

Sex, Science & Statistics

By *Patricia Hausman*

The participation of women in science and engineering has long been a contentious issue in the academy, and new findings from a committee of the National Research Council (NRC) seem unlikely to put the controversy to rest.

The committee's report, entitled [From Scarcity to Visibility: Gender Differences in the Careers of Doctoral Scientists and Engineers](#), is a book-length analysis of data from several national surveys, such as the National Science Foundation's Survey of Doctoral Recipients (SDR). It was prepared by a panel convened by the NRC's Committee on Women in Science and Engineering. Chaired by J. Scott Long of Indiana University, the panel also included Georgine Pion (Vanderbilt University), Anne Preston (Haverford College), Lee Sechrest (University of Arizona), and Lilli Hornig, a retired professor of chemistry.

Using data from the 1973, 1979, 1989 and 1995 survey years, the panel examined how female participation in scientific fields has changed over time. It also considered how background characteristics, labor force behavior, and career outcomes differ by sex—particularly in for academic scientists. Perhaps its most fundamental finding was that females are earning an increasing proportion of doctorates in science and engineering, yet not participating in the S& E workforce at commensurate levels.

This article highlights findings that seem most relevant to controversies surrounding the hiring and promotion of women into academic positions. Unless otherwise noted, outcomes refer to the 1995 survey year.

Attrition from the Workforce

Sex differences in attrition from the S & E workforce were evident from the very earliest career stages, with considerably more females than males failing to enter the fulltime S& E workforce on receipt of their doctoral degrees. More than 90% of males who earned a doctoral degree in 1994 were employed full-time in science and engineering during the following year. The corresponding figure for females was below 80%. Of those females not working full time in S& E, the lion's share held a part-time position or had opted for full-time work in other fields.

The sex difference in full-time S & E employment was seen not only among new recipients of doctoral degrees, but at every career stage. Overall, 17% of females with S & E doctorates, as compared to 6% of males, were not working fulltime in S & E. The higher prevalence of part-time work among females was the primary contributor to this disparity. However, a greater tendency of females leave the workforce voluntarily also played a role. The number of females describing themselves as voluntarily out of the labor force (but not retired) varied from a low of about 4% among new doctoral recipients to 7% among those who had earned their degrees in 1965. For males the corresponding figures ranged from near 0 to 2%. Very few individuals of either sex reported being unemployed and seeking work.

Sex differences in the proportion of individuals working fulltime outside of science and engineering varied also among fields. Among those with doctorates in the social and behavioral sciences, males were actually more likely than females to report working fulltime outside of the field of their doctorates. By contrast, among those with degrees in the life and physical sciences, the pattern was reversed.

The impact of marriage and child-bearing on career trajectory was clear. In the panel's words, "differences between men and women in labor force participation are eliminated if we compare single men to single women."

Achieving Tenure

Although females are widely considered disadvantaged in every aspect of academic careers, a number of findings were at odds with this notion. For example, even though males were more likely to ultimately achieve tenure, females scientists had a 5 percentage point advantage in securing early tenure. The magnitude of this advantage varied dramatically by type of academic setting. At doctoral institutions, 10% of females vs. 5% of males obtained tenure within 5 years of receiving the doctoral degree—in contrast to 16% of females and 9% of males at baccalaureate institutions. Schools classified as master's institutions showed dramatic differences favoring women, with 21% of females in S & E receiving early tenure, but only 4% of males.

As for getting on the tenure track, males and females proved to be on equal footing during the first five years following receipt of the Ph.D. Thereafter, males gained a persistent advantage of about 10 percentage points. Female representation was strongest at baccalaureate and medical institutions. Though females constituted a higher portion of academics off the tenure track than on it, males nonetheless constituted two-thirds of those holding non-tenure-track positions.

Among tenure-track faculty, differences in the proportions of males and females progressing to tenure changed little between 1979 and 1995. Throughout the period, the male advantage held steady at about 20 percentage points. However, closer analysis showed that what appeared to

be a lack of progress for women was largely due to differences in work experience between males and females on the tenure-track. With "professional age" taken into account, the male advantage in achieving tenure was estimated at about 7 percentage points. The committee noted that the combination of differences in career age and type of employing institution accounted for a substantial portion, though not all, of sex differences in likelihood of achieving tenure.

Academic Rank and Productivity

Raw figures for sex differences in academic rank also indicated large disparities in the proportion of male and female faculty attaining the rank of full professor. Again, however, adjusting for career age left far less difference between the sexes.

The panel also confirmed previous reports of sex differences in research productivity (as measured by publication counts). Among fulltime academic scientists, males averaged almost 30% more publications than females. However, among tenured faculty, the male advantage was less than 10%, and among full professors in the life sciences, less than 5%.

Data for the 1975 survey year showed women with young children were about 6 percentage points less likely to be tenured than their single counterparts. However, in the 1989 and 1995 surveys, this difference was not observed.

Salary Differences

Among academic scientists, sex differences in compensation proved fairly small once a variety of factors were taken into account. Controlling for professional age, field, primary work activity, and institutional Carnegie classification markedly reduced seemingly large discrepancies in compensation. After these adjustments,

male salaries were about 6% higher than those of similarly situated females.

Salaries of tenure-track faculty at research universities were examined to determine the relationship of research productivity to compensation. When the number of papers published during the previous five years was added to customary variables such as rank, professional age, and prestige of the Ph.D., the magnitude of male salary advantage varied from 4% for full professors to 9% for assistant professors.

Obtaining the report

The report is posted on-line in the [open book format](#), where its entire contents can be read and searched. However, the open book format does not readily lend itself to printing hard copy. Copies of the book are available from the National Academy Press, at a list price of \$45. A 20% discount is offered for [on-line purchases](#).

Orders may also be phoned into the National Academy Press at 800-624-6242.

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