Three Ways of Winning Doctoral Education:

Rate of Progress, Degree Completion, and Time to Degree

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When you complete your degree you are happy!

If you get there fast you feel accomplished.

If you make normal progress – you high five your friends

Remember - little steps lead to the big one.

The timeliness with which students progress through and complete their doctoral programs has been the focus of frequent study and debate (Hartnett and Willingham 1979; Spurr 1970; Wright 1957). As the least prescriptive of higher education degrees, the amount of expected time for candidates to move from baccalaureate to doctoral degree completion has never been firmly established. The doctorate has the unique role of preparing scholars, researchers, and university teachers and some tolerance on time may have more to do with universities placing more emphasis upon ensuring that students are adequately prepared to assume these roles at the expense of emphasizing amount of time that is required.

For the past three decades there has been an increased emphasis upon the timeliness of students' doctoral degree completion. This is, after all, an era of public accountability. In a society where seemingly everything is measured for efficiency, why should the doctoral degree be sacrosanct? Thus far, however, despite persistent scrutiny (for example, Bowen and Rudenstine 1992; Nerad and Miller 1996), it has managed to remain a bastion of ambiguity and continues to enjoy self-determined efficiency.

The doctoral degree process involves both the arts of learning and creating and the science of completing distinctive stages. General assessment tools for measuring what students learn and create during their doctoral programs do not exist and are presently not the focus of graduate faculty, researchers, or policy makers, not even in this era of accountability in higher education . The prevailing assessments are either graduate faculty evaluations of students' course

work and dissertations, peer review of presentations for professional conferences, or editorial board–review of papers for publication in professional journals. The doctoral education process is nonetheless judged for its cost and efficiency in much the same way as other levels of higher education. This explains in part, the fascination of researchers and policy makers with the amount of time students spend working on their doctoral degrees. The concept of time to degree has emerged as a measure of both student success and institutional efficiency. Moody Prior (1962) observes the tension between the desire to prescribe the expected time it takes for students to progress through their doctoral programs and the effort to uphold high expectations in the quality of student work: "The Ph.D. is an open-end degree. Its final requirement is an independent investigation and the presentation of results in an acceptable form; thus although practical considerations can and must act as a check on the duration of this exercise, it cannot be circumscribed by an exact, preordained time limit" (Prior 1962, 284).

Because we could not be certain at the inception of the study that we would ultimately obtain completion data for the sample (and consequently time-to-degree data), we sought an alternative measure of development and progress. The degree completion data presented here are, of necessity, a still photograph snatched from a moving picture. Conceivably, over a longer period, the entire sample might complete their doctorates. All we can document here are the totals, at the four-year benchmark.

Much of the reason for focusing upon these three critical outcomes is our interest in finding clues that will increase the timeliness of students' degree completion. Our interest also lay in the equitable access to the critical experiences so that all students regardless of race/ethnicity, gender, and personal background have the opportunity to succeed in doctoral education. In this current examination, we are particularly interested in the opportunities for

doctoral students to make steady progress toward their degree, to complete their degree and the time that it takes them to complete their degree. Two questions guide our analyses of the doctoral experience.

1. What are the race/ethnicity and gender differences in doctoral student rate of progress in their degree programs, doctoral degree completion and the elapsed time to their degrees?
2. What contributes to doctoral student rate of progress, degree completion and elapsed time to degree?

Methodology and Data Analyses

The research presented in this chapter is based on our book *Three Magic Letters: Getting to Ph.D.* First we will present a brief overview of the methodology and data analyses. For more of a detailed discussion please consult chapters 3 and 4 and appendices A to D.

The sampling plan consists of a three-stage design. The first stage involves selecting 21 doctoral granting universities and inviting them to participate , the second stage involved selecting the 11 fields of study, and the third stage involved selecting a stratified sample of students from the participating universities and the relevant fields of study. Doctoral students who were beyond the first year of their doctoral coursework, and who were actively engaged in their programs in the fall of 1996 were selected from the following eleven fields : (a) biological sciences, (b) mathematics, (c) economics, (d) physical sciences, (e) education, (f) political science, (g) engineering, (h) psychology, (i) English, (j) sociology, and (k) history. For analytic purposes, the fields were collapsed into the following education, engineering, humanities, science and mathematics, and the social sciences.

The 88-item Survey of Doctoral Student Finances, Experiences, and Achievements was

developed for this study. The survey consists of seven sections: (1) application and enrollment process, (2) current doctoral program experience, (3) attendance patterns, (4) financing your doctoral education, (5) future plans, (6) undergraduate experiences, and (7) background. The sample has 9,036 doctoral students representing a 70% response rate. Men and women are equally represented in the sample. The distribution of the sample by race/ethnicity and citizenship is US African Americans (10%), US Asian Americans (9%), US Hispanics (7%), US Whites (58%) and International students (16%). Hispanic representation by field ranges from a high of 6% in education to a low of 3% in engineering and 2% science and mathematics.

We developed a conceptual framework for examining how students navigate the doctoral experience. The background characteristics include students' gender, race/ethnicity, parent socioeconomic status (a measure of education and occupation), students' marital or domestic partner status, a student's household income, whether the student has children under 18, and their age. Two Admissions credentials, GRE General Test scores (Verbal, Quantitative, and Analytical) and the selectivity of the undergraduate college are included in the analyses along with whether their current program was their first/only choice doctoral program. For predicting each outcome, we selected a variety of doctoral program experiences including the following: whether the student is attending a public or private graduate school, whether the student had a master's degree upon entry, whether the student ever had a fellowship, whether the student ever had a research assistantship (RA), whether the student ever had a teaching assistantship (TA), whether the student incurred educational debt during their program, whether the student had a mentor, whether the student was always full-time, the amount of time the student was in their doctoral program, whether they had some research productivity and whether the student expected their first job to be a faculty or a postdoctoral position.

The statistical analyses are both descriptive and relational. The descriptive analyses include analysis of variance (ANOVAs) for continuous outcomes and Chi-Squares (crosstabs) for dichotomous (binary) outcomes in order to reveal similarities and differences among the race and sex groups within fields of study on the various dependent measures. The relational analyses consist of regressions by field of study. At the graduate level, the norms and practices with respect to such issues as funding and scholarship varies considerably. Our goal is not to compare and contrast the experiences across the fields, but rather to observe if there is parity within a field for women and underrepresented minorities[1]. Logistic (dichotomous outcomes) regressions were performed. Separate logistic regressions for each of the five fields will be presented The main goals of the analyses are to identify instances of significant race, sex and disciplinary differences.

The Three Ways of Winning

Rate of Progress

Research on the amount of time students spend progressing through their doctoral degree programs has focused mainly on the number of years it takes for students to complete their programs and those factors that contribute to time to completion (Bowen and Rudenstine 1992; Ehrenberg and Mavros 1995; Gillingham, Seneca, and Taussig 1991; Tuckman, Coyle, and Bae 1989, 1990; Wilson 1965). While we were waiting in the hopes of achieving completion data for at least some among our sample, we devised an alternative measure to explore students' progress toward their doctorates. This involved examining the time elapsed in relation to the milestones and processes leading up to the degree. Unless the doctoral degree process is divided into stages or milestones, researchers are unable to identify those stages of degree programs that constitute impediments toward completion.

Using Tinto's (1975) theoretical model of undergraduate student retention, Girves and Wemmerus (1988) gave us a start on this research when they developed a conceptual model showing the contribution of various types of financial support to graduate student degree progress. They observed three steps of doctoral degree progress: completion of courses beyond the master's, completion of the general examination that admits the student to candidacy, and attainment of the doctoral degree.

As an alternative to examining only degree completion as a measure of degree progress, Nerad and Cerny (1991) described the doctoral education process as having five stages: taking courses, preparing for and taking the qualifying exam, finding a dissertation topic and an adviser and writing a dissertation prospectus, undertaking the dissertation research and writing (which includes having sufficient funds to cover both the research expenses and the cost of living while writing), and applying for professional employment.

Our rate of progress measure is somewhat more refined in that it includes more milestones, and our estimates of rate are somewhat more complex in that we make field distinctions a prominent dimension. We constructed this rate of progress measure as follows. First, we grouped individuals by their field of study and reported stage of progress. We settled on the following eight stages of progress.

—completed less than half of courses required for a doctoral degree

—completed more than half, but not all, of courses required for a doctoral degree

—completed all course work required for a doctoral degree

—completed preliminary or general examinations but not yet admitted to doctoral candidacy

—admitted to doctoral candidacy but not yet working on dissertation

—working on dissertation

—completed all degree requirements for a doctoral degree, but degree has not yet been awarded

—doctoral degree has been awarded

With five field groups (education, engineering, the humanities, sciences and mathematics, and the social sciences) and eight possible stages, there are forty possible "field-stage" pairs. First, we calculated the median number of years for each of these forty pairs. Next, we calculated the number of years for each individual person in the sample, based on her or his field and stage. The rate of progress measure was constructed by dividing this field- and stage-specific median value by the time each individual reported being in her or his doctoral program at the time the survey was administered. Specifically, this rate of progress measure takes the form

$$\text{Relative Progress} = (\text{Median Years}_{fs} / \text{Years}_{ifs}),$$

where i = individual, f = field group, and s = stage of progress. Here, values strictly greater than 1 indicate a faster rate of progress relative to the median student in the same stage, values strictly less than 1 indicate slower progress, and values equal to 1 indicate that the student has taken the median number of years to reach her or his particular stage of progress.

This rate-of-progress measure offers perhaps the principal advantage of measuring each student's progress relative to the medians in her or his respective field. Precisely, it measures an individual's progress relative to the median number of years for her or his specific field-stage group. This aspect of the measure allowed us to group individuals at different stages of progress when performing analyses (e.g., conditional means, regression.) on this measure. Compared with an alternative measure we considered (Years_{ifs} <MS> Median Years_{fs}), the ratio we chose avoids the problem of a year's difference meaning something different at the various stages of progress.

For example, being a year behind the median at an early stage (for example, when course work has been completed) may be different from being a year behind at the dissertation stage. Our ratio more accurately represents this conceptual difference. Finally, because it relies on the stage- and field-specific median and the individual's own measure of years taken to achieve the present stage, arbitrary assignments are avoided. This measure is *z*-scored for all analyses.

In our sample, engineering students were making the fastest progress toward their doctoral degrees, followed by students in sciences and mathematics, education, the humanities, and the social sciences. Engineering and sciences and mathematics are the two fields where doctoral training is most like professional schools, with clearly defined curriculums and a priori expectations of time to completion. It is surprising to us that education students are progressing at a faster pace than humanities and social sciences students, given that they are older and more often in school part-time. Doctoral students in the social sciences progressed at a slower pace than students in each of the other fields.

Thirty years ago, Solmon (1976) used multiple national databases to test the common belief that women take longer than men to complete their doctoral degrees. He finds that women and men attending the same graduate institutions and same programs progressed at much the same pace. The fastest completers among doctoral students in Abedi and Benkin's (1987) sample were men. However, we found some major field differences between the sexes. In engineering, women progressed at a faster rate than men, and in the social sciences, men progressed more quickly than women.

Little work appears to have been done examining doctoral progress in terms of students' racial backgrounds coupled with their field of study. Peter Sheridan and Sandra Pyke (1994) include demographic factors in their analysis of time taken to complete doctoral degrees and

determine that American citizenship was a contributor to decreasing the time to degree. Abedi and Benkin (1987), however, find a weak relationship between citizenship and field of study with the elapsed time to degree. Our data reveal modest differences among the four U.S. race groups in rate of progress and few between citizens and noncitizens. In education and the social sciences, international students in our sample had a faster rate of progress than students of each of the other race-ethnicity groups. They also had a faster rate of progress than Asian Americans in sciences and mathematics and than Hispanics and whites in engineering and the humanities. The requirement of a visa, regardless of whether F-1 or J-1, imposes a time constraint on international students that is nonexistent for U.S. citizens, which may encourage international students to make faster progress.

Completion Rates

Our research, while mainly cross-sectional, has a longitudinal component. On the one hand, our survey represents a snapshot of doctoral students who had completed at least one year and were enrolled in the fall of 1996. On the other hand, we sought outcome measures of doctoral attainment by tracking our sample of individuals through degree completion. To accomplish this, we relied on dissertation abstracts, the graduation records of the participating universities, and doctoral degree completion information obtained from the Survey of Earned Doctorates (NSF).[2] This process allowed us to compile rates of completion. Doctoral students who transferred and completed their doctoral degree requirements at another university were not included in our group of degree completers. We collected three pieces of information on degree completion: whether a student had completed the degree, the type of doctoral degree attained, and the calendar year in which the degree was conferred.[3]

Researchers have estimated that only half of all doctoral students persist until graduation (Baird 1993; Bowen and Rudenstine 1992; Tinto 1993). Overall, nearly 62 percent of the sample completed their doctorates within four years of survey response, from 1997 to 2001, the latest year for which degree completion data are available. The remaining 38 percent may or may not complete their doctoral degrees; the only way their completion rates can be determined would be to continue the search for an indeterminate number of years, using the same three sources.

When we administered our survey in 1997, 44 percent of the students reported that they had completed their preliminary examinations and were in the process of writing a dissertation. Of those who were at the dissertation stage, nearly 80 percent had received a doctoral degree by 2001, four years later. Forty-four percent of the remaining students who in 1997 were at various stages of their doctoral program, from having completed less than half of their course work to having been admitted to candidacy but not yet working on their dissertations, also earned their doctoral degrees by 2001.

As we would expect from the foregoing discussion on rate of progress, among our sample, the fields with the largest share of completers were engineering, and sciences and mathematics, with 75 and 72 percent, respectively, completion rates. The only difference in completion rates between males and females was in education, where 54 percent of the women compared with 49 percent of the men had completed. Among the race-ethnicity groups, the key differences were the lower completion rates of African Americans in contrast to white and international students in engineering, sciences and mathematics, and the social sciences. The only difference between Hispanics and whites was in engineering, with 56 percent of Hispanics completing their degrees compared with 79 percent of whites.

Elapsed Time to Degree

Rates of doctoral student progress have typically been measured in three ways: total time to degree, the length of time from completing the bachelor's degree to completing the doctorate; elapsed time to degree, the amount of time from entering a doctoral degree program to completion; and registered time to degree, the amount of time registered in the doctoral program, from starting the program to completion. Bowen and Rudenstine (1992) rely on the first two approaches in their calculations of time to degree: the total time between baccalaureate and doctorate and the elapsed time from entering the doctoral program to receiving a doctoral degree. They report that the gap in time to degree among fields varied depending on which of the measures was used. Students in education, for example, took more time away from school between degrees than did students in the sciences. Using total time to degree, Bowen and Rudenstine find that doctoral students in education took an average 12.4 years, compared with 9.2 for those in humanities, 8.13 in social sciences, 6.9 years in engineering, and 6.1 years in physical sciences. Using elapsed time to degree, education students took 10.3 years, humanities 8.6 years, social sciences 7.4 years, engineering 6.2 years, and physical sciences 5.9 years to complete their doctorates.

Baird's (1990) analyses of data from the National Research Council indicate that the fastest students were those in chemistry (5.9 years), chemical engineering (5.9), and biochemistry (6.0). The slowest were students in music (10), art history (9.3), French (5.5), and history (5.5). Baird finds that the fields with the narrowest range were the biological and physical sciences and mathematics, and he notes a relatively wide range in the humanities and social sciences, the difference between the fastest and slowest disciplines being four years. He attributes these differences to the "clarity of the central paradigms within disciplines and the degree of agreement about those paradigms" (Baird 1990, 380). Baird states that the biological

and physical sciences have relatively clear and agreed-upon bodies of knowledge and procedures, whereas the humanities and social sciences thrive on differences in definitions, content, and interpretation.[4]

Our results substantially support the Bowen and Rudenstine (1992) observations. Just as other researchers have found time to degree to vary widely by field of study (Baird 1990; Ehrenberg and Mavros 1995; Tuckman, Coyle, and Bae 1989; Wilson 1965), we found the average time off varied substantially by major field. At slightly more than two years, sciences and mathematics doctoral students reported taking the least amount of time off between receiving their undergraduate degrees and beginning their doctoral degree programs. Education students, on average, took the longest time off by far, at almost 12.0 years. Students enrolled in the remaining three field groups (engineering, the humanities, and the social sciences) each took off an average of between 3.5 to 4.5 years. Note that while the mean for the sample approaches six years, this is largely because of the inclusion of education students.

Our goal was to create a measure of elapsed time to degree. The attendance pattern section of the survey asked students when (by term and year) they had begun their doctoral programs. To calculate an individual's time to degree, we subtracted the year and term the student started her or his doctoral program from the year she or he received the degree. We have degree completion data to 2001. We assumed that all students received their doctoral degrees in the spring, and therefore we added half a year to each degree year. For example, a student who started a doctoral degree program in the fall term 1994 (1994.75) and received the doctoral degree in the early summer of 1999 (1999.50) had a time to degree of 4.75 years. Engineering students were the fastest, at 4.75 years, followed by students in education, sciences and

mathematics, and the social sciences, each at 5.75 years; humanities students had the longest median time to degree, 6.75 years.

In addition to median elapsed time to degree, we looked at mean elapsed time to degree (5.97) and continued our analyses to identify differences among fields and by race and sex. Overall, engineering students who completed their doctorates within our measurement frame averaged the least time to degree, at 5.23 years. This was faster than the mean for sciences and mathematics (5.71), education (6.28), the social sciences (6.35), and the humanities (7.41). Although students in education were slower than those in two other fields, they showed the largest standard deviation (more than 3 units), indicating the widest variations among its students' completion times.

In general, women in the sample who completed their doctorates within the period of the survey took nearly half of a year longer, on average, than their male peers (6.25 years compared with 5.77 years). This pattern is similar to the pattern that Robert Ibarra (1996) has observed among Latinos, where women had longer elapsed time to degree, which he attributed to their higher part-time attendance. In our study, in the social sciences, male students averaged 6.11 years to the doctorate, while women averaged 6.59 years. With this exception, all fields were remarkably similar.

Pearson's (1985) review of the research, as well as his own research, indicates that while blacks took longer to complete their degrees (bachelor's degree to doctorate), the actual amount of time registered in graduate school was similar for blacks and whites (Blackwell 1981; National Board on Graduate Education 1976). Smith and Tang's (1994) analyses of the data from the 1990 Survey of Earned Doctorates concurs with Pearson's findings: African Americans had the longest time to degree (bachelor's degree to doctorate) in the doctoral population.

As might be expected, given their faster rate of progress, international students who earned a doctoral degree were significantly ahead of all other groups on time to degree. They averaged 5.32 years compared with 5.99 years for Asian Americans, 6.21 for whites, 6.26 for African Americans, and 6.34 for Hispanics. Examining these differences by field, we found that international students in education (5.17) were ahead of both whites (6.50) and African Americans (6.27). In engineering, international students led at 4.89 years, compared with whites at 5.50 and Hispanics at 6.00. In sciences and mathematics, international students averaged 5.47 years, compared with whites at 5.76 years and Asian Americans at 6.02 years. In the social sciences, international students averaged 5.81 years to completion, compared with 6.46 for whites, 7.21 for Asian Americans, and 7.49 for Hispanics.

Several researchers have considered why time to degree might be protracted. It is not surprising that the reasons suggested for prolonging doctoral study are similar to the those for failure to complete degrees. The type of financial support can hasten or lengthen time to degree (Abedi and Benkin 1987; Bowen and Rudenstine 1992; Ehrenberg and Mavros 1995; Gillingham, Seneca, and Taussig 1991; Hauptman 1986; National Research Council 1996; Nerad and Cerny 1991; Wilson 1965). Navigating the dissertation stage can also influence the time it takes to complete a degree (Council of Graduate Schools 1990; Isaac, Koenigsknecht, Malaney and Karras 1989; Nerad and Cerny 1991; Rudd 1986).

What Contributes to Winning Student Experiences

One of the goals of our work on the doctoral experience is to examine issues that various constituents of the graduate enterprise can work on either individually or as a community. Each of the three experiences that chart the progress of students toward the ultimate accomplishment – earning the three magic letters – rate of progress, degree completion and time to degree are

milestones that the individual student reaches but that can be influenced and shaped by the larger graduate community.

Rate of Progress

Rate of progress is our measure of students' median time through eight stages of their doctoral programs. This measure allows us to take a continuous snapshot of the factors that are important for students across the five fields of study. It is not surprising that, for all students in the sample, the largest predictor of steady progress in every field was continuous full-time enrollment (see table 1). As well, for students in education, engineering, and humanities, having a mentor made a considerably positive difference in accelerating progress. Older students in education, engineering, humanities, and sciences and mathematics appear to have made faster progress than younger students, and in humanities and the social sciences, international students progressed faster than their white peers. In engineering, men made slower progress than women. In the social sciences and in sciences and mathematics students with children under the age of eighteen also made slower progress. For students in education and the social sciences, higher parental SES was associated with faster progress; students in engineering and in sciences and mathematics with lower household incomes appear to have been slowed in their progress.

<Table 1 about here>

Counter to what one might expect, students with higher GRE verbal scores made slower progress in education, engineering, sciences and mathematics, and the social sciences. Students with higher GRE analytical scores made faster progress in education, sciences and mathematics, and the social sciences. Social sciences students who entered their programs having already earned master's degrees also made faster progress, as did those studying education, sciences and mathematics, and the social sciences at private graduate schools. Fellowship recipients in the

field of engineering had a slower rate of progress, while those in sciences and mathematics progressed relatively faster, compared with nonrecipients. Students who held teaching assistantships in education, as well as students in sciences and mathematics who demonstrated some research productivity, appear to have made slower progress. Student debt burdens appear to be an impediment to progress only for students in the social sciences.

Doctoral Degree Completion

For our analyses of doctoral degree completion, only those students (nearly 62% of the sample) who had completed their degrees by 2001 were categorized as completers. Conceivably, as more respondents complete their degrees, some of the variables could increase in importance and others decrease, but for the moment, this glimpse of what has been happening is more extensive than any previous research. By analyzing the data for students who completed their degrees, we are able, at least, to provide a fresh look at the elements that contributed to their success.

Research productivity proved to be an important predictor of doctoral degree completion in all five fields (see table 2). Students in sciences and mathematics with research productivity were 3.9 times more likely to complete their doctorates than those without. In the other four fields, the effect was similar, although not as large: humanities, 3.0 times; engineering 2.7 times; education, 1.8 times; and the social sciences, the lowest, 1.6 times. With the exception of engineering, another key predictor of degree completion was maintaining full-time enrollment. In sciences and mathematics, students who maintained full-time enrollment were 4.0 times more likely than their part-time peers to complete their degree programs: for humanities, 2.8 times more likely; for the social sciences, 1.9 times; and for education, 1.6 times. Students who had

spent more time in the program were slightly more likely to complete their degrees in every field except education. Education is also by far the field with the longest time to degree.

<Table 2>

Having a mentor made a small but significant contribution toward degree completion in the fields of engineering (1.7), the social sciences (1.5), and education (1.4). Students in the fields of education, sciences and mathematics, and the social sciences who expected their first postdoctoral job to be as college faculty or postdoctoral researcher were also slightly more likely to complete their programs ahead of their peers with other career intentions.

Various funding options played a limited role in predicting degree completion. Being a teaching assistant somewhat improved a student's chances of completion in both education and humanities. Research assistantships made a slight contribution in sciences and mathematics. Holding a fellowship was significant only for students in education.

What role did admissions criteria play in predicting degree completion? Attending one's first choice of doctoral program made a small but significant contribution toward completion in engineering and in sciences and mathematics. Students in education, engineering, and the social sciences who achieved higher GRE verbal scores were less likely to complete their doctorates than their peers with lower scores. Students in social sciences with higher GRE analytical scores were also less likely to finish their degrees.

Gender did not influence degree completion in any field. In engineering, African Americans were 6.7 times less likely, Hispanics 2.5 times less likely, and Asian Americans 1.8 times less likely than whites to complete their degrees. Compared with those of their white peers, the odds of completing their degrees were also lower for Hispanics in the social sciences and for Asian Americans in sciences and mathematics. In engineering, older students were less likely

than younger ones to finish their degrees. However, engineering students who were married or had domestic partners were twice as likely to finish their doctorates, as were married students in education and in sciences and mathematics, although the effect was less strong. The presence in the household of children under the age of eighteen appears to have been an impediment to completion only in the field of education.

Time to Degree

For the nearly 62 percent of the sample who completed their degrees over the four years of the study, we have been able to calculate time to degree by matching the individuals with the dates at which they started their programs. Aside from continuing full-time enrollment, which as we might expect was a significant predictor of faster progress in all five fields, the other significant predictors vary by field (see table 3).

<Table 3 about here>

Among the demographic characteristics found to be related to time to degree were a few race-ethnicity matters and socioeconomic status effects. Hispanics in engineering took three-quarters of a year longer, and Asian Americans a third of a year longer in sciences and mathematics and nearly a year longer in the social sciences, than whites to complete their programs. In the fields of engineering and the social sciences, the higher a students' parental socioeconomic status, the less time it took them to earn their degrees. Engineering students with relatively high student household incomes took more time to achieve their degrees, as did students in sciences and mathematics.

It appears that having a mentor in the humanities and the social sciences is associated with shorter time to degree. This is another example of how mentoring positively influences student experiences, but interestingly not in every field, as it did with research productivity. How

students financed their doctoral degrees played a limited role in determining time to degree. None of the three major forms of student support--fellowships, teaching assistantships, or research assistantships--predicted time to degree. Only in the social sciences was debt incurred as a doctoral student a factor in lengthening time to degree.

Students with higher GRE verbal scores took significantly longer to finish their degrees in the fields of education, engineering, sciences and mathematics, and the social sciences. Conversely, higher GRE analytical scores predicted shorter time to degree in education, sciences and mathematics, and the social sciences. Prior attendance at a selective undergraduate institution predicted longer time to degree for engineering students, as did attendance at a private graduate school for both engineering and social sciences students. However, attendance at a private graduate school was associated with a shorter time to degree for sciences and mathematics students. Earning a master's degree before entering a doctoral program also promoted a shorter time to degree in both education and engineering. While the presence in the household of a spouse or partner was a stronger predictor of a shorter time to degree for students in engineering, humanities, and sciences and mathematics, the presence in the household of children under eighteen was a strong predictor of longer time to degree for students in engineering, humanities, and the social sciences. Age was a factor only for students in education, reducing the time to degree.

Conclusion

The pressures of efficiency and accountability in doctoral education cannot be ignored. Questions of time to degree, rate of progress, and completion rates will become as common as they are at the undergraduate level and will rival questions of publication rates, grant funding, and student qualifications for the attention of graduate faculty. We have introduced a new

measure of efficiency that we call rate of progress, which we believe to be a reasonable barometer of time to degree, allowing both faculty and students to assess students' accomplishments and progress. Graduate faculty may eventually wish to set standards and expectations that can be conveyed to students about expected rates of progress and time to completion. We might then expect differences in the rates across disciplines to dissipate--or at least to be explained by differing requirements in different disciplines and fields.

Footnotes

[1] The term underrepresented minorities refers to African Americans and Hispanics/Latinos.

[2] With more than 1.6 million entries, the Dissertation Abstracts database is the single, authoritative source for information about doctoral dissertations and master's theses. The database represents the work of authors from more than a thousand graduate schools and universities.

[3] Nearly 87 percent of our sample earned Ph.D.s. An additional 12 percent earned either an Ed.D. (Doctor of Education), DPE (Doctor of Physical Education), DR or Drec (Doctor of Recreation), DHS (Doctor of Hebrew Studies), DME (Doctor of Musical Education), or DRE (Doctor of Religious Education), predominantly from the Harvard Graduate School of Education (22%) and Teachers College, Columbia University (64%). The remaining 1 percent earned the Ph.D. without a dissertation or an Applied Research Doctorate without a dissertation.

[4] Based upon his research and review of the research on time to degree, Baird (1990, 383) gives the following advice to students who would like to "keep their time in graduate school to a minimum: don't take a full-time job; go to graduate school immediately after college; attend full-time; enter the same discipline as your undergraduate major; attend the same college as your undergraduate college; if you can't get a fellowship try to find a job as a research assistant; complete your required coursework and qualifying examinations as soon as possible; find a conscientious adviser; and if you must get married, for goodness sake don't have children."

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4 Three Ways of Winning Doctoral Education: Rate of Progress, Degree Completion, and Time to Degree. (pp. 65-79). Catherine M. Millett and Michael T. Nettles.Â Simply put, the educational system grows increasingly unresponsive to Americaâ€™s Hispanic and black populations as the degree stakes go up. Borrowing the pipeline analogy, the STEM faculty pipeline is just the last, smallest-diameter section of a system that eliminates large numbers of Hispanic and black students all along the way while providing little support to those who try to stay the course. Some universities are beginning to complain not only of a... Such baccalaureate completion programs may shorten the time between nursesâ€™ attainment of associateâ€™s and baccalaureate degrees, facilitated by focused efforts such as those undertaken through APINâ€™s shared curriculum models. In New York, for example, nearly 80 percent of participants in these programs progressed from an associateâ€™s to a baccalaureate degree within about 1 year.Â BOX 3-3 Educational Pathways to Achieving a Baccalaureate Degree in Nursing.Â Baccalaureate completion programs are postlicensure programs that provide a pathway for individuals who already have a diploma or associateâ€™s degree in nursing and are already licensed RNs to complete their baccalaureate education in nursing. Doctoral degrees are advanced graduate or professional degrees that demonstrate mastery in a particular subject area. Doctoral degrees are terminal degrees, meaning they're the highest possible degrees available in their field. Doctorates can be both applied or research-based degrees and they usually attract learners who already hold master's degrees.Â This degree takes around three years to complete, and many programs offer online options. The program generally culminates in a portfolio of engineering work rather than a dissertation.Â Some online programs offer lower tuition rates and allow students to complete coursework at an accelerated rate. Some doctoral degrees, like MDs, cannot take place online due to their intensive or clinical natures. Issues associated with improving program quality and completion rates in doctoral education have been addressed by a number of re-searchers worldwide [Lipschutz 1993; Ali, Kohun, Levy 2007; Pena et al. 2010; Di Pierro 2007; 2012]. Seven aspects of doctoral studies that should be altered to increase doctoral completion rates are exam-ined [Lipschutz 1993]: admissions, graduate curriculum, supervision, monitoring progress, financial support, institutional climate, practic-es and procedures.Â In addition, monitoring the progress of doctoral students is a crit-ical factor of their research productivity, and the key role here should be played by the supervisor [Lipschutz 1993]. Departmental factors affecting time-to-degree and completion rates of doctoral students at one land grant research institution. The Journal of Higher Education. 72(3), 341-367.Â The impact of race and gender on graduate school socialization satisfaction with doctoral study and commitment to degree completion. Western Journal of Black Studies, 25 (1) 30-46. 14. Golde, C. (1998).