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ABSTRACT

Aggregate measures of labor market conditions for recent science and engineering Ph.D. recipients changed only slightly between April 1993 and April 1995. The unemployment rate for all recent Ph.D.s rose from 1.7% in 1993 to 1.9% in 1995. The rate of recent Ph.D.s involuntarily working outside the field of their degree similarly rose slightly from 4.0% in 1993 to 4.3% in 1995; however, the aggregate numbers mask much larger positive and negative changes in labor market conditions within individual disciplines. Most individuals who complete the rigors of a doctorate in science or engineering do not do so simply to find steady employment with a good salary. Their technical and problem solving skills make them highly employable, but the opportunity to do the type of work for which they have trained is also important. No single measure can well describe the science and engineering labor market. This issue brief provides an overview of labor market indicators for recent recipients of science and engineering Ph.D.s from institutions in the United States. It uses data from the 1993 and 1995 Survey of Doctorate Recipients, a biennial NSF (National Science Foundation) survey of holders of Ph.D.s from U.S. institutions up to age 75. This brief also discusses variations by field or sector of items such as unemployment rates, involuntarily working outside of field, percentage in tenure track positions, and salaries. (Author/DKM)

What's Happening in the Labor Market for Recent Science and Engineering Ph.D. Recipients?

by
Mark Regets

NATIONAL SCIENCE FOUNDATION
Directorate for Social, Behavioral and Economic Sciences

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Division of Science Resources Studies
ISSUE BRIEF
NSF 97-321, September 23, 1997

In several fields, recent Ph.D. recipients faced unemployment rates unusually high for highly skilled groups, reaching 4.3 percent in Chemical Engineering.

Electronic Dissemination

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Aggregate measures of labor market conditions for recent science and engineering Ph.D. recipients (1-3 years since degree) changed only slightly between April 1993 and April 1995. The unemployment rate for all recent Ph.D.s, shown in table 1, rose from 1.7 percent in 1993 to 1.9 percent in 1995.[1] The rate of recent Ph.D.s involuntarily working outside the field of their degree (IOF) similarly rose slightly from 4.0 percent in 1993 to 4.3 percent in 1995. However, the aggregate numbers mask much larger changes in labor market conditions, both positive and negative, within individual disciplines.

This Issue Brief provides an overview of labor market indicators for recent recipients of science and engineering Ph.D.s from U.S. institutions. It uses data from the 1993 and 1995 Survey of Doctorate Recipients, a biennial NSF survey of holders of Ph.D.s from U.S. institutions up to age 75.

Most individuals who complete the rigors of a doctorate in science or engineering do not do so simply to find steady employment with a good salary. Their technical and problem-solving skills make them highly employable, but the opportunity to do the type of work they want and have trained for is also important. For that reason, no single measure can well describe the science and engineering labor market. Some of the labor market indicators that are available are discussed below.

How Do Unemployment Rates Vary by Field?

Only 1.9 percent of recent (1 to 3 years after degree) Ph.D. recipients were unemployed[2] in April 1995—low compared to the 5.7-percent unemployment rate for all civilian workers and only a little above the 1.5-percent rate for all S&E Ph.D.s (Table 1). In several

Table 1: 1993 and 1995 Labor Market Rates for Recent U.S. S&E Ph.D.s (1-3 Years After Degree)

Field of Degree	Unemployment Rates		Involuntarily-Out-of-Field Rates	
	1993	1995	1993	1995
All Science & Engineering	1.7	1.9	4.0	4.3
Engineering	1.9	1.7	3.7	3.7
Chemical Engineering	1.1	4.3	2.1	3.3
Civil Engineering	1.9	1.3	1.4	1.0
Electrical Engineering	1.9	0.9	3.8	3.0
Mechanical Engineering	1.3	2.8	8.3	5.0
Life Sciences	0.9	2.0	2.6	2.6
Agriculture	1.1	1.1	2.7	2.2
Biological Science	0.7	2.2	2.3	2.8
Health/Medical	1.5	1.3	2.1	2.2
Math/Computer Sciences	1.1	2.6	4.9	6.2
Computer Science	1.5	1.1	2.1	2.7
Mathematical Science	0.7	4.0	7.1	9.3
Physical Sciences	3.0	2.4	5.4	5.3
Chemistry	1.6	2.1	4.0	4.1
Geosciences	3.4	1.7	8.5	6.8
Physics	5.3	2.9	6.1	6.7
Social Sciences	1.8	1.4	4.6	5.5
Economics	2.1	1.4	4.1	2.7
Political Sciences	2.4	2.5	5.1	11.2
Psychology	1.4	0.5	2.2	3.8
Sociology/Anthropology	3.3	3.2	11.6	9.1

SOURCE: NSF/SRS, Survey of Doctorate Recipients, 1993 and 1995.

[1]For information on unemployment rates for all holders of science and engineering Ph.D.s, see the NSF/SRS Issue Brief *Ph.D. Unemployment Trends: Cause for Alarm?* by Carolyn Shettle.

[2]People are defined as unemployed if they were not employed during the week of April 15, 1995 and had either looked for work during the preceding four weeks or were on layoff from a job.

fields, however, new Ph.D.s faced higher unemployment rates: 4.3 percent in chemical engineering; 4.0 percent in mathematical sciences; 3.2 percent in sociology/anthropology; and 2.9 percent in physics. While still much lower than for the general population, these unemployment rates are unusually high for a highly skilled group. For recent physics Ph.D.s, however, the 2.9-percent rate represented a large drop from the 5.3-percent unemployment rate reported by the similar graduation cohort in 1993. For mathematical sciences and chemical engineering, the 4.0- and 4.3-percent unemployment rates in 1995 were notable increases from the 0.7- and 1.1-percent rates reported in 1993.

Four to six years after receiving a Ph.D., 26.3 percent were in tenured or tenure track positions, only slightly less than the rate for all graduation years.

How Many Work Involuntarily Outside of Field (IOF)?

Another 4.3 percent of recent S&E Ph.D. recipients in the labor force reported that they could not find full-time employment "closely" or "somewhat related" to their degrees (Table 1). The definition of IOF includes those working part-time in their field because full-time work was not available. As with unemployment, IOF rates varied greatly by field, with much higher rates of 11.2 percent in political science; 9.3 percent in mathematical sciences; 9.1 percent in sociology/anthropology; 6.8 percent in geosciences; and 6.7 percent in physics. Fields with relatively low IOF rates for recent Ph.D.s included 1.0 percent in civil engineering; 2.2 percent for agricultural and medical Ph.D.s; 2.7 percent for economics and computer science; and 2.8 percent in the biological sciences.

How Many Are in Tenure Track Positions?

Most science and engineering Ph.D.s do not work in academia. Across all fields and ages, only 30.8 percent of S&E Ph.D.s in the labor force are in tenure-track or tenured positions at 4-year educational institutions. Across fields, academic tenure track employment varies from a high of 54.0 percent for economics to a low of 14.0 percent for chemical engineering. Still, the availability of tenure track positions is an important aspect of the job market for those who do seek academic careers.

In 1995, one to three years after receiving their Ph.D.s, 15.8 percent of S&E Ph.D. recipients were in tenure track positions (Table 2). This rises to 26.8 percent for those with 4

Table 2: Percent Holding Tenure and Tenure Track Appointments at Four-Year Institutions: Comparison of Early and Mid-Career

Percent Tenure-Track in 1995 by Years Since Ph.D.

Field of Degree	Early Career		Mid-Career	All Years
	1-3 years	4-6 Years	11-20 Years	
All Science and Engineering	15.8	26.8	30.5	30.8
Agriculture	13.4	26.0	36.1	32.8
Biological Science	8.0	19.8	34.2	32.5
Chemical Engineering	6.6	6.0	14.6	14.0
Chemistry	6.9	14.6	15.1	18.8
Civil Engineering	25.5	29.9	33.7	34.5
Computer Science	34.5	42.3	38.9	40.9
Economics	42.4	55.4	52.2	54.0
Electrical Engineering	10.8	22.5	26.4	22.9
Geosciences	10.9	30.1	27.3	28.8
Health/Medical	32.5	45.2	37.9	39.0
Mathematical Science	36.0	52.7	51.3	53.5
Mechanical Engineering	14.4	26.3	24.2	23.3
Physics	5.8	15.6	20.3	23.5
Political Science	29.5	68.4	51.6	52.7
Psychology	13.1	19.8	19.8	22.1
Sociology/Anthropology	32.2	50.4	49.2	49.9

SOURCE: NSF/SRS, Survey of Doctorate Recipients, 1995.

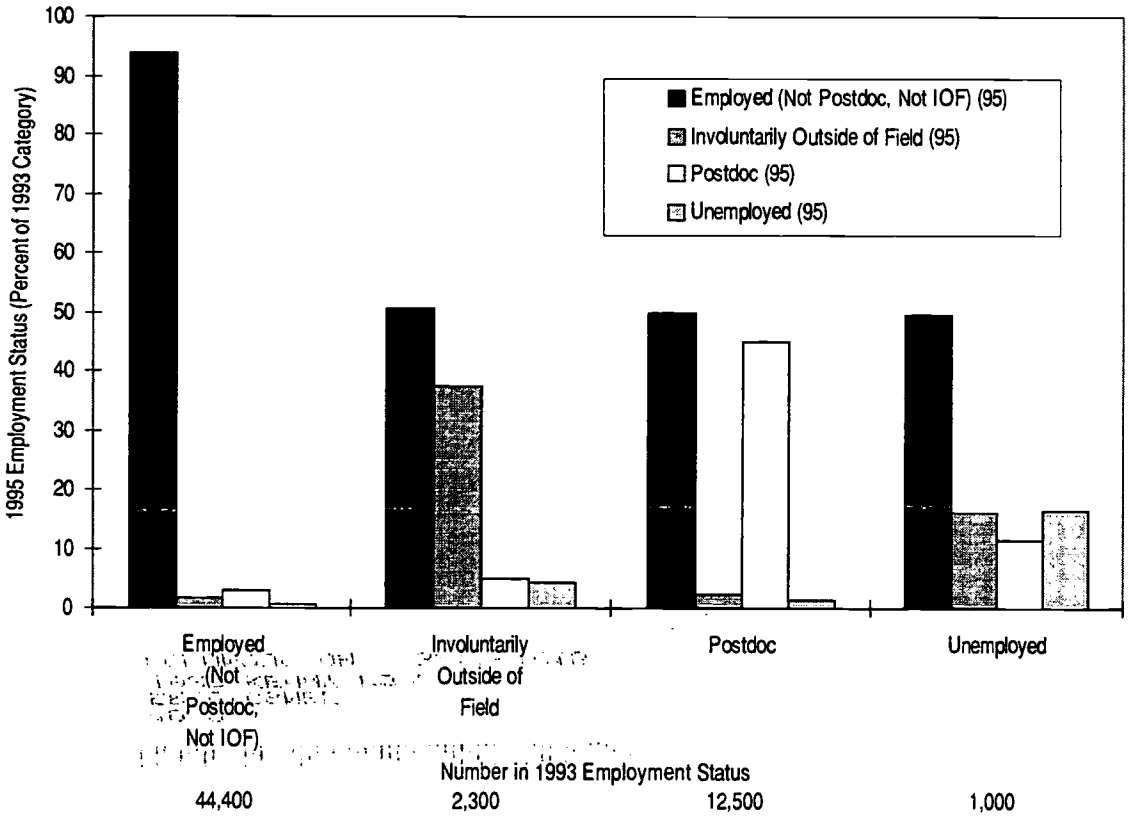
to 6 years since receipt of their degrees. By comparison, the rate for those in mid-career (11-20 years after degree) is slightly greater at 30.5 percent. The percent of Ph.D.s with tenure track positions does not, however, tell much about how difficult it is to obtain academic employment—in fields where many new Ph.D.s prefer employment in industry, there may actually be less competition for academic jobs.

Comparable historical data on tenure track rates in early career are not available, but comparisons with mid-career tenure track rates do provide an imperfect indicator of changes in the availability of academic positions. By this relative measure, early career tenure-track rates (4 to 6 years out) are noticeably lower than mid-career rates in biological sciences (-14.4 percentage points); agriculture (-10.1 percentage points); chemical engineering (-8.6 percentage points); and physics (-4.7 percentage points).

Changes in Employment Status

Changes in employment status between 1993 and 1995 are shown in chart 1 for the 1990-92 graduation cohort of science and engineering Ph.D.s. Of the 72.2 percent[3] of these recent Ph.D.s that were in "regular" employment in 1993 (not in a postdoc and not involuntarily working outside of their field), the vast majority

Chart 1: Following Individuals: Changes in Employment Status Between 1993 and 1995 (1990-1992 S&E Ph.D. Recipients)



SOURCE: NSF/SRS, Survey of Doctorate Recipients, 1993 and 1995.

[3] The percentages cited were calculated using unrounded estimates and included 1,000 recent Ph.D. recipients outside of the labor force that are not shown in chart 1.

(94 percent) were still in regular employment in 1995. Of those in other 1993 employment statuses (postdocs, involuntarily outside of field, and unemployed), 50 percent of each group moved to regular employment by 1995. Forty-five percent of recent Ph.D.'s who were postdocs in 1993 were still in a postdoc position in 1995—37 percent of those working involuntarily outside of their field were IOF in 1995. There was, however, much less evidence of long-term unemployment—only 0.3 percent were unemployed in both April 1993 and 1995 (16 percent of the 1.7 percent of recent Ph.D. recipients who were unemployed in 1993).

How Do Salaries Vary by Sector?

Median salaries in 1995 for recent Ph.D.s, as shown in table 3, were highest in the private, non-education sector ($56,000) and lowest for postdocs ($28,000). The pattern of salary by broad field of degree also varies by sector of employment, but salaries were generally higher in engineering and math/computer science and lower in the social and life sciences.

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Table 3: 1995 Salary by Sector for Recent S&E Ph.D.s (1-3 years after Degree) Sector

Field of Degree	Private, Non-Ed	Government	Tenure Track	Postdoc	Other Education
All Science & Engineering.....	56,000	46,000	41,300	28,000	35,000
Engineering.....	60,000	52,000	49,300	33,000	43,000
Life Sciences.....	52,000	42,500	42,500	26,500	33,900
Math/Computer Sciences.....	65,000	61,250	43,000	35,000	35,900
Physical Sciences.....	55,000	52,000	38,000	30,000	34,000
Social Sciences.....	48,000	44,784	38,200	27,000	34,000

SOURCE: NSF/SRS, Survey of Doctorate Recipients, 1993 and 1995

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