



by Alan I. Rapoport

ARE FORMS OF FINANCIAL SUPPORT AND EMPLOYMENT CHOICES OF RECENT SCIENCE AND ENGINEERING PH.D.S RELATED?

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Recent S&E Ph.D.s with primary RA support were relatively more likely to work in industry.

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Slightly more than half of recent¹ Ph.D.s, but less than half of the overall doctoral science and engineering (S&E) workforce², are employed in academic institutions. Because of this employment pattern, which has continued for several decades, information about current graduate education practices is of interest. This includes concerns about the role of different types of financial support mechanisms in preparing doctoral students for employment in different sectors of the economy.³

Graduate students tend to rely on multiple modes of financial support over the course of their doctoral studies, making assignment of a clear primary support mode difficult. However, students are able to identify which support mechanism they consider to have been primary—fellowship, research assistantship (RA), teaching assistantship (TA), traineeship, self-support, or other mechanisms.⁴ The students' responses can then be related to their subsequent employment. The relationships observed between support and employment are described here without any claim that the former causes the latter.

In 1995, over half of recent (1993-94) S&E Ph.D.s with primary RA, fellowship, traineeship, or TA support were working in academic institutions. However, those with primary RA support were relatively more likely to work in industry, and less likely to work in academia, than those with primary fellowship, traineeship, or TA support (table 1). Industry employed a third of those with RA support, but only 21 per-

cent of those with TA support, 19 percent of those with fellowships, and 15 percent of those with traineeships. Academic institutions employed 51 percent of those with RA support, but 61 percent of those with fellowship, 65 percent of those with traineeship, and 66 percent of those with TA support. Similar results were obtained for U.S. citizens.

These findings are not limited to recent Ph.D.s interviewed in 1995. With a few minor exceptions, they hold as far back as 1979. Since 1979, those with primary RA support had a relatively greater propensity for industry employment—and a lower propensity for academic jobs—than those with primary fellowships,⁵ traineeships, and TAs.⁶

A small number of universities—about 125⁷—dominate the conduct of academic research, while a much larger number—about 1,600—award four-year and advanced degrees in science and engineering. RA and fellowship supported S&E Ph.D.s who did enter academic employment disproportionately ended up working at these research universities. From 1979-95, these institutions employed from 59-68 percent of all the recent S&E Ph.D.s who were working in colleges and universities, including 71-84 percent of those in academic employment who had primary RA support, and 72-90 percent of those with primary fellowship support (figure 1).

⁵Except for 1987 when those with primary fellowship support had a lower propensity for academic jobs than RAs.

⁶The relationships between primary support mechanism, employment sector, and primary work activity may in part reflect factors not examined in this analysis: distribution of support mechanisms across specific fields, sectoral employment differences across these fields, etc.

⁷The Carnegie Commission calls them the research universities.

¹Those receiving their doctorate in the two years preceding the biennial Survey of Doctorate Recipients.

²Includes full-time, part-time, and postdoctorates.

³For example, by the Committee on Science, Engineering, and Public Policy (COSEPUP), 1995, *Reshaping the Graduate Education of Scientists and Engineers*. Washington, DC: National Academy Press.

⁴Other includes own/family resources, loans, other nonspecified, and unknown.

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Table 1. Percentage of recent S&E Ph.D.s working in academe or industry, by selected primary mechanism of support: 1979-95

Survey year	All	Research Assistantship	Teaching Assistantship	Traineeship	Fellowship
Academe					
1979.....	52%	49%	60%	68%	56%
1981.....	50	44	61	62	55
1983.....	49	48	58	60	59
1985.....	50	49	59	55	65
1987.....	47	45	60	55	43
1989.....	49	45	57	68	75
1991.....	49	46	58	62	63
1993.....	51	49	71	58	62
1995.....	54	51	66	65	61
Industry					
1979.....	21	30	24	14	20
1981.....	27	39	23	13	27
1983.....	26	35	26	16	17
1985.....	25	32	22	17	23
1987.....	24	31	18	19	26
1989.....	25	30	23	13	17
1991.....	26	32	23	20	19
1993.....	28	34	16	21	28
1995.....	27	33	21	15	19
Average n.....	28,487	7,958	4,290	2,833	746

NOTE: Recent S&E Ph.D.s are those receiving their degrees in the two years preceding the survey year of the biennial Survey of Doctorate Recipients. Percentages represent the percent of recent S&E Ph.D.s in each year that work in academe and industry but do not sum to 100 percent since employment sectors other than academe and industry are not shown. Industry includes self employment. "Average n" is the average number of recent S&E Ph.D.s across the nine survey years for each primary support mechanism and for the "All" category, includes all recent S&E Ph.D.s including those with mechanisms not shown (own/family resources, loans, other non specified, and missing).

SOURCE: National Science Foundation, Division of Science Resources Studies, Survey of Earned Doctorates and Survey of Doctorate Recipients, various years, unpublished tabulations.

Recent S&E Ph.D.s tended to designate research as their primary activity more frequently than teaching, but responses differed with primary support mode (table 2). In 1995, 73-75 percent of recent S&E Ph.D.s with RAs and fellowships identified research as their primary job activity, compared to 56 percent overall, 54 percent of those with traineeships, and 40 percent of those with a TA. (However, 1995 is anomalous for the relationship between traineeships and work activity that appeared to hold during 1979-93.) This pattern also has been quite consistent since 1979 and is similar to that for recent U.S. citizen Ph.D.s only.

A significantly greater percentage of those with TAs as primary support and a significantly smaller

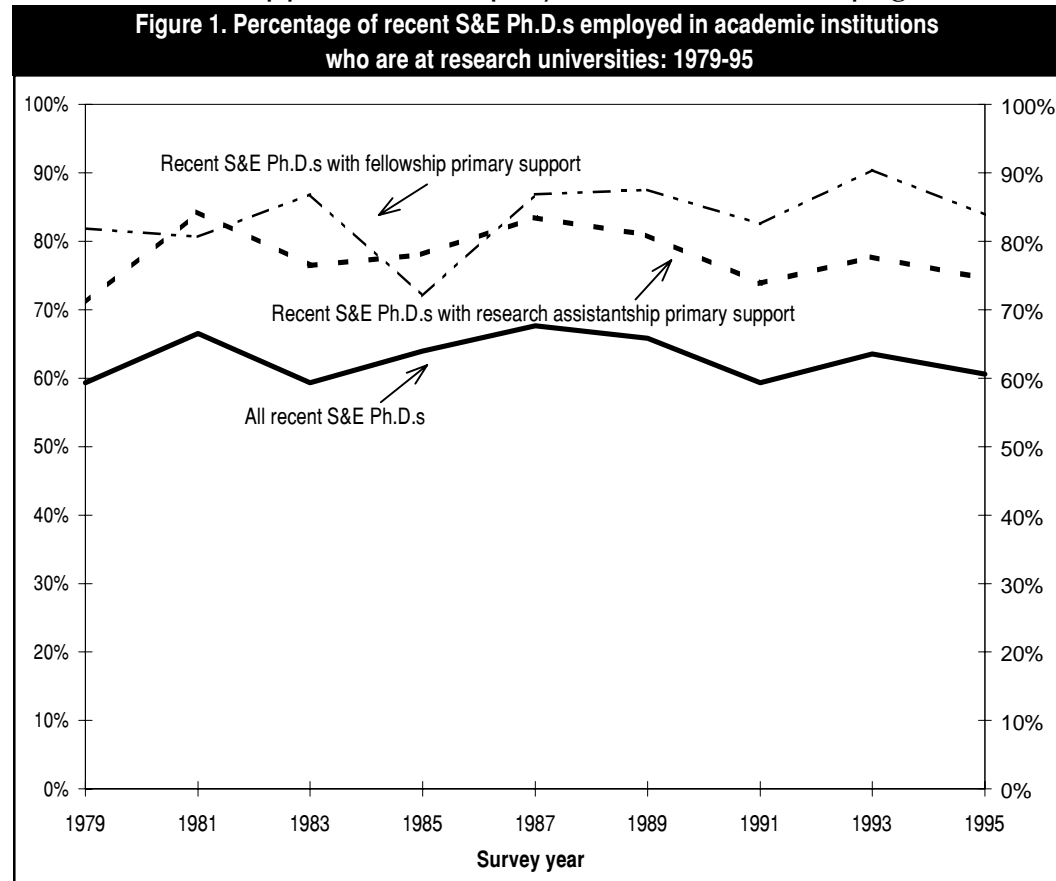
percentage of those with a research assistantship were likely to report teaching as their primary work activity than the overall population of recent S&E Ph.D.s. This was true for both all recent S&E Ph.D.s and U.S. citizens only throughout the 1979-95 period. For S&E Ph.D.s with fellowships or traineeships, the propensity to report teaching as their primary work activity varied over these years.

Tentative conclusions and suggestions for further research

These findings suggest that Ph.D.s reporting RAs as their primary graduate support mechanism tend, in the early part of their careers, to seek out or work in jobs in which research is

Recent S&E Ph.D.s with primary RA or fellowship support were more likely than most others to report research as their primary activity.

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NOTES: Recent Ph.D.s are those receiving their degrees in the two years preceding the biennial Survey of Doctorate Recipients. Research universities are a Carnegie commission classification for 125 universities that dominate academic research.

SOURCE: National Science Foundation, Division of Science Resources Studies, Survey of Earned Doctorates and Survey of Doctorate Recipients, various years, unpublished tabulations.

their primary activity. Previous RAs employed in the academic sector are much more likely to be located at research universities, where such work is especially emphasized. But previous RAs that are not employed at research universities are more likely to be in jobs in other sectors with research as their primary activity rather than in academia at non-research institutions.

As indicated earlier, the available data do not provide any information about the causes of these patterns, whether students who desire careers as researchers or in industry seek out RA support or whether the experiences associated with RA support influence the choice of employment sector and type of work sought by recent S&E Ph.D.s. Likewise, we cannot conclude from the finding that RAs disproportionately end up in industry that all is well with their training. These remain areas for further research.

SOURCES: The sources of data for this issue brief are: 1) the Survey of Earned Doctorates, which is an annual survey designed to obtain data on the number and characteristics of individuals receiving research doctoral degrees from U.S. institutions, including information on sources of support during graduate school; and 2) the Survey of Doctorate Recipients, which is a biennial sample survey collecting demographic and career history information about individuals with doctoral degrees.

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Table 2. Percentage of recent S&E Ph.D.s with research or teaching as primary work activity, by selected primary mechanism of support: 1979-95

Survey Year	All	Research Assistantship	Teaching Assistantship	Traineeship	Fellowship
Research					
1979.....	47%	60%	47%	52%	56%
1981.....	51	76	44	54	73
1983.....	53	70	50	63	73
1985.....	53	73	50	71	60
1987.....	56	76	55	74	66
1989.....	59	78	59	73	79
1991.....	56	75	46	64	75
1993.....	58	75	47	69	80
1995.....	56	75	40	54	73
Teaching					
1979.....	24	15	34	24	24
1981.....	22	11	35	21	17
1983.....	21	15	28	17	9
1985.....	20	15	31	12	26
1987.....	19	12	30	7	21
1989.....	18	8	31	11	17
1991.....	19	11	34	17	13
1993.....	17	8	38	14	11
1995.....	18	9	35	20	15
Average <i>n</i>	28,487	7,958	4,290	2,833	746

NOTE: Recent S&E Ph.D.s are those receiving their degrees in the two years preceding the survey year of the biennial Survey of Doctorate Recipients. Percentages represent the percent of recent S&E Ph.D.s in each year that report research and teaching as their primary work activity but do not sum to 100 percent since work activities other than research and teaching are not shown. "Average *n*" is the average number of recent S&E Ph.D.s across the nine survey years for each primary support mechanism and for the "All" category, includes all recent S&E Ph.D.s including those with mechanisms not shown (own/family resources, loans, other non specified, and missing).

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