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The Research Productivity of New PhDs in Economics: The Surprisingly High Non-Success of the Successful[†]

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Economics PhD programs are primarily designed to produce research economists. There is little or no focus on training students to suit the needs of business or industry (Siegfried and Stock 1999). Our experience suggests that most students, especially at the better programs, enter graduate school planning to seek academic jobs, or at any rate, jobs that require research. We would also argue that students have a more-or-less common preference ordering over departments. In general, a student admitted to MIT or Princeton is unlikely to choose to go to Duke or Ohio State instead. Thus, the top programs have first pick over applicants to graduate programs in any given year, and this should concentrate both quantity and scholarly ambition in a strongly top-heavy way in programs specifically designed to train researchers.

To explore the effect of this dynamic, we construct a panel dataset consisting of two parts: a census of PhD recipients from academic institutions in the US and Canada who received their economics PhDs between 1986 and 2000, and a complete record of the journal publications of these individuals for the years 1985 to 2006 in the hundreds of journals listed in EconLit. This allows us to look at the distribution of research output of the PhDs from individual departments and also to compare research outcomes across programs of various ranks.

Our evidence shows that only the top 10–20 percent of a typical graduating class of economics PhD students are likely to accumulate a research record that

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might lead to tenure at a medium-level research university. Perhaps the most striking finding from our data is that graduating from a top department is neither necessary nor sufficient for becoming a successful research economist. Top researchers come from across the ranks of PhD-granting institutions, and lower-ranked departments produce stars with some regularity, although with lower frequency than the higher-ranked departments. Most of the graduates of even the very highest-ranked departments produce little, if any, published research. Indeed, we find that PhD graduates of equal percentile rank from certain lower-ranked departments have stronger publication records than their counterparts at higher-ranked departments. In our data, for example, Carnegie Mellon's graduates at the 85th percentile of year-six research productivity outperform 85th percentile graduates of the University of Chicago, the University of Pennsylvania, Stanford, and Berkeley.

In this paper, we lay out and describe the patterns we find in publication in the first six years after a PhD. We conclude by discussing some implications for several groups: 1) undergraduate students considering the possibility of seeking a PhD degree in economics; 2) those who administer, teach, and advise in PhD programs in economics; 3) and the committees responsible for recruiting and hiring new assistant professors, who must make decisions about whether to go after a higher-ranked candidate from a lower-ranked PhD program or a lower-ranked candidate from a higher-ranked PhD program.

Publications Patterns of New PhD Economists

We start with a census of 14,299 economics PhD recipients from 154 academic institutions in the US and Canada who graduated between 1986 and 2000 compiled by the American Economic Association (AEA) and connect this to an EconLit database with 368,672 papers published between 1985 and 2006 in 1,113 peer-reviewed journals (including conference volumes to the extent that these are captured in EconLit). Pooling all years, 7,154 economics PhDs could be detected as authors of the 48,938 papers in EconLit. This study follows up on Conley, Crucini, Driskill, and Önder (2013), in which we examined recent trends in publication rates of young scholars in economics, and we refer readers to that paper for more details regarding the nature and origin of these data.

Next, we take each of the top-30 economics departments, combine all their graduates from 1986 to 2000 into a single sample, and look at total research productivity at the end of the sixth year after graduation. We did the same for graduates of non-top-30 departments as one combined group. We use a department ranking developed by Coupé (2003) based on faculty research productivity to choose the top-30 group. Of course, which departments are "top 30" is open to debate, and regardless of how the ranking is established, some departments are likely to have moved in and out of this group over the 15 year interval we study. Given this, it would be better to think of our "top 30" departments as representative of "top departments" in general.

Raw counts of publications are imperfect measures of the research productivity of individual scholars because of the variation in the quality of those publications. We therefore use journal quality indexes from Kalaitzidakis, Mamuenas, and Stengos (2003), which are appropriate for the time frame of our study, to convert each raw publication into a number of *American Economic Review*–equivalent papers which we refer to as "*AER* papers." To give some sense of the weights we used, the following publication lists (and it may be useful to think of these as entries on the curriculum vitae of tenure candidates) are all roughly equivalent to one *AER* paper: (a) one paper in the *American Economic Review* or *Econometrica;* (b) one and one half papers in the *Journal of Political Economy* or *Quarterly Journal of Economics*; (c) two papers in the *Review of Economic Studies, Journal of Econometrics*, *Econometric Theory*, or *Journal of Economic Theory*; (d) three papers in the *Journal of Monetary Economics* or *Games and Economic Behavior*; (e) four papers in the *European Economic Review*, *Review of Economics and Statistics*, *International Economic Review,* or *Economic Theory*; (f) five papers in the *Economic Journal*, *Journal of Public Economics*, or *Economics Letters*; or (g) six to ten papers in high-quality field journals. We also adjust for the number of coauthors on a given paper. Thus, if a PhD in our sample publishes a paper with C coauthors in a journal with a quality index of Q relative to the *AER*, then the graduate is credited with Q/C *AER* papers. We should note that in Conley, Crucini, Driskill, and Önder (2013) we looked at alternative journal rankings and also dispensed with discounting for coauthorship. The results are qualitatively robust to such variations.

Table 1 shows the number of *AER* papers that appear on the (constructed) CVs of graduates of each department at the end of their sixth year after graduation by productivity percentile. For example, Harvard graduates in the 95th percentile of research productivity relative to their classmates published the equivalent of 2.36 *AER* papers in this period. We order the table using the Coupé (2003) ranking because this gives a kind of "prior" about how students ought to perform, while the rest of the columns give a sort of "posterior" of actual performance.

Table 1 reveals a rapid drop-off in research productivity of PhD graduates regardless of department as class rank decreases. At Harvard, for example, a student has to be in the 85th percentile or above to be likely to publish even a single *AER* paper in six years. The median Harvard graduate publishes only .04 *AER* papers. On the other hand, the 90th percentile of graduates of Carnegie Mellon or the University of California, San Diego, and the 80th percentile of Rochester graduates can also be expected to have one *AER* paper or more by year six. Going farther down this table, we see that a 95th percentile graduate of a typical non-top-30 department has a stronger publication record than the 70th percentile graduate of Harvard, Chicago, U Penn, Stanford, or Yale, or an 80th percentile graduate of Berkeley, Michigan, NYU, UCLA, or Columbia.

Research productivity in economics is generally highly concentrated. In Conley, Crucini, Driskill, and Önder (2013), we find that the top 1 percent of publishing research economists across the whole sample produce 13 percent of all (quality-adjusted) research output, and the top 20 percent of publishing economists produce 80 percent of it. What is most surprising in this present analysis is that this

Table 1
Number of *AER*-Equivalent Publications of Graduating Cohorts from 1986 to 2000

	Percentiles of graduates' AER*-equivalent publications 6 years after PhD*									*Average cohort size*	*Publishing grads (%)*
	99th	*95th*	*90th*	*85th*	*80th*	*75th*	*70th*	*60th*	*50th*		
Harvard	4.31	2.36	1.47	1.04	0.71	0.41	0.30	0.12	0.04	30.5	66.3
Chicago	2.88	1.71	1.04	0.72	0.51	0.33	0.19	0.06	0.01	27.3	59.4
U Penn	3.17	1.52	1.01	0.60	0.40	0.27	0.22	0.06	0.02	19.3	59.5
Stanford	3.43	1.58	1.02	0.67	0.50	0.33	0.23	0.08	0.03	24.7	67.9
MIT	4.73	2.87	1.66	1.24	0.83	0.64	0.48	0.20	0.07	25.5	70.0
UC Berkeley	2.37	1.08	0.55	0.35	0.20	0.13	0.08	0.04	0.02	28.0	62.4
Northwestern	2.96	1.92	1.15	0.93	0.61	0.47	0.30	0.14	0.06	10.1	65.8
Yale	3.78	2.15	1.22	0.83	0.57	0.39	0.19	0.08	0.03	15.7	64.8
U MI, Ann Arbor	1.85	0.77	0.48	0.29	0.17	0.09	0.05	0.02	0.01	19.1	54.0
Columbia	2.90	1.15	0.62	0.34	0.17	0.10	0.06	0.01	0.01	17.4	54.8
Princeton	4.10	2.17	1.79	1.23	1.01	0.82	0.60	0.36	0.19	16.2	76.1
UCLA	2.59	0.89	0.49	0.26	0.14	0.06	0.04	0.02	0	17.9	48.5
NYU	2.05	0.89	0.34	0.20	0.07	0.03	0.02	0.01	0	11.7	46.0
Cornell	1.74	0.65	0.40	0.23	0.12	0.07	0.05	0.02	0.01	17.3	57.9
U WI, Madison	2.39	0.89	0.51	0.31	0.20	0.11	0.06	0.03	0.01	25.0	60.3
Duke	1.37	1.03	0.59	0.49	0.23	0.19	0.11	0.05	0.02	7.8	59.8
Ohio State U	0.69	0.41	0.13	0.07	0.04	0.02	0.02	0.01	0	15.9	47.9
U Maryland	1.12	0.37	0.23	0.10	0.07	0.05	0.03	0.01	0.01	13.5	56.2
Rochester	2.93	1.94	1.56	1.21	1.14	0.98	0.70	0.34	0.17	8.7	78.5
U TX, Austin	0.92	0.53	0.21	0.06	0.05	0.02	0.01	0	0	10.3	38.3
Minnesota	2.76	1.20	0.68	0.46	0.29	0.21	0.12	0.04	0.01	22.2	59.5
U IL, Urbana-Ch	1.00	0.38	0.21	0.10	0.06	0.04	0.03	0.01	0.01	26.4	54.8
UC Davis	1.90	0.66	0.42	0.27	0.12	0.08	0.05	0.02	0.01	6.2	53.8
Toronto	3.13	1.85	0.80	0.61	0.29	0.19	0.15	0.07	0.03	6.4	64.6
British Columbia	1.51	1.05	0.71	0.60	0.52	0.45	0.26	0.22	0.11	4.5	73.1
UC San Diego	2.29	1.69	1.17	0.88	0.74	0.60	0.46	0.30	0.18	6.1	78.3
U Southern CA	3.44	0.34	0.14	0.09	0.03	0.02	0.02	0.01	0	4.9	43.8
Boston U	1.59	0.49	0.21	0.08	0.05	0.02	0.02	0	0	12.5	41.0
Penn State U	0.93	0.59	0.25	0.12	0.08	0.06	0.02	0.01	0.01	7.1	51.4
Carnegie Mellon	2.50	1.27	1.00	0.86	0.71	0.57	0.52	0.21	0.09	2.0	66.7
Non-Top-30	1.05	0.31	0.12	0.06	0.04	0.02	0.01	0	0	16.8	40.1

Source: Based on the authors own calculations using the data described in the paper.
Note: We order the table using the Coupé (2003) ranking of economics departments.

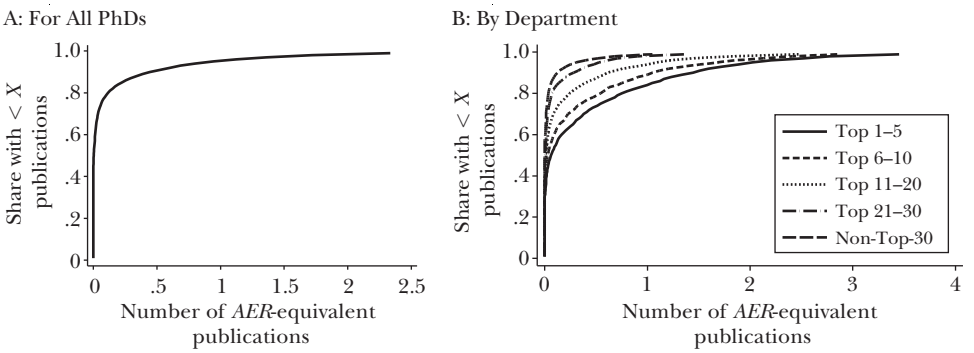
pattern is mirrored at each individual department. Thus, even though the top five or ten have their pick of applicants each year, they still produce only a few winners in the research game.

Figures 1A and 1B can help to visualize the quick drop-off in productivity documented in Table 1. The cumulative distribution of publications for all PhDs is shown in Figure 1A: when we rank all PhDs based on their productivity (independent of their alma mater), 80 percent of all PhDs accumulate about 0.2 *AER*-equivalent papers or less within six years after graduation, and about 90 percent of PhDs do not reach 0.5 *AER*-equivalent papers within that time.

Figure 1

Cumulative Distribution Functions of Number of PhDs' Publications

(share with less than X*-AER-equivalent publications six years after graduation)*

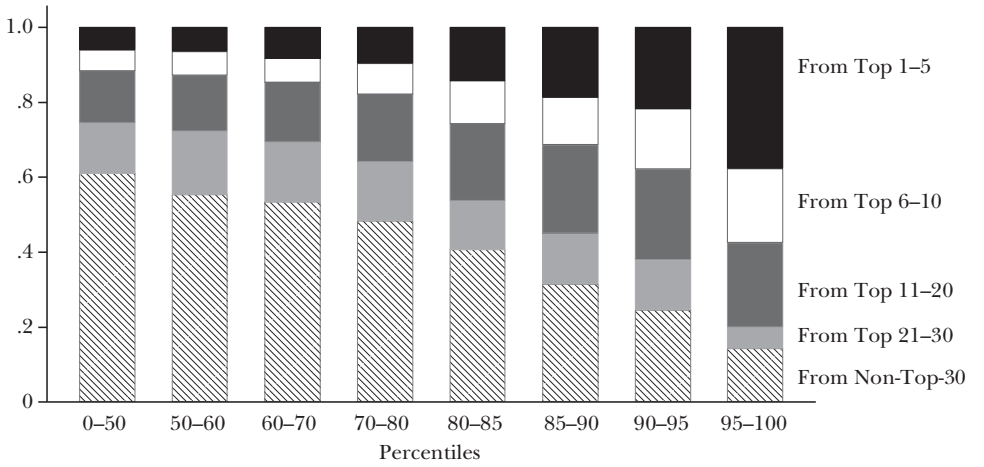


Source: Based on the authors own calculations using the data described in the paper.
Note: Figure 1B shows separate cumulative distributions by department tiers where tiers are defined by the productivity of graduates.

Figure 1B shows separate cumulative distributions by department tiers where tiers are defined by the productivity of graduates. We re-rank departments in Table 1 based on the productivity of their 95th percentile graduate, which enables us to compare departments based on how much more (or less) productive their PhDs are compared to others. When ranked in this way, the top five departments in the first tier are MIT, Harvard, Princeton, Yale, Rochester, and the five departments in the next tier are Northwestern; University of Toronto; Chicago; University of California, San Diego; and Stanford. The next ten departments and the ten after that are the third and fourth tiers, respectively. Non-top-30 departments constitute the fifth tier. Comparing cumulative distribution functions of these tiers portrays a clear pattern: 20 percent of PhDs from the top tier departments have at least one *AER*-equivalent paper, while the ratio for third tier (top 11–20) departments is about 10 percent, and it drops to about 1–2 percent for departments outside top-20 departments. An even more striking observation is that about 40 to 60 percent of PhDs in each tier do not have any publications.

At the very top end, consider "superstar" graduates who manage to publish 2.5 or more *AER*-equivalent papers at year six (remember, this could easily mean one paper in *AER*, then a number of other papers in highly ranked journals). By our measure, the top one or two graduates from Harvard or MIT will typically meet this standard, along with the top graduate from Stanford, Yale, or Princeton, if these departments are having a good year. Once every other year, Chicago, U Penn, and Minnesota should produce a superstar. Other departments will do so with less frequency. Of course, others may become publication superstars later in their careers, but only seven or eight in a given graduation cohort are likely to reveal themselves as such by the sixth year after receiving their PhD.

Figure 2
Department Tiers' Share in Productivity Percentiles



Source: Based on the authors own calculations using the data described in the paper.

Consider instead a standard of .6 *AER*-equivalent papers—which is, remember, equal to roughly 4–6 papers in well-regarded field journals in the six years after graduation. This level of research productivity is on average reached by the 80th percentile and above of PhD graduates from Harvard, MIT, Northwestern, Yale, Princeton, Rochester, University of California, San Diego, and Carnegie Mellon. To put it another way, 80 percent or more of the graduates of the following universities will not have .6 *AER*-equivalent papers at the end of six years: Chicago; U Penn; Stanford; UC Berkeley; University of Michigan, Ann Arbor; Columbia; UCLA; NYU; Cornell; University of Wisconsin, Madison; Duke; Ohio State; University of Maryland; University of Texas, Austin; Minnesota; University of Illinois, Urbana–Champaign; University of Toronto; University of British Columbia; University of Southern California; Boston University; and Penn State.

Figure 2 offers another way of visualizing how research productively is distributed over departmental quality tiers. For example, the figure shows that about 40 percent of students who end up above the 95th percentile of research productivity at year six will come from the top five departments, while about 10 percent will come from non-top-30 departments.

Although regularities are captured when departments are aggregated into various tiers, some of the most interesting results arise from individual comparisons. One such finding is that a few departments perform relatively better at producing successful students who are not in the top percentiles and so have a longer tail of relatively productive students than more highly ranked departments. Put another way, it is not the case that better-ranked schools always outperform all lesser-ranked

Table 2

Department Rankings based on Graduating Cohort's Publication Performance at Different Percentiles of the Graduating Class (1986–2000)

	Coupé ranking	*Ranking at percentile of the class*								
		99th	*95th*	*90th*	*85th*	*80th*	*75th*	*70th*	*60th*	*50th*
Harvard	1	2	2	4	4	5	8	6	8	8
Chicago	2	12	8	8	9	10	10	12	12	17
U Penn	3	7	11	10	13	12	12	10	13	14
Stanford	4	6	10	9	10	11	11	9	9	10
MIT	5	1	1	2	1	3	3	4	6	6
UC Berkeley	6	17	15	17	16	17	16	16	15	13
Northwestern	7	9	6	7	5	7	6	7	7	7
Yale	8	4	4	5	8	8	9	11	10	11
U MI, Ann Arbor	9	21	21	20	19	18	19	21	20	23
Columbia	10	11	14	15	17	19	18	18	22	20
Princeton	11	3	3	1	2	2	2	2	1	1
UCLA	12	14	19	19	21	20	22	22	21	26
NYU	13	19	20	23	23	24	26	26	27	30
Cornell	14	22	23	22	22	21	21	19	19	15
U WI, Madison	15	16	18	18	18	16	17	17	17	19
Duke	16	25	17	16	14	15	15	15	14	12
Ohio State U	17	31	27	30	29	29	27	27	24	28
U Maryland	18	26	29	25	25	25	24	23	25	21
Rochester	19	10	5	3	3	1	1	1	2	3
U TX, Austin	20	30	25	27	31	27	29	31	31	27
Minnesota	21	13	13	14	15	14	13	14	16	18
U IL, Urbana-Ch	22	28	28	26	26	26	25	24	26	24
UC Davis	23	20	22	21	20	22	20	20	18	16
Toronto	24	8	7	12	11	13	14	13	11	9
British Columbia	25	24	16	13	12	9	7	8	4	4
UC San Diego	26	18	9	6	6	4	4	5	3	2
U Southern CA	27	5	30	29	27	31	28	28	28	25
Boston U	28	23	26	28	28	28	30	29	30	29
Penn State U	29	29	24	24	24	23	23	25	23	22
Carnegie Mellon	30	15	12	11	7	6	5	3	5	5
Non-Top-30		27	31	31	30	30	31	30	29	31

Source: Based on the authors own calculations using the data described in the paper.
Note: The first column shows the Coupé (2003) ranking of economics departments.

schools in the sense of first order stochastic dominance. Table 2 gives a set of departmental rankings based on the productivity of different percentiles of the graduating class. Thus, at the 95th percentile of students, MIT graduates are more productive at year six than those of any other department. If we look at students in the 70th percentile, however, MIT's ranking drops to fourth.

Table 2 shows that some departments like Harvard, MIT, Yale, and to a lesser extent Chicago and U Penn follow a downward trend in these rankings from left to right across the percentiles. That is, they do better at training top students than middle- or lower-level students in a relative sense. Other departments, such as

Rochester, University of British Columbia, University of California, San Diego, and Carnegie Mellon, do not compete with the top departments in producing the very top research scholars, but are able to turn out lower-ranked students who dominate the similarly ranked graduates at better-ranked departments. For example, Rochester is third-best at producing students at the 90th and 85th percentile, and as we look across to still lower percentiles, it mostly trades the one and two spots with Princeton.

Discussion

If the objective of graduate training in top-ranked departments is to produce successful research economists, then these graduate programs are largely failing. Only a small percentage of economics PhDs manage to produce a creditable number of publications by their sixth year after graduation. Even at the top five departments, it would be hard to argue that the bottom half of their students are successful in terms of academic research. The number of *AER*-equivalent papers of the median at year six is below 0.1 in all cases and is in fact zero in most. At the majority of the departments ranked in the top ten in conventional rankings (such as Coupé 2003), 60 percent of their students fail to meet this 0.1 *AER*-equivalent standard, and for the majority of the PhD graduates of the top 30 departments, 70 percent fail. A tenure standard of 0.1 *AER*-equivalent papers is roughly equal to publishing one paper in a second-tier field journal over six years. This record would not be enough to count as "research-active" in most departments, much less to result in tenure. Even from the highest-ranked departments, very few graduates prove to be stars. Lower-ranked departments, on the other hand, produce stars with some regularity, although not as often as top departments.

For graduate students in economics (and also potential graduate students), the message is that becoming a successful research economist is difficult. The good news is that one does not have to go to a top department in order to become a successful research economist. The bad news is that wherever one goes, only the very best of each class is likely to find academic success as defined by research publications.

Indeed, to become a tenured professor of economics one must cross many hurdles. Admission to an economics PhD program is difficult: most well-ranked departments receive several hundred highly competitive applications for entering classes that generally number between 10 and 30. Many of those admitted to a graduate program will ultimately fail to complete their degree. For example, Stock, Siegfried, and Finegan (2011) find that graduation rates from economics PhD programs are on the order of 30 percent by the fifth year after admission, rising to around 60 percent by the eighth year. (There is wide variability, but the higher-ranked programs seem to have higher graduation rates in general.) Even for those who do complete the PhD, the likelihood of ultimately accumulating a research record that might gain tenure at a top-100 department (much less a top-30 or top-10 department) is not very great. Thus, students thinking about applying to

PhD programs in economics would be well advised to have "Plan B's" for every stage of the journey—including the possibility of not being accepted into a PhD program, the possibility of not completing the program, the possibility of not finding a suitable academic job, and the possibility of not receiving tenure. We hasten to add that there are many rewarding and worthwhile nonresearch and nonacademic career paths open to those who obtain masters or doctorate degrees in economics, and many students discover, either while in graduate school or during their untenured years, that they actually prefer these sorts of jobs to the academic life.

These results also raise some concerns for those of us who sit on admission committees and teach in graduate programs. To be admitted to a top PhD program in economics, an applicant has to have great grades, near-perfect test scores, strong and credible recommendations, and package these credentials in a way that stands out to the admission committee. Thus, successful candidates must be hardworking, intelligent, well-trained, savvy, and ambitious. Why is it that the majority of these successful applicants, who apparently did all the right things up to the time they arrived at graduate school and even managed to complete their PhDs, have such unimpressive careers as researchers? Are we failing the students or are the students failing us?

Three possible answers suggest themselves. First, perhaps what makes a successful research economist is not well-measured by tests and grades. For example, along with being hardworking, well-trained, and intelligent, a successful career might also require attributes like being creative, self-motivated, thick-skinned, or having an aptitude for academic networking. Of course, such attributes are quite difficult to discern in the application process.

A second possible answer is that there might be a virtuous circle in professional success. If a new graduate (given an underlying level of fundamental quality) gets a good first job, is well mentored and fostered by new colleagues, and has early success in publishing, that new graduate may be more likely to have more papers accepted by good journals in the future. Oyer (2006) discusses learning-on-the-job aspects in academic careers and establishes a causal relationship between landing a research-oriented first job after the PhD, and life-cycle publication productivity. Luck may also play a role, as some new PhD economists find that their subfield or topic offers more fertile ground for additional research than others.

A third possibility is that both students and professors in certain departments may find themselves playing a positional game. The faculty will attempt to identify the top students in an entering class, give them more time and attention, and suggest better projects to them. In turn, the students identified in this way may work harder to preserve their position. The pattern of only a few high research performers followed by a very quick drop-off would be consistent with this hypothesis (for some interesting speculations about this dynamic in many occupations, see Gladwell 2013).

When we started this project, one issue in the forefront of our thinking was a common problem faced by many hiring committees. The most highly-ranked departments in economics are able to choose their new assistant professors from among the top graduates of other top departments. However, at lesser departments, there is always a debate about whether it is better to hire lower-ranked graduates

from top-ranked departments of economics, or the best graduates from lower-ranked departments. Our conclusion is that it is indeed worthwhile for lower-ranked schools to look outside the top-ranked departments for new hires, though only at the top students of such programs in general.

Our evidence is based on the accumulated record after six years, which unfortunately is not the information available to the hiring committee at the time the hire is made. Some evidence suggests that hiring committees may not be very accurate at forming expectations of quality when a new PhD hits the job market. Smeets, Warzynski, and Coupé (2006) explore the efficiency of the academic job market in matching students to positions. They study the 1992 and 1993 PhD cohorts from the 26 best graduate schools and discover that the matching of quality students to quality first jobs is not as tight as one might hope. They further show there is substantial, mostly downward, movement from the first to the final job hold, and overall, the research productivity of students who get first jobs of various qualities does not differ as starkly as we see in Table 1. This finding suggests that the students who are identified as top graduates in a given year (and who get top jobs as result) might not line up with the students who end up being the most productive six years later. For example, our data show that publishing a paper before graduation is uncorrelated with the productivity over the six-year probationary period before a tenure decision.

Students put tremendous efforts into acquiring the credentials that allow them to gain admission to graduate school. Graduate schools, in turn, put tremendous effort into figuring which of these applicants are worthy of admission and then spend countless hours in their training and supervision. The hiring process takes weeks of thought and attention as recommendations are written, papers are read, candidates to be interviewed are identified, fly-outs are scheduled, and seemingly endless job talks are attended. These data suggest, but by no means prove, that our long-standing and expensive process may not be very effective. It may in fact be that many students and graduates have the potential for success, but realizing it is a matter of luck, position, or a having random but hard-to-measure endowment of something special.

An explanation might be that all parties are investing in lottery tickets, hoping for the prize. Students may overestimate their abilities and the overall odds that anyone succeeds, while admission and hiring committees think that they have a better than average insight into who will turn into a winner. Of course, some students and committees will be right in their estimations, but our data show that most of them will be wrong. We have no wish to depress all of these happy optimists. However, it does seem that there is substantial room to improve either our profession's mechanism for selecting who enters PhD programs in economics, or our method of training economics PhDs, or both.

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