

Why women earn less: Just two factors explain post-PhD pay gap

Nature | News

Study of 1,200 US graduates suggests family and choice of doctoral field dents women's earnings.

20 May 2016

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Women earn nearly one-third less than men within a year of completing a PhD in a science, technology, engineering or mathematics (STEM) field, suggests an analysis of roughly 1,200 US graduates.

Much of the pay gap, the study found, came down to a tendency for women to graduate in less-lucrative academic fields — such as biology and chemistry, which are [known to lead to lower post-PhD earnings than comparatively industry-friendly fields, such as engineering and mathematics](#).

But after controlling for differences in academic field, the researchers found that women still lagged men by 11% in first-year earnings. That difference, they say, was explained entirely by the finding that married women with children earned less than men. Married men with children, on the other hand, saw no disadvantage in earnings.

Many studies have reported similar gender pay gaps and have identified similar contributing factors — but few have systematically broken down the relative contributions of different variables, says Bruce Weinberg, an economist at the Ohio State University in Columbus who led the study, published in the May issue of *American Economic Review*.

“I was quite surprised that we could explain the wage gap using just field of study and family structure,” he says.

The offspring effect

An unmarried, childless woman earned — on average — the same annual salary after receiving her doctorate as a man with a PhD in the same field, the researchers found. The study examined the employment and earnings of 867 men and 370 women who graduated between 2007 and 2010 from 4 different universities.

Weinberg says that the data cannot identify or tease apart factors that might explain why

married women with children earn less — among the possibilities, whether employers assign different responsibilities and salaries to these women, or whether the women spend less time or energy on their careers. But, he says, “our data suggest that these positions, as they are currently structured and operate, are not fully family-friendly for women”.

The findings support earlier research that suggests that parental and household responsibilities often affect women disproportionately, particularly in environments without adequate work–life and family policies, says Heather Metcalf, director of research and analysis for the US Association for Women in Science (AWIS) in Alexandria, Virginia.

The analysis is part of the UMETRICS project, based at the University of Michigan in Ann Arbor, which links anonymized census data on employment and income to student information from a consortium of universities, mainly in the midwestern United States.

Holes to fill

Mary Ann Mason, a law professor at the University of California, Berkeley, says that the work is a “good, careful study”, albeit limited in that it cannot yet provide information on what happened in later postdoc years. Research by Mason and others suggests that women who have young children within 5–10 years after earning their PhDs are less likely to have tenure-track jobs or to hold tenured faculty positions than men or women without children^{2, 3}, for instance.

An important missing piece, says economist Shulamit Kahn at Boston University in Massachusetts, is whether the women and men in the study worked equal numbers of hours. Kahn’s research suggests that, outside of academia, female scientists tend to work slightly fewer hours than do their male counterparts. (That paper did not examine scientists’ family status).

Weinberg says that the team is working to expand and extend the project, first by securing participation from more universities. He hopes, eventually, to be able to track doctoral recipients over the first 5–10 years of their post-PhD careers.