Data Sources: Recent Trends in Employment and Unemployment among Doctoral Scientists and Engineers

The headlines of late are filled with stories about the depressed state of the U.S. labor market. In the month of December 2008, nearly 525,000 U.S. workers lost their jobs, and the unemployment rate reached 7.2% (BLS, 2009). Fortunately for the graduate school community, the story is probably not so dismal among our ranks. In 2007, among individuals 25 years of age and older, the annual average unemployment rate for those with a doctoral degree was 1.4%, compared with 1.8% for those whose highest degree was a master's, 2.2% for those with only a bachelor's, and 3.6% overall (BLS, unpublished tabulations). Although annual data for 2008 are not yet available, the unemployment rate for doctorates most likely remained below that for other levels of educational attainment based on historical trends.

The employment situation for science and engineering doctorates is also typically better than the national average. The most comprehensive source of data about the state of employment and unemployment for science and engineering doctoral degree holders is the National Science Foundation's Survey of Doctorate Recipients (SDR). This longitudinal survey is conducted every two to three years, and gathers information from individuals who earned a research doctorate in a science, engineering or health field from a U.S. institution. The survey sample is restricted to individuals who are living in the United States and are under the age of 76. The latest SDR survey collected employment data for scientists and engineers as of April 1, 2006, and results from this survey are compared here with SDR data reported for scientists and engineers as of October 1, 2003.

Full-Time and Part-Time Employment Status

In 2006, there were 711,800 doctoral scientists and engineers in the United States, a 3.9% increase from 685,300 three years earlier in 2003. The proportion of scientists and engineers who were employed full-time changed little between 2003 and 2006, increasing minimally from 77.5% to 77.9%. Part-time employment also remained steady, with 9.1% of doctoral scientists and engineers employed part-time in 2003 and 9.5% in 2006. Female doctoral scientists and engineers were more likely in both 2003 and 2006 to be employed part-time than their male counterparts. In 2003, 15.0% of women and 6.9% of men were employed part-time, and in 2006, 14.8% of women and 7.3% of men were employed part-time.

Unemployment Status

In 2006, 1.2% of doctoral scientists and engineers were unemployed (see Figure 1), down from 1.9% in 2003. Women were slightly more likely than their male counterparts to be unemployed in 2006—1.4% for women vs. 1.1% for men. The same was true in 2003—2.1% of women were unemployed vs. 1.8% of men.

By race/ethnicity, unemployment rates were nearly identical in 2006. Asian, Hispanic and White doctoral scientists and engineers all had a 1.2% unemployment rate, and Black



doctoral scientists and engineers had a 1.3% unemployment rate. In 2003, unemployment rates varied more by race/ethnicity, from highs of 2.7% and 2.0% for Asian and Black doctoral scientists and engineers, respectively, to lows of 1.8% and 1.6% for White and Hispanic doctoral scientists and engineers, respectively. The unemployment rate for Native Americans was 1.3% in 2003, but this figure should be interpreted cautiously given the low number of Native American survey respondents. The unemployment rate for Native Americans was suppressed in 2006 for this very reason.

By field of doctorate, those with degrees in chemical engineering had the highest unemployment rate in 2006 (2.9%), followed by those in microbiology and chemistry (both at 2.4%), and mechanical engineering and physics (both at 2.2%). Unemployment rates were lowest for individuals with doctorates in sociology and civil engineering (both at 0.5%), political sciences and electrical/computer engineering (both at 0.8%), and health (0.9%).

Retirement Status

The percentage of scientists and engineers who reported that they were retired increased slightly in 2006 to 9.9%, up from 9.4% in 2003. Men were far more likely than women to report being retired in both 2006 and 2003, in large part reflecting the increase in the number of women among new doctorate recipients in science and engineering in the last two decades, and thereby a younger median age for women than men among doctoral scientists and engineers. In 2006, 11.5% of men and 6.1% of women were retired, both percentages up from 11.0% and 5.0% in 2003, respectively.

Involuntary Out-of-Field Employment

The SDR also collects data on the numbers of individuals involuntarily employed out of field. Individuals counted in this category include those who reported working part-time

continued from page 3 Data Sources

because full-time work was not available, as well as individuals working in an area not related to their doctoral degree due to a lack of suitable work in their field. The involuntarily out-of-field rate in 2006 was 3.1% for all doctoral scientists and engineers, but rates varied considerably by field of doctorate, ranging from a high of 8.7% in physics, to a low of 0.9% in health. In 2003, the involuntarily out-of-field rate was higher at 5.0%, ranging from a high of 8.7% in physics once again, to a low of 2.2% in economics.

Postdoctoral Appointments

Postdoc participation grew in 2006, with 4.8% of all doctoral scientists and engineers reporting being in such positions, up from 3.3% in 2003. New doctorate recipients are also more likely to take postdocs than their peers in earlier cohorts. In 2006, while 38% of all SDR survey respondents reported that they had held a postdoctoral appointment at some point in their career, 45% of those who received their doctorate within the last five years reported having taken a postdoc, compared with just 31% of those who received their doctorate more than 25 years ago (NSF, 2008).

Employment Sector

Academia remains the primary employer of doctoral scientists and engineers in the United States. Overall, 43.7% of all employed doctoral scientists and engineers worked in four-year academic institutions in 2006 (see Figure 2), and an additional 3.4% worked in other academic institutions. Both percentages are identical to those reported in 2003. The for-profit sector accounts for the second largest share of employment, with nearly one-third (31.0%) of all doctoral scientists and engineers employed in this sector in 2006, down slightly from 31.6% in 2003.



Sector of employment varies greatly by field of doctorate. In two fields, sociology and political sciences, over two-thirds of doctorate recipients worked in four-year institutions in 2006—69.6% and 66.0%, respectively. In contrast, just 18.3% of doctorates in materials/metallurgical engineering and 18.5% of doctorate recipients in chemical engineering worked in four-year institutions. Employment in the for-profit sector also varies by field of doctorate, ranging from a high of 66.9% of materials/metallurgical engineering doctorate recipients, to a low of 6.9% of doctoral sociologists.

What the Future Holds in Doctoral Science and Engineering Employment

While it is informative to look at recent trends in employment and unemployment among doctoral scientists and engineers, these trends cannot tell us what will happen in the coming months, in light of the current economic recession. The SDR was conducted again in 2008, and the results will be reported in 2010, but even these data will not tell us what happened in late 2008 and beyond as the recession deepened. Given recent trends, however, there are two things that are likely to occur.

First, it is likely that there will be an increase in 2009 in the number of new science and engineering doctorate recipients taking postdoctoral appointments. The number of scientists and engineers accepting postdocs slowly declined throughout the economic boom that occurred in the late 1990s, but during and immediately after the recession, the numbers of postdocs increased, growing 1.4% in 2001, 4.9% in 2002 and 5.8% in 2003 (NSF, 2005). The increases were greater in certain disciplines, such as physics, where nearly two-thirds of all new doctorate recipients accepted postdocs at about the time of the last two recessions, compared with only about 45% in the late 1990s (AIP, 2007).

Second, it is likely that the unemployment rate will remain lower for doctoral scientists and engineers than for individuals with bachelor's degrees or lower levels of educational attainment, since this has been the case historically.

We also know that it will likely be tougher to get a job today than it was in recent years, particularly in the academic job market. According to a recent survey conducted by *The Chronicle of Higher Education* and Moody's Investors Services, more than 40% of responding academic business officers say that their institutions have imposed partial freezes on faculty hiring, and 5% have imposed total freezes on hiring new faculty (Blumenstyk, 2009). Although these freezes will undoubtedly make it harder for some to find a job, it will be some time before national data reveal the true effect of the economy on the employment of doctoral scientists and engineers.

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McNair Voices: The Barometer for Retaining Low-Income Graduate Students

Introduction

Expanding the graduate education pipeline is critical for the future faculty workforce. The Federal TRIO Programs consist of eight educational opportunity programs which support low-income Americans in succeeding all along the educational pipeline. The mission of TRIO's Ronald E. McNair Post-Baccalaureate Achievement Program ("McNair Scholars") is to diversify the American professorate by preparing low-income undergraduates for entry to Ph.D. programs. Since 1989, McNair has provided federal funds to postsecondary institutions to administer research training, GRE test preparation, academic counseling, and related graduate preparation resources to high achieving, low-income (LI) students, more than any other single program of its kind.

Annually, several hundred McNair students enter graduate school—over 70% of whom are low income—and many enter Ph.D. programs at leading research universities (Seburn, Chan, & Kirshstein, p. 28, 2005).ⁱ However, Figure 1 shows low-income students enrolled in graduate programs earn graduate degrees at rates well below those of higher income students. completion among their own students by listening to the voices of low-income graduate students.

Voices of Low-Income Graduate Students

To examine graduate retention, one urban, private research university in the U.S. southwest interviewed McNair alumni enrolled in its Ph.D. programs. LI graduate students related how they struggle with self-doubt and feel underprepared or as if they do not deserve to be in graduate school. Even though these students proved their academic worthiness by gaining admission to a highly selective graduate institution, feelings of academic inadequacy still trouble them. One related:

"A lot of times I felt like there is something else I'm supposed to know that everyone else in graduate school seems to know. Other grad students are comfortable discussing books I'd never even heard of—or at least, no one else admitted they'd never heard of."

Other LI students often feel alienated among students from wealthier backgrounds or who attended more prestigious undergraduate schools, and concluded their academic

Figure 1: Graduate Degree Completion Rates among Low-Income Students ⁱⁱ				
	All Advanced Degrees	Master's	Professional Degree	PhD
Higher Income Low Income	47% 29%	29% 19%	12% 7%	6% 3%

backgrounds differed significantly. LI students observed bias in faculty relations with students based on judgments of undergraduate background rather than individual performance. Second, these low-income

Federal analysts point to "less financial and social support" among the factors which explain lower persistence rates (Seburn, Chan, & Kirshstein, p. 28, 2005).ⁱⁱⁱ Yet graduate deans may also examine graduate persistence and degree doctoral students were clear: families viewed their pursuit of graduate study as reduced foregone income for the household. Each related multiple ways in which the high cost of graduate study exacts a burden on their parents, from

continued on page 6

5