorts for 1996–1997 and 2001–2002 (Siegfried and Stock 1999; Stock and Siegfried 2006), we found that 88 percent of individuals who earned an economics PhD did so within eight years. In contrast, among those in the fall 2002 entering cohort who did not drop

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TABLE 1—PHD PROGRAM ATTRITION AND COMPLETION RATES, BY PROGRAM RANK

	Tier					Total
	(1)	(2)	(3)	(4)	(5)	
Program rank	1–6	7–15	16–30	31–48	>48	—
Number of programs	3	6	7	6	5	27
Number of entering students, fall 2002	103	149	141	127	66	586
First- and second-year attrition rate (percentage)	<b>13.6</b>	<b>17.4</b>	32.6	<b>39.4</b>	<b>37.9</b>	27.5
Third- through eighth-year attrition rate (percentage)	5.8	9.4	10.6	7.1	<b>15.2</b>	9.2
Total eight-year attrition rate (percentage)	<b>19.4</b>	<b>26.8</b>	<b>43.3</b>	<b>46.5</b>	<b>53.0</b>	36.7
Five-year completion rate (percentage)	33.0	31.5	26.2	23.6	<b>16.7</b>	27.1
Sixth- through eighth-year completion rate (percentage)	<b>41.7</b>	<b>39.6</b>	28.4	<b>25.2</b>	<b>18.2</b>	31.7
Total eight-year completion rate (percentage)	<b>74.8</b>	<b>71.1</b>	54.6	<b>48.8</b>	<b>34.8</b>	58.9
Still in program rate (percentage)	5.8	<b>2.0</b>	2.1	4.7	<b>12.1</b>	4.4

Notes: Attrition, still in program, and completion rates are all calculated relative to the original population of entering students ( $N = 586$ ) and are reported as percentages. Numbers in bold indicate that the rate is statistically different from the rate for the rest of the sample at the 0.05 significance level (two-tailed tests).

out, 93 percent had their degree in hand after eight years. If 75 percent of the remaining 26 students eventually earn their degree, the final completion rate for the entering PhD class of fall 2002 will be 62 percent. This is 12 percentage points higher than the 50 percent completion rate for economics PhDs reported by William G. Bowen and Neil L. Rudenstine (1992) for cohorts entering nine leading economics programs from 1972 to 1976, and 4 percentage points higher than the 58 percent completion rate for economics PhDs reported by the Council of Graduate Schools (Margaret F. King 2008) for cohorts entering six economics PhD programs from 1992–1993 through 1994–1995. The higher expected completion rate by our sample of program entrants could reflect better information about and preparation for doctoral studies by applicants (David Colander 2005), better decisions by admissions committees, a loosening of completion requirements for those who clear the hurdle of admission into economics PhD programs, or all three changes since the earlier periods. Pulling in the same direction is the overrepresentation of highly ranked programs in our entry cohort (relative to completion cohorts), since such programs have dramatically higher eight-year completion rates (see Table 1).

Like Bowen and Rudenstine, we treat students in the fall 2002 entering cohort sample who transfer from one economics PhD program to another as dropouts. Thus, the completion rates we report reflect completion of a PhD at the program in which students initially matriculated. Because some transfers earn a PhD in

economics from a different university, more than 62 percent of our entering cohort will eventually hold a PhD in economics. After taking transfers into account, we estimate that close to two-thirds of all fall 2002 entrants will eventually earn a PhD in economics somewhere.<sup>1</sup>

In sharp contrast with the pattern of completion rates after eight years of study, five-year completion rates at the tier 1 and 2 programs were only marginally higher than completion rates at tier 3 and 4 programs, because, thanks to lower attrition, a much higher fraction of PhD students were still working on their dissertations at tier 1 and 2 programs after five years. The inventory of students still working in the tier 1 and 2 programs after five years cleared out during the next three years, however, since close to 42 percent of the fall 2002 entering classes at those programs finished during years six through eight. After eight full years, tier 5 programs had by far the highest proportion (one-eighth) of students still working toward their degree.<sup>2</sup>

<sup>1</sup> Stock, Finegan, and Siegfried (2006) identified 20 dropouts during the first two years of their PhD study who enrolled in a different PhD program. A few more were probably overlooked. Assuming that 25 transfers from among the original 586 achieve a 70 percent completion rate (slightly higher than average, because of what they learned in an earlier PhD program), total eventual PhD completions in the cohort, whether at the institution where they initially enrolled or elsewhere, would turn out to be about 66 percent of the original cohort.

<sup>2</sup> Only 18 percent of tier 5 entrants completed their degrees during years six through eight, compared to 33 percent for universities in tiers 1–4.

TABLE 2—TIME-TO-DEGREE FOR THREE COHORTS OF ECONOMICS PhDs

	Cohort		
	Graduating class of 1996–1997	Graduating class of 2001–2002	Entering class of Fall 2002
Median years to degree	5.25	5.42	—
Median years to degree among those who finished within eight years <sup>a</sup>	5.08	5.17	5.66
Fourth-year completion rate <sup>b</sup>	0.14	0.13	0.02
Fifth-year completion rate	0.25	0.29	0.42
Sixth-year completion rate	0.28	0.22	0.31
Seventh-year completion rate	0.13	0.18	0.17
Eighth-year completion rate	0.08	0.07	0.02
Completed in more than eight years	0.12	0.12	0.05
Observations	584	570	365

*Notes:*

<sup>a</sup>Number of observations for 1996–97 = 471; 2001–02 = 463; fall 2002 entrants = 345

<sup>b</sup>The completion rates are calculated only among completers and are reported as percentages. For the entering class of fall 2002, we assume that three-quarters of the 26 continuing students after eight years will eventually complete. Thus the *N* for that group is 365 (345 completers + (0.75 \* 26) continuing students by the end of year eight).

## II. Time-to-Degree

Descriptive statistics regarding time-to-degree are reported in Table 2. The median time-to-degree from entering their PhD program until they were awarded their degree (not until they defended their dissertation), was 5.6 years for the 345 individuals in the *entering* class of fall 2002 who had earned their degree within eight years. The median time-to-degree from the *completing* cohorts of 1996–1997 and 2001–2002 among those who finished within eight years was 5.1 and 5.2 years, respectively. The right tail of the time-to-degree distribution has declined markedly, from 12 percent of the completing classes of 1997 and 2002 finishing after eight years, to a maximum of 5 percent for the entering class of fall 2002, the bulk of whom finished in 2006–2007 or 2007–2008. In recent years, fewer students are taking a very long time to complete their degree. At the same time, however, the median time-to-degree for those in the entering class of fall 2002 who finished within eight years is five to six months longer than the median time-to-degree for those that finished within eight years in both of the earlier classes.

There are several possible explanations for why we observe a rise in the median time-to-degree (among those who finish within eight years) for the entering cohort graduating around 2007–2008 relative to completing cohorts of 1997 and 2002. First, it could be a statistical artifact because the 27 institutions in

our entering class sample from fall 2002 may exclude some programs that graduate a disproportionate number of matriculants within four or five years. Second, it could be a statistical artifact because the median time-to-degree for the 1997 and 2002 completion cohorts is biased downward because the relative size of the entering cohorts was changing or because the completion cohorts could have started their PhD programs at various points in the year rather than in the fall. Third, it could reflect only temporary changes because the substantially weaker demand for new economics PhDs in 2008–2009 and 2009–2010 caused some students to delay graduation. Finally, it could be the case that the median time-to-degree has indeed lengthened. We examine each of these possibilities in turn below.

First, we explore the impact of restricting our entering cohort sample to only students in the 27 sample programs by comparing time-to-degree when we do and do not limit the 1997 and 2002 completing cohort data to students from the same 27 programs. Among those finishing within eight years, the median time-to-degree for the combined 1996–1997 and 2001–2002 graduates from our 27 sample universities is 5.0 years, identical to what we find for graduates from a wider set of programs in the same years. Thus, it appears that limiting the sample to our 27 programs does not play a role in explaining the longer time-to-degree among our later graduating cohorts.

Second, Bowen and Rudenstine (1992) explain how and why trends in median time-to-degree may be misleading if calculated from completion cohorts during a period when the number of students entering PhD programs is changing. The issue was apparently first recognized by Ansley J. Coale (1972).

If the cohorts of entering graduate students shrink over time (as they did, beginning in the early 1970s), successive PhD cohorts will contain fewer “fast” finishers and an increasing proportion of “slow” finishers. The progressively smaller entering cohorts yield smaller and smaller numbers of fast finishers to the relevant PhD cohorts. It also takes more years for the slow finishers in these smaller entering cohorts to affect the medians for the PhD cohorts. Thus, during a period when the size of entering cohorts is diminishing quite rapidly, the mix of students in any given graduate student population, and thus in successive PhD cohorts, necessarily drifts toward a longer median time-to-degree. In other words, the change in the relative proportions of slow finishers and fast finishers carries with it a built-in bias in the direction of the former group. (Bowen and Rudenstine 1992, p. 116–117).

Thus, the bias caused by using completion cohorts depends on the rate of change (and the second derivative) of the size of entering cohorts (Bowen, Graham Lord, and Julie Ann Sosa 1991).

Although we do not have data on the size of entering cohorts, we can approximate their size from the size of completing cohorts. If most PhDs completed the requirements for their degree in either five, six, or seven years during the 1990s, the median time-to-degree person in the completing cohort of 1996–1997 would have entered in fall 1991. Over three-quarters of that group would have finished in 1995–1996, 1996–1997, and 1997–1998. The average size of those three completing cohorts is 937. A similar calculation for completing cohorts of 1991–1992 and 2001–2002 yields an average size of 849 and 838, respectively. The entering cohort size rose by about 10 percent from 1991–1992 to 1996–1997 and declined by roughly 11 percent from 1996–1997 to 2001–2002—modest, but not trivial changes. That suggests that the median years-to-degree estimate should be a bit

higher than 5.1 for the 1996–1997 cohort and a bit lower than 5.2 for the 2001–2002 cohort. Adjusting for a modest bias in the median time-to-degree for the two earlier periods caused by the use of completion cohorts, the true pattern of time-to-degree for completion cohorts of 1997, 2002, and 2008 might be 5.15, 5.15, and 5.6 years rather than 5.1, 5.2 and 5.6 years—still revealing, if anything, an upward trend.

The fall 2002 entering cohort obviously all began their PhD studies in fall, when the usual two-semester core PhD theory and econometrics sequences begin. Of the 1,154 PhDs in our 1997 and 2002 graduating cohort samples, 44 started PhD studies in January, which may have added nine months to their studies if they could not make much progress until the core sequences started the following fall. Although those starting in January did take a little longer to complete their degrees, the difference is not statistically significant at even the 0.10 level.

Third, Jeffrey A. Groen (2010) finds that a stronger job market increases the probability of a PhD student’s completing his or her degree in a given year, thereby reducing time-to-degree. His estimates imply that a 20 percent decline in job listings increases expected time-to-degree by 0.52 years. Such a decline happened between 2008 and 2009, as job listings in *Job Openings for Economists* fell by about 20 percent. This plummeting demand for economics PhDs affected only the 74 completers in the 2002 entering cohort who had not earned their degree by the end of six years, however, and so probably had only a moderate effect on lengthening the median time-to-degree.

Finally, it appears that at least some of these 27 programs in our sample have changed from a norm of four years to a norm of five years. Indeed, we know of one large program in our sample that changed its completion norm from four to five years during the interval separating our earlier completion cohorts from the entering class of fall 2002. This program alone accounted for roughly one-tenth of the students who completed within four years in the earlier cohorts. It takes only a half dozen more programs with similar experiences to account for all of the difference between the 13.4 percent four-year completion rate in the earlier completion cohorts and the 2.0 percent rate in the 2002 entering cohort.

In addition to the lengthening time-to-degree, it is clear that there has been a marked decline

in the tails of the time-to-degree distribution over the past 15 years. Although methodological complications make it difficult to use completion cohorts to compare time-to-degree over different periods, it is obvious nevertheless that a larger fraction of completers are more recently finishing within eight years, but still, on average, may be taking a bit longer than similar students a decade earlier. At one end of the distribution, only 2 percent (just seven students out of 586 in the 2002 entering cohort) completed their degree within four years, while 13.4 percent of the combined 1997 and 2002 completion cohorts finished inside four years. At the other end of the distribution, the proportion taking over eight years has also declined dramatically, from 12 percent among the earlier cohorts to less than 5 percent among the fall 2002 entrants.

In our view, the evidence above indicates that there has been a genuine increase in the median time-to-degree in economics PhD programs. In addition, student progress toward the degree is becoming more homogeneous, as programs rarely have really fast completers, but have also successfully curtailed protracted efforts that drag on for a decade or longer. In short, both tails of the time-to-degree distribution are declining in importance, while the median time-to-degree is inching upward slowly.

### III. Predicting Completion

Of the 586 individuals who entered one of our sample PhD programs in the fall of 2002, 215 had dropped out after eight years, 26 were still working on their degree, and 345 had earned their PhD. In an earlier report on this research project (Stock, Finegan, and Siegfried 2009), we tried to identify measurable personal and PhD program characteristics associated with completing a degree within five years. We found that students in tier 1 or 2 programs were less likely to have completed their degrees within five years than students from tier 3 or 4 programs, that larger first-year program cohort size was associated with a higher probability of completing a degree within five years, and, not surprisingly, that students from programs with high attrition during the first two years experienced a lower probability of completing their degrees within five years. We also found lower five-year completion rates in programs not offering shared offices to at least some entering students,

and in programs requiring a substantial research project prior to thesis work. Males, those with undergraduate degrees from top-60 US liberal arts colleges, and those with undergraduate degrees from foreign institutions were more likely to have completed their degrees within five years. These findings confounded two effects—whether the students would complete their degree, and, if so, whether they would do so with dispatch (within five years).

With our new information on this group, we can assess what factors are associated with earning an economics PhD within eight years. Because 93 percent of the students who had not dropped out had earned a degree by the end of the eighth year, this new analysis essentially allows us to distinguish those who completed their degree from those who did not. It also allows us to see whether those who finished within five years differ in important ways from those who also eventually finished, but took longer.

The completion regressions are reported in Table 3.<sup>3</sup> With only 26 entrants still working on their dissertations after eight years, the results of the probit for completion within eight years should indicate what is important for completing a PhD in economics, regardless of when it is completed. The probit for completion within five years allows for an assessment of factors associated with completing the PhD relatively quickly. A striking contrast is that only one of the factors that are significantly associated with degree completion within eight years is also associated with degree completion within five years, and the sign of that association differs across the two regressions. The variable *hold undergraduate degree in economics/math* identifies students who majored in mathematics (whether combined with an economics major or not), whereas the variable *hold undergraduate degree in economics* identifies economics majors without a math major. Compared to students with undergraduate degrees outside of economics, students with undergraduate degrees in math are *more* likely to eventually finish their degrees, but they are *less* likely to do so quickly (i.e., within five years).

Apart from the expected negative relationship between a higher program-level two-year

<sup>3</sup> The sample is limited to 570 students because we do not have GRE or demographic information on 16 entrants.

TABLE 3—PREDICTING COMPLETION, PROBIT REGRESSION  
(dependent variable = 1 if student completed PhD)

Program characteristics	Complete within 8 years (sample includes all entrants)			Complete within 5 years (sample includes completers only)		
	Mean	$dY/dX^a$	z-stat.	Mean	$dY/dX^a$	z-stat.
Tier 1 or 2	0.44	-0.067	-0.76	0.54	-0.224*	-1.79
Tier 3 or 4	0.46	—	—	0.40	—	—
Tier 5	0.10	0.028	0.26	0.06	0.192	1.11
First-year cohort size	26.39	0.002	0.25	27.04	0.019*	1.94
Faculty-student ratio	0.27	0.638	1.37	0.27	0.477	0.69
Private university	0.42	0.061	0.60	0.46	0.139	0.93
Terminal master's degree offered	0.15	-0.105	-0.85	0.13	0.201	1.14
Seminar attendance required	0.59	-0.050	-0.64	0.55	-0.049	-0.44
Core exam pass required	0.65	-0.008	-0.11	0.66	0.086	0.84
No shared offices	0.17	-0.140	-0.91	0.14	-0.402**	-2.31
Individual advisers assigned	0.32	-0.034	-0.44	0.34	0.051	0.48
Program-level two-year attrition rate	0.28	-0.011**	-2.94	0.23	-0.004	-0.67
Percent of dissertations essays	67.20	0.000	0.31	67.93	0.002	1.19
More than five years full financial aid usual	0.21	0.029	0.34	0.17	-0.127	-1.05
Hard completion time limit	0.23	-0.089	-0.60	0.25	-0.008	-0.04
Soft completion time limit	0.46	0.017	0.22	0.43	0.074	0.65
Prethesis research required	0.46	-0.035	-0.45	0.45	-0.221**	-1.97
Topic seeker meetings with faculty	0.42	0.134**	2.03	0.45	-0.027	-0.28
<i>Student characteristics</i>						
GRE analytical score (*10 <sup>-1</sup> )	72.38	0.007**	2.23	73.83	-0.002	-0.48
GRE verbal score (*10 <sup>-1</sup> )	56.32	0.002	1.00	57.31	-0.002	-0.58
GRE quantitative score (*10 <sup>-1</sup> )	77.19	0.014**	2.08	78.09	0.000	0.00
US citizen	0.34	0.153*	1.77	0.32	-0.076	-0.66
Male	0.65	0.148**	2.96	0.68	0.024	0.35
Age at entry to program	25.40	-0.005	-0.44	25.35	-0.016	-0.82
Hold prior graduate degree	0.45	0.008	0.15	0.46	-0.046	-0.63
Hold undergraduate degree in economics	0.70	0.025	0.44	0.70	-0.190**	-2.34
Hold undergraduate degree in economics/math	0.09	0.207**	2.43	0.12	-0.305**	-2.82
Years since undergraduate degree	2.66	0.017	1.23	2.67	0.009	0.40
Theory field interest	0.34	-0.004	-0.07	0.37	0.009	0.13
Other field interest	0.41	—	—	0.41	—	—
No specified field of interest	0.25	-0.034	-0.52	0.22	0.037	0.41
<i>Type of undergraduate institution attended</i>						
US economics PhD-granting	0.25	0.007	0.06	0.23	0.322*	1.67
US top-60 liberal arts	0.09	0.093	0.79	0.09	0.374*	1.90
Other US	0.05	—	—	0.03	—	—
Top-50 foreign	0.04	0.222	1.41	0.05	0.318	1.43
Other foreign	0.57	0.250**	1.99	0.60	0.193	0.96
<i>Financial aid during first year</i>						
Fellowship	0.47	-0.102	-1.53	0.53	0.094	1.07
Research assistantship	0.05	0.018	0.12	0.06	0.168	0.86
Teaching assistantship	0.28	—	—	0.27	—	—
No aid	0.20	-0.295**	-4.13	0.14	0.076	0.69
Observations	570		570	339		339
Pseudo R <sup>2</sup>			0.171			0.118

*Notes:*

<sup>a</sup>Reports predicted change in the probability for a one-unit change in the independent variable at the mean. For discrete variables, reports the predicted change in the probability for a change from 0 to 1. Asterisks indicate coefficients with *p*-values less than 0.05 (\*\*) or 0.10 (\*).

attrition rate and the probability that students complete their degrees (within eight years), only one program-level characteristic is significantly related to the probability that the average student completes the degree. Students in programs where faculty members have regular monthly or bimonthly contact to check on the progress of students seeking a dissertation topic (*topic seeker meetings with faculty*) have a 13 percentage point higher probability of eventually completing their degrees. The absence of a significant association between such meetings and early completion suggests that five-year completers were less likely to need such help or obtained it on their own initiative.

Among student characteristics, the quantitative GRE score, and to a lesser extent the (now defunct) analytical GRE score, are both related to the probability of completing a degree within eight years. A ten-point increase in quantitative GRE score is associated with a modest 1.4 percentage point increase in the probability of completing the PhD. Stock, Finegan, and Siegfried (2009) found a significant positive relationship between both quantitative and verbal GRE scores and the probability that a student persists in the PhD program through the first five years, but detected no significant relationship between GRE scores and completing the PhD within the first five years after matriculation. Thus, it appears that GRE scores have more effect on whether students will, in fact, eventually earn a PhD than on how fast they are likely to earn it.

Four other student characteristics significantly predict the probability of completing an economics PhD. Men and US citizens are 15 percentage points more likely than women and non-US citizens to complete their degrees.<sup>4</sup> Students who attended “other” foreign institutions (those outside the top 50) are 25 percentage points more likely to complete the PhD than those who attended non-PhD-granting US institutions or liberal arts colleges ranked below 60. Finally, students who entered their PhD programs without initial financial aid are 30 percentage points less likely to complete their degrees than those who entered with first-year teaching assistantships. The latter outcome stems primarily from its

impact on attrition. In earlier attempts to predict attrition (Stock, Finegan, and Siegfried 2009), a variable indicating whether a student received any first-year financial aid was associated with a significant 19 percentage point higher probability of remaining in the program through five years, although when we controlled for the fact that those with otherwise stronger credentials are more likely to receive financial aid, the independent effect of financial aid on attrition disappeared.

In order to explore factors associated with completing the degree faster, given that the degree is earned, in the right-side panel of Table 3, we report results of a probit estimate of completion within five years, using a sample restricted to individuals who had their diploma by the end of eight years.<sup>5</sup> Most of the results are consistent with estimates of the probability of completing within five years reported in Stock, Finegan, and Siegfried (2009), which are based on a sample that consisted only of those who had either not yet completed or had finished within five years. Students in tier 1 or 2 PhD programs were less likely to complete their degrees within five years than students in tier 3 or 4 programs. Because there is no significant relationship between the tier indicators and completion within eight years, we conclude that although tier 1 and 2 program students finish more slowly, they are no less likely to eventually complete than their peers at tier 3 or 4 programs.

Those with access to shared offices during their first year of study had a 40 percentage point advantage in the probability of completing within five years, but no edge in the probability of completion eventually. Quite surprisingly, students who were required to complete a prethesis research paper (45 percent of the PhDs enrolled, from 10 of the 27 programs) were 22 percentage points *less* likely to finish in five or fewer years, implying that the burden of writing such a paper may outweigh the advantage that accrues to those students who use the paper as a springboard to dissertation research. Also surprising is the result that students who majored in economics as undergraduates were 19 percentage points *less* likely to finish within five years. As mentioned above, students with a mathematics major (whether combined with an economics major or

<sup>4</sup> Several studies of PhD completion rates across various disciplines have found higher completion rates for men than for women (King 2008, p. 3).

<sup>5</sup> The sample size here is 339 because six of the 345 completers had to be omitted due to absence of complete data.



not) were 31 percentage points less likely to finish within five years but 21 percentage points more likely to finish eventually.<sup>6</sup>

We find that students whose bachelor's degrees were from a top-60 US liberal arts college or an economics PhD-granting university finished faster, as did those who were in PhD programs with larger first-year cohort size and with access to offices during their first year of PhD study. Those with a BA from a leading liberal arts college enjoyed a 37 percentage point advantage toward finishing in the first five years relative to those with degrees from other non-PhD-granting US institutions. Nothing else that we identified seems to matter for completing the PhD quickly.

The proportion of the variation explained in both the overall completion (within eight years) regression and the speed of completion (five years versus six to eight years) regression is low. Evidently, the personal and program characteristics that we have been able to measure are not the most important determinants of whether and when a new PhD student will complete his or her degree. Perhaps unobservable personal characteristics, such as ambition, motivation, attentiveness, persistence, organizational skills, ingenuity, and creativity are relatively more important.

#### IV. Endogeneity of Financial Aid in Predicting Completion

The financial aid indicators in the completion model are likely endogenous, because aid is usually awarded on the basis of the same personal characteristics that affect completion, as well as on factors unobservable to us, such as transcripts and letters of recommendation. To address endogeneity, we used several approaches, including two-stage least squares, a bivariate probit regression approach, and limiting the sample to include only those with financial aid.<sup>7</sup>

<sup>6</sup> A possible explanation is that students with more previous work in math are more likely to be tapped as TAs and section instructors, and these tasks tend to delay degree completion.

<sup>7</sup> Because our endogenous variable, *received any financial aid*, is binary, traditional two-stage least squares estimation does not produce consistent estimators (see Jeffrey M. Wooldridge 2002 section 15.7.3 or William H. Greene 2008 section 23.7). Joshua D. Angrist (2001) argues in support of using two-stage least squares despite its inconsistency, but Guido W. Imbens (2001) disagrees.

For the two-stage least squares and bivariate regression models, we follow Groen et al. (2008) and Stock, Finegan, and Siegfried (2009), predicting whether each student received any first-year financial aid by using as an instrument the percentage of *other* students that received aid in each program's incoming class. This proportion is undoubtedly related to whether a specific student received first-year financial aid, as students in programs that award aid to relatively more students are more likely to receive aid themselves, *ceteris paribus*. The proportion of students receiving aid also is not likely to affect an individual's probability of earning a degree, because it is based on outcomes for other students at the time they all entered the program.<sup>8</sup>

The two-stage least squares results (available from the authors) generate an insignificant estimated relationship between financial aid and the probability of completion when we instrument for it using the percent of incoming class receiving aid. In our earlier paper on attrition and five-year completion (Stock, Finegan, and Siegfried 2009), bivariate probit estimates of attrition indicated that once the endogeneity of financial aid was controlled, it had no independent association with attrition. Although most coefficients in the bivariate probit regression for completion within five years were consistent with there being no independent effect of financial aid on completion once its endogeneity was controlled, they were highly sensitive to model specification, causing us to question their validity. That is also the case in our bivariate probit estimates of completion within eight years.

We also used a simpler approach of estimating a completion model that excludes the financial aid variable, both for the full sample and for a sample that included only students who received financial aid in the first year. The only difference in these estimated equations is that the coefficients on the other foreign undergraduate institution and GRE analytical and quantitative scores are smaller and not significant in the sample restricted to aid recipients.

<sup>8</sup> The percentage of the incoming class that receives financial aid is strongly related to whether an individual student is awarded aid. A 10 percentage point increase in the proportion of the incoming class that receives aid is associated with a 4.3 percentage point increase (significant at the 1 percent level) in the probability an individual entering student receives aid.

## V. Differences in Completion between Men and Women

The predicted eight-year completion rate is 15 percentage points higher for men than for women, and the difference is statistically significant. Because it is possible that factors associated with completion differ between men and women, we estimated the completion regressions separately by gender. The estimates are available from the authors. As expected, a higher program-level two-year attrition rate and the absence of financial aid are associated with lower completion rates for both men and women. Surprisingly, none of the other characteristics significantly associated with female completion rates matters for men, and none of the other factors associated with male completion matters for women.

For men, regular contact with their advisor while seeking a dissertation topic is associated with a 14 percentage point higher completion probability. Also positively related to completion for men (but not women) are higher analytical GRE scores and having attended a top-60 liberal arts school or a foreign institution outside the top 50 as an undergraduate. For women, pursuing a PhD at a private university increases the probability of completion by a whopping 62 percentage points—which, however, is offset by 38 percentage points if the university also offers a terminal master's degree in economics (we have no idea why). Women are more likely to complete their degree in programs that have fewer PhD students per faculty member, where a higher proportion of students write three-essay-style (versus single topic treatise) dissertations, and where there is a soft (flexible) time limit on PhD study. Women who enter PhD programs with a prior graduate degree in hand are less likely to complete a PhD in economics. Alternatively, women who enter programs after having earned an undergraduate degree in math are 41 percentage points more likely to complete. Women who enter without a specific field of interest have a 27 percentage point lower probability of completion, and, surprisingly, those women who are awarded no-work fellowships during their first year of study have a 45 percentage point *lower* chance of graduating.<sup>9</sup>

<sup>9</sup> A lower completion rate for those holding no-work fellowships vis-à-vis teaching and research assistantships

## VI. Differences in Completion between US citizens and non-US citizens

The predicted economics PhD completion rate is 15 percentage points higher for US citizens than for non-US citizens.<sup>10</sup> Further, when we estimate completion separately for citizens and noncitizens, several structural differences emerge (again, results are available from the authors). As expected, higher program-level two-year attrition rates and an absence of financial aid are associated with lower completion rates for both citizens and noncitizens.

The only other characteristics strongly related to completion for international students are higher analytical GRE scores and holding a bachelor's degree in mathematics. A ten point higher analytical GRE score is associated with a modest 1 percentage point higher probability of completion, while international students with an undergraduate mathematics major enjoy a 27 percentage point advantage over international students with majors outside math and economics. Among domestic students, those studying at tier 1 or 2 programs have a lower probability of completion, while those at programs requiring students to make regular contact with their adviser while seeking a dissertation topic had higher completion chances. A ten point increase in quantitative GRE scores is associated with a 23 percent higher probability of completion, while being male is associated with a 2 percentage point higher completion probability among US citizens.

## VII. Predicting Time-to-Degree

Research examining the time required to earn a PhD in economics has found that financial aid, sex, citizenship, age, type of undergraduate institution, and starting a job prior to completing the PhD all impact time-to-degree (TTD). Siegfried and Stock (2001) and Stock and Siegfried (2006) used data on individuals who completed their economics PhD degrees in 1996–1997 and 2001–2002. Ronald G. Ehrenberg and Panagiotis G. Mavros (1995),

is consistent with prior findings by Bowen and Rudenstine (1992) and Cary Nelson and Barbara E. Lovitts (2001).

<sup>10</sup> Studies of PhD completion rates among a wider set of disciplines have found that completion rates are modestly higher for international students than for students who are US citizens and permanent residents (King 2008, p. 3).

TABLE 4—TIME-TO-DEGREE, DURATION MODEL

<i>Program characteristics</i>	All completers			Survey respondents					
	Coefficient	z-stat	Months <sup>a</sup>	Coefficient	z-stat	Months <sup>a</sup>	Coefficient	z-stat	Months <sup>a</sup>
Tier 1 or 2	1.10**	2.81	6.6	1.10**	2.03	6.3	1.11**	2.10	6.8
Tier 3 or 4	—	—	—	—	—	—	—	—	—
Tier 5	0.94	-1.51	—	1.10*	1.65	6.5	1.04	0.60	—
First-year cohort size	1.00*	-1.77	-0.3	0.99*	-1.78	-0.3	0.99**	-3.08	-0.6
Faculty-student ratio	1.07	0.40	—	0.64*	-1.93	-23.0	0.58**	-2.14	-26.8
Private university	1.04	0.97	—	0.95	-1.10	—	0.94	-1.22	—
Terminal master's degree offered	0.96	-0.84	—	0.98	-0.34	—	0.94	-1.33	—
Seminar attendance required	1.01	0.24	—	0.97	-0.62	—	1.00	-0.07	—
Core exam pass required	1.00	0.02	—	0.93**	-2.18	-4.6	0.91**	-2.86	-5.5
No shared offices	1.10*	1.87	7.3	1.07	0.86	—	1.16*	1.82	10.2
Individual advisers assigned	1.01	0.47	—	0.98	-0.55	—	0.96	-1.09	—
Program-level two year attrition rate	1.00	1.18	—	1.00	0.85	—	1.00	0.74	—
Percent of dissertations essays	1.00	0.86	—	1.00	-0.25	—	1.00*	-1.89	-0.1
More than five years full financial aid usual	0.96	-1.31	—	0.98	-0.63	—	0.97	-0.89	—
Hard completion time limit	1.08	1.38	—	0.96	-0.50	—	0.98	-0.27	—
Soft completion time limit	1.03	1.21	—	0.90**	-2.29	-6.5	0.90**	-2.22	-6.5
Prethesis research required	1.04	1.20	—	1.13**	3.47	8.1	1.18**	4.97	11.6
Topic seeker meetings with faculty	0.96*	-1.66	-2.7	0.99	-0.35	—	0.99	-0.41	—
<i>Student characteristics</i>									
GRE analytical score (*10 <sup>-1</sup> )	1.00	1.35	—	1.00**	-2.47	-0.2	1.00**	-2.56	-0.2
GRE verbal score (*10 <sup>-1</sup> )	1.00	-0.44	—	1.00*	1.77	0.1	1.00	0.83	—
GRE quantitative score (*10 <sup>-1</sup> )	1.00	-0.81	—	1.01	1.02	—	1.01	1.54	—
US citizen	1.07**	2.03	4.7	1.06	1.19	—	1.08	1.48	—
Male	0.99	-0.54	—	1.00	-0.23	—	0.98	-1.01	—
Age at entry to program	1.01	1.06	—	1.00	0.02	—	1.00	0.56	—
Hold prior graduate degree	0.99	-0.48	—	1.02	0.69	—	1.00	-0.11	—
Hold undergraduate degree in economics	1.07**	3.24	4.9	1.05	1.42	—	1.04	0.97	—
Hold undergraduate degree in economics/math	1.10**	2.98	6.7	1.06	1.18	—	1.06	1.27	—
Years since undergraduate degree	1.00	0.85	—	1.00	-0.11	—	1.00	-0.40	—
Theory field interest	0.98	-1.26	—	1.01	0.36	—	1.00	-0.15	—
Other field interest	—	—	—	—	—	—	—	—	—
No specified field of interest	0.98	-0.68	—	1.03	0.66	—	1.01	0.27	—
Dissertation set of essays	—	—	—	—	—	—	1.04	1.29	—
Started job prior to completion of PhD	—	—	—	—	—	—	1.10**	3.85	6.2
Married at matriculation	—	—	—	—	—	—	1.00	0.05	—
Had child at matriculation	—	—	—	—	—	—	0.93*	-1.82	-4.4
Had child during graduate school	—	—	—	—	—	—	0.98	-0.60	—
<i>Type of undergraduate institution attended</i>									
US economics PhD-granting	0.95	-1.00	—	0.92*	-1.94	-5.1	0.91**	-2.57	-6.1
US top-60 liberal arts	0.92	-1.59	—	0.88**	-2.45	-7.6	0.85**	-3.65	-9.6
Other US	—	—	—	—	—	—	—	—	—
Top-50 foreign	0.97	-0.47	—	0.85**	-2.17	-9.4	0.88**	-2.11	-7.9
Other foreign	1.00	0.04	—	0.95	-0.93	—	0.94	-1.44	—
<i>Financial aid during first year</i>									
Fellowship	0.95**	-2.16	-3.7	1.02	0.59	—	1.02	0.45	—
Research assistantship	0.95	-1.25	—	1.12	1.43	—	1.04	0.39	—
Teaching assistantship	—	—	—	—	—	—	—	—	—
No aid	0.94*	-1.90	-3.9	1.08*	1.72	5.4	1.10*	1.70	6.3
Observations	339			149			149		

Note:

<sup>a</sup> Predicted changes in months reported only for coefficients significant at the 0.10 level (two-tailed tests).

using data on students who entered graduate programs at Cornell University between 1962 and 1986, had information on prior master's degree, sex, citizenship, GRE scores, and financial aid. They did not have information on age, undergraduate major, or program characteristics (because their data were all from one program).

Using information on the students in the entering class of 2002 who completed their degree within eight years, we examine factors associated with the speed at which students complete their degrees by employing a duration model based on a Weibull distribution.<sup>11</sup> We report estimated exponentiated accelerated failure time coefficients and the predicted change in time-to-degree in months for statistically significant coefficients (at the 0.10 level) in Table 4.

Among the program characteristics, students who attended one of the tier 1 or 2 programs in our sample took six months longer to earn their PhD than those from tier 3 or 4 programs. This is apparent in the descriptive statistics. The longer time might reflect higher dissertation standards, greater effort to turn a good job market paper into an article accepted at a leading economics journal, or more time spent working as a teaching assistant at higher ranked programs. Entering the PhD program as part of a larger first-year cohort is negatively related to TTD, but the coefficient is tiny (a one student increase in cohort size from the mean of 27 is associated with a reduction in time-to-degree of one week). The estimated coefficient on the *no shared offices* variable is consistent with our findings on probability of completion within five rather than eight years, indicating that students in programs that provide shared office space to at least some first-year PhD students take an average of seven fewer months to complete their degrees than students in other programs. Also, students in programs requiring regular meetings between those seeking dissertation topics and their mentors finished about three months sooner, on average.

Among the personal characteristics significantly associated with TTD within our set of completers is US citizenship, which is associated with five months longer TTD, and holding an

undergraduate degree in economics or mathematics, which are associated with a five and seven month longer TTD, respectively. Finally, those who were awarded no-work fellowships during their first year of PhD study and those who were awarded no financial aid both took about four months longer to finish their degrees than students with teaching assistantships.<sup>12</sup>

We have additional information on 149 of the students who completed their degrees within eight years from responses to a survey sent to all completers shortly after they received their degrees. For each survey respondent, we know the style of his dissertation (a single topic treatise versus a set of essays), whether he began a job prior to completing the PhD, and his marital and parental status at the start and end of PhD studies. We report analogous duration model estimates for this subset of students in the center and right panels of Table 4.

The center panel of Table 4 shows the results for survey respondents using only the regressors that we used for all completers. Many of the estimated relationships between these regressors and TTD differ for this group relative to the full set of completers. The very different patterns of significant coefficients for all completers and survey respondents may be partly explained by differences in the characteristics of survey returners and nonrespondents. We find that US citizens, those who attended US economics PhD-granting institutions as undergraduates, those with an undergraduate degree in economics, and those receiving teaching assistantships during their first year of study were significantly overrepresented among the survey respondents. The survey respondents all completed their degrees prior to the end of year seven and were overrepresentative of early completers. The two groups also differed in several program characteristics.<sup>13</sup>

<sup>11</sup> Estimations using a Cox proportional hazards model yielded qualitatively similar results. We present the Weibull results in the table because they are easier to interpret. For an explanation of this model and the coefficients that it generates, see Wooldridge (2002), p. 699.

<sup>12</sup> Using data on 72,000 students in several PhD disciplines in the United States (including economics), Groen (2010) found time-to-degree results similar to ours for financial aid, but in his sample domestic students completed degrees faster than international students.

<sup>13</sup> Survey respondents were more likely from tier 5 programs, programs with lower faculty-student ratios, private universities, and programs that do not require a core exam pass before the start of the second year, have a higher percent of essay-style dissertations, are less likely to have a hard completion time limit, and are more likely to require prethesis research.

For the survey respondents, *no shared offices*, *US citizen*, *hold undergraduate degree in economics*, *hold undergraduate degree in economics/math*, and *fellowship* are not significantly related to time-to-degree. Among program characteristics, graduates from tier 5 programs completed more than six months slower than those from programs in tiers 3 or 4. The empirical results also indicate that students in the (ten) programs that require a substantial second or third-year original research paper (i.e., not a literature review) under faculty supervision take eight months longer to complete their degrees than those in programs without such requirements. Program characteristics associated with shorter TTD for survey respondents include the program's faculty-student ratio. Our estimates indicate that increasing the faculty-student ratio from its mean of 0.25 to 0.35 would be associated with a 2.3 month shorter TTD. Students in programs where they are required to pass one or more core, comprehensive, or preliminary exams before the start of their second year of PhD study finish five months faster than others, and those in programs with a soft completion time limit finish six months faster.

Among the student characteristics, a 10-point higher analytical GRE score is associated with a modest 0.2 month shorter TTD, while a 10-point higher quantitative GRE score is associated with a similarly modest 0.1 month longer TTD. Earning an undergraduate degree from an economics PhD-granting university or top-60 liberal arts college is associated with 5.1 and 7.6 month shorter TTD, respectively, while students who attended a top-50 foreign university finished 9.4 months faster than their counterparts from nonelite baccalaureate US institutions.

When the five new variables based on survey responses are added to the model in the right-hand panel, the *tier 5* and *GRE verbal score* variables lose statistical significance, but access to shared offices regains the significance it had for all completers. Among these responders, access to a shared office is associated with a 10.2 month shorter TTD. Students who began a job prior to their completion of the PhD took about half a year longer to complete their degrees, while those who had at least one child at the time they entered their PhD programs took 4.4 months less time to finish.

## VIII. Conclusion

Eight full years after commencing doctoral studies in one of the 27 economics departments participating in this study, 59 percent of the entering class of fall 2002 had earned their PhD at the institution where they first matriculated, 4 percent were still working on their dissertations, and 37 percent had left without a PhD. We have used probit regressions to explore which program characteristics, student characteristics, and indicators of the kind of undergraduate education and first-year financial aid are associated with completion within five and eight years, and with a continuous measure of elapsed time-to-degree.

Relatively few characteristics show both statistical significance and quantitative importance in explaining eight-year completion rates. Characteristics associated with higher probability of completion include topic-seeker meetings with faculty, US citizenship, male gender, holding an undergraduate degree in mathematics, and having earned an undergraduate degree at a nonelite foreign institution as compared to a nonelite US institution. A factor associated with lower probability of finishing is the absence of first-year financial aid.

Significantly associated with faster completion (through a higher probability of finishing in five years and lower elapsed TTD) are having earned an undergraduate degree from either a US economics PhD-producing university or a top-60 liberal arts college and enrolling in a PhD program where first-year students have access to shared offices. In contrast, attending a tier 1 or 2 program, arriving with a bachelor's degree in economics or mathematics, or entering a program that requires a predissertation research paper are all associated with *reduced* chances of finishing quickly.

While the small number of student credentials and program features found to be strongly associated with successful completion of doctoral studies in economics is a disappointment, it is also reassuring on two counts. First, it serves as evidence of the success of PhD admissions committees in weighing and balancing the objective measures of likely success across applicants. If these measures had large estimated probit coefficients, one would wonder why more applicants with those earmarks of success were not being admitted. Second, it suggests that it is not easy

to make changes in the features of an economics PhD program that will predictably lead to faster student completion—although providing access to shared offices for first-year students appears to be an important exception.

Finally, the relatively few successful objective predictors of student success point to the larger role played by letters of recommendation and students' essays and transcripts in admissions decisions. It appears that much of the eventual success of students who enroll in economics PhD programs is simply unknowable a priori.

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## Comment

By DAVID COLANDER\*

Siegfried and Stock's careful empirical work has given us solid evidence that about two-thirds of those admitted to graduate economics

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programs finish, which they point out is an improvement over earlier completion rates. They attribute this improvement, I believe correctly, to better information on the part of students and better selection processes on the part of graduate programs. I played a small role in that “improvement” with my work on graduate economics education (Colander and Klammer 1987).<sup>1</sup> That work helped make transparent to incoming students how graduate economic training had changed from the 1960s, when its goal was to broadly train students in economic literature, institutions, and theory, to the 1980s when its goal became almost exclusively to train students to be “scientific” economic hands-off researchers. The increase in the completion rates is consistent with better information on the part of students and graduate programs. Students know what economic graduate programs are like, and graduate programs know the type of students they want.

From my perspective, this improvement in micro-efficiency—the fit between matriculating students and programs—has come at a cost in macro-efficiency—the fit between graduating students and the jobs they get. One of the goals of my earlier research was, through transparency, to encourage graduate programs to give more focus to the skills needed by undergraduate professors and by hands-on applied researchers, which would have included more training in economic institutions, economic literature, and communication skills with non-economists. I failed miserably in achieving that goal. This failure isn’t measured by completion rates since they don’t take into account the discouraged applicant pool—the students who would have made great economists, but who either did not apply or did not get accepted because of that better transparency.<sup>2</sup> I suspect that this group far exceeds the matriculating students.

Consider the advising process: If a student comes to me, or to hundreds of other undergraduate professors, telling us that he is considering

graduate work in economics, we explain what graduate economic education involves and what its goals are. We discourage him from applying unless he accepts those goals.

If the student is not discouraged at that point, we next tell about the core hazing process, which is designed to keep those with different goals out of the profession. We tell him that if the primary goal is to go into undergraduate teaching or into hands-on applied policy research, much of what he will learn in core graduate training will be only tangentially relevant. We also tell him that it would definitely behoove him to closet those policy and teaching interests and follow a “don’t tell” policy on the application. This advice discourages large numbers of superb students who would make great undergraduate teachers and hands-on policy advisors from applying.

Not only are some students who want to go into undergraduate teaching or hands-on applied policy work not choosing to go on to graduate study, but those closeted students who actually decide to put up with the core hazing process aren’t receiving the training in the content or skills that is most applicable to applied policy or undergraduate teaching. To be a good hands-on policy advisor or researcher, or a good undergraduate professor to all but the most advanced undergraduates, students need training as a hunting dog economist. That includes training in a good consumer’s (but not necessarily a producer’s) knowledge of the wide range of theoretical and statistical techniques that cutting edge researchers are using, along with training in economic institutions, history of economic ideas, and economic history. Graduate economic students get little such training today. Instead, they are trained to be show dog economists who excel at writing appropriately quality-ranked journal articles, but who have little training in hands-on applied research.

Graduate programs have little incentive to change; their interest is in micro-efficiency. But those groups that provide funding for economists, along with those who hire hands-on policy researchers, or who pay the tuition which ultimately funds hiring undergraduate professors, have an interest in macro-efficiency, so my recent research focuses on making graduate economic education transparent for them.

<sup>1</sup> Colander, David and Arjo Klammer. 1987. “The Making of an Economist” *Journal of Economic Perspectives*. Fall.

<sup>2</sup> Sherwin Rosen once told me that, through my work on graduate education, I had discouraged more people from going into economics than any other person alive. He meant that as a compliment.

## Comment

By N. GREGORY MANKIW\*

This paper is a contribution to an important line of work. As economists, we often remind policymakers that their decisions should be based on objective, empirical research rather than uninformed supposition. Yet when we are the decision makers, as we are when we run our own educational programs, we often have little data-driven analysis on which to base our judgments. This kind of research should, over time, lead to a better educational system.

I would like to take note of two facts highlighted in this study and to tentatively discuss what they might mean. The first fact is that it is taking longer for students to earn their PhDs in economics. The second fact is that a sizeable percentage of students who start PhD programs do not finish.

It is tempting to interpret these facts as a sign of educational failure. After all, students enter these graduate programs to earn a PhD. If the successful ones are taking longer to finish, and many others are not getting their degrees at all, then it might seem that we are doing something wrong.

But it is far from obvious that these facts are symptoms of a problem. Perhaps longer times to completion and some amount of dropping out are optimal.

Consider time to completion. There is no doubt that economics is still a young science, and there is much we do not know. But there is also no doubt that research is continually adding to our stock of knowledge. Perhaps students are taking longer to earn PhDs because there is more for them to learn. It may well be optimal to spend six rather than five years in graduate school before our profession releases students into the world with our highest level of certification.

Another relevant fact is that most students, when they get their first academic jobs, end up at colleges and universities with lower ranked departments than where they earned their PhDs. Why hurry the process of moving to a less vibrant intellectual environment? It may well be better for the professional development of the

candidate to spend an extra year or so in graduate school.

Consider now the fact that many students drop out of graduate school without a PhD in hand. While many of these students are disappointed by this outcome, it is likely that in many cases their choice to drop out is optimal. They entered graduate school without fully knowing what it was like and whether it was a good match for them. After a couple of years, they decided it wasn't. In light of the inherent uncertainty when choosing a path in life, a bit of experimentation is desirable.

My own life is a case in point. When I left college, I was unsure what career path I wanted to take. I therefore enrolled in two graduate programs—the PhD program in economics at MIT and the law program at Harvard Law School—thinking I might finish both. In the end, however, I dropped out of law school after three semesters. Looking back, the decisions to enter and drop out of law school were the right choices. I started because I thought a legal career might be the best path for me, and I stopped when I learned it wasn't.

The question we face as designers of educational programs is how to structure them in light of the longer times that PhDs take and the fact that some students who start these programs may rationally choose not to complete them. The answer may be to divide current PhD programs into two chunks. The first chunk would be a two-year master's degree focused on taking advanced courses. The second chunk—appropriate for only a subset of master's students—would be a research degree culminating in the PhD.

Many programs in effect already do that. But the master's degree is too often viewed as a consolation prize for a PhD dropout. Perhaps we should instead encourage people to view the master's degree in economics as a fully respectable terminal degree. Moreover, having finished a master's degree, PhD candidates would be treated as professionals—more like the most junior faculty and less like the most senior students.

Many students leave college wanting to learn a bit more economics. But a PhD may be more than they want or need for their careers. An expansion of master's programs in US economics departments may offer many students the stepping stone they need.

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## Comment

By MELISSA P. MCINERNEY\*

This paper by Wendy A. Stock, John J. Siegfried, and T. Aldrich Finegan (2011) is part of an important project that clarifies which program and individual characteristics are correlated with completing a PhD degree and finishing more quickly. As a member of the fall 2002 entering cohort at the University of Maryland, and one of the data points in the analysis, I was invited to comment on Stock et al. (2011). I will draw from my experience and discuss three of the more surprising results, as well as suggest an additional university characteristic that would enhance the analysis.

The authors find that students in programs requiring prethesis research were no more likely to complete the PhD and less likely to complete it within five years. This was not the result I expected because writing my third year, prethesis paper gave me a head start toward ultimately completing my dissertation. As with all students who write a third-year paper, I gained experience selecting a research question, executing the analysis, and presenting the results. I examined an aspect of the Workers' Compensation insurance program, a social insurance program with many institutional details. The paper allowed me the opportunity to synthesize institutional details before beginning my dissertation.

This experience seems incongruent with the findings. However, recall that this variable reflects a program-level characteristic, so the coefficient estimate captures the impact of being in a department that has a prethesis research requirement; it does not necessarily capture the impact of conducting research before the dissertation. As an example, in my entering class at Maryland, some students were required to write third-year field papers, while others sat for a field exam. The binary characterization of Maryland's prethesis research requirement does not identify who actually wrote a significant third-year paper. Therefore, these findings do not preclude the existence of benefits from writing a significant paper before the dissertation.

One finding that continues to emerge in this research project is the importance of providing shared office space to graduate students. The authors find the presence of shared office space is correlated with a faster time to degree. While the sign of this conditional relationship might not be surprising, the magnitude of the effect is rather large. Stock et al. (2011) show that students without access to shared offices tend to take 7.3 additional months to complete the degree and are 40 percentage points less likely to finish in five years. Maryland provides shared offices for students, and early in the graduate degree this gave me and my classmates space to work together, form study groups, and be better prepared for coursework and preliminary exams. The positive effect of shared offices persisted as we continued through the program and began to help one another with research. In fact, many of my fellow students began to collaborate on projects addressing ideas born out of conversations in those shared offices, and eight years after matriculating, we continue to serve as resources for each other.

Students who have already completed graduate study in another program prior to matriculation were no more likely to finish—and no more likely to finish faster. Although the authors find no correlation between prior graduate study and probability of completion or time to degree, there may be interesting heterogeneous effects depending on the type of prior graduate study. In particular, there may be an important interaction between the field a student writes a dissertation in and which graduate program the student completed. As an applied micro-economist who writes about domestic social programs, the Master's in Public Policy that I had completed before beginning my PhD gave me a useful understanding of social policy in the United States.

The authors measure time to degree as the years between matriculation and graduation. Without controls for university graduation dates, this definition may overestimate the time it takes students to finish degree requirements. I completed the requirements for my degree by June of my sixth year (5.75 years); however, I had to wait until August to graduate (6 years). Since some schools offer graduation even fewer times a year, controlling for this university policy will isolate meaningful differences in the time to completing degree requirements.

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This paper provides important estimates of the impact of determinants of completion and time to degree. As we learn more about what program characteristics matter, departments can adopt practices to best position students for success.

## Comment

By JAMES M. POTERBA\*

The most striking finding in this very careful and interesting study is the relatively small number of robust relationships between either time-to-completion or probability-of-completion and the attributes of doctoral programs and their students. This may indicate that even within a given PhD program, there is substantial heterogeneity in the experiences of different students. One dissertation supervisor differs from another, and the within-department variation may swamp the between-department variation. Alternatively, it may indicate that the process of earning a PhD is highly idiosyncratic. Program attributes that may speed one student on the way to completion may constitute a detour for others.

The interpretation of the findings is complicated by the potential endogeneity of program attributes. Changing completion rates and completion times may lead faculties to modify their courses of study or to adopt other interventions. In my own department, a trend toward longer completion times led many faculty to suggest that students should write a third-year research paper; even if this innovation reduces time-to-completion, historical analysis will probably suggest a negative correlation between this program attribute and completion times.

One finding that emerges clearly is a lengthening time-to-completion for economics PhD students. Those who completed their degrees in 1996–1997 and 2001–2002 had a median completion time of between 5.1 and 5.2 years, about

half a year less than the 5.6-year median for students who entered PhD programs in 2002. A number of factors might account for this development; they deserve investigation in future work. A partial list would include the following.

(i) Shifts in the nature of economic research. If the demands of dissertation research have increased, rising completion times may simply reflect a longer required time to satisfy these demands. In some areas of empirical research, anecdotal evidence suggests that more students are collecting their own data, running experiments, managing and then evaluating randomized controlled trials, or doing other projects that make it difficult to begin writing a paper shortly after completing coursework. Ellison (2002)<sup>1</sup> suggests that referees at top economics journals are demanding more of authors before recommending a paper for publication; dissertation writers may similarly be facing rising standards.

(ii) Shifts in the return to another year of dissertation research. It is not clear that hiring committees consider time-to-completion in evaluating the research accomplishments of job market candidates, at least for students who complete their degrees in six years or less. Doctoral students approaching the job market may view themselves as engaged in a tournament in which the most attractive positions will be awarded to those with the most highly regarded research papers. If the returns to earning a highly competitive position are substantial, and if polishing one's research papers for another year raises the likelihood of that outcome, then students may rationally decide to extend their graduate school careers.

(iii) Shifts in the relationship between course content and research opportunities. As the field of economics has evolved, it is possible that the distance between the research frontier and the subject matter covered in core and field courses has grown. This is a phenomenon that may proceed at different speeds in different subfields, and it is not clear that it can explain a significant increase in completion times over a very short time interval.

(iv) Shifts in the opportunity cost of an additional year of graduate study. A decline in the

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<sup>1</sup> Ellison, Glenn. 2002. "Evolving Standards for Academic Publishing: A q-r Theory." *Journal of Political Economy*, 110: 994–1034.

effective cost of remaining in graduate school could explain a trend toward longer completion times. While I am not aware of any systematic data to quantify recent developments, my impression is that at least at top PhD-granting departments, the availability of fellowship support has increased. This is a result of longer commitments to teaching-free fellowship support for entering students, as well as rising numbers of predoctoral fellowships that facilitate dissertation research. Data on the relationship between fellowship stipends, the number of teaching assistant or research assistant hours required to qualify for financial support, and the salaries and teaching burdens of assistant professors would be needed to explore this possibility.

(v) Shifts in the nature of the graduate student population. A change in either student

qualifications or student tastes for finishing graduate school quickly could account for the observed findings. Nothing in the current study suggests that student preparation for graduate school has changed across cohorts; measuring student preferences is more difficult, and almost impossible to do retrospectively.

Testing alternative, and not necessarily exclusive, explanations for the increase in time-to-completion is one direction for future work. A second is analyzing the welfare effects of this increase. Whether longer completion times are socially efficient depends on a host of factors, including the change in the quality of the final research product, the improvement in match quality that results from an additional year of delay, and the flow of utility that students derive from spending another year as a graduate student rather than an assistant professor.