

Study of Danish academics reveals child penalty

Academics in the child-friendly nation face career disadvantages, such as lower employment rates, after becoming parents.

By **Jenessa Duncombe**

Welcoming a new child into the world is often described as a life-changing event for parents. New research suggests that it also could be an inflection point in parents' academic careers, particularly in the careers of women.

Researchers analyzing the careers of academics in Denmark found evidence of child penalties—"differential effects of parenthood on women's and men's likelihood of staying in academia, and having tenure"—despite the country's paid parental leave and subsidized childcare. In their preprint, which was posted earlier this year and has been submitted to a peer-reviewed journal, the researchers found that mothers leaving academia account for about 70% of Denmark's academic-employment gender gap.

"What surprised us was that the penalties persist well beyond the period of parental leave," says study coauthor Sofie Cairo, an economist at Copenhagen Business School. "This suggests that the challenge is not only time away from work immediately after birth but the longer-term difficulty of combining research with the ongoing responsibilities of caring for young children."

The study is part of a growing body of literature by economists quantifying child penalties, such as lost earnings or work-hour reductions, in a variety of careers. A study from 2019, for example, concluded that Danish women with children experience a persistent earnings penalty of 20% in the 20 years after their first child. Similar studies have been conducted in many countries around the world.

Denmark as a case study

One difficulty in child penalty research is obtaining information on when workers become parents. To make up for missing birth history, some researchers have assumed that workers have children after a certain number of years of marriage. Other researchers have surveyed workers directly about when they welcomed children.

"Our setting in a Scandinavian country allows us to actually overcome some of the empirical challenges



▲ (Photo by iStock.com/dragana991.)

that our colleagues in the past have faced," says study coauthor Valentina Tartari, an economist of science at the Stockholm School of Economics. Tartari and her colleagues had access to Danish academics' entire parenthood history via the country's administrative book-keeping. Denmark's population registers contain contemporary demographic, labor, family, and education information tagged by personal tax numbers. The registers include the year, age, and career stage that an academic became a parent. The data can be anonymized for studies like Tartari's.

Examining the child penalty in a country with strong family policies is a particularly useful case study because the child penalty may be lower than in countries with fewer family-oriented policies, says Tartari. Danish policies supporting maternity leave date back to the early 20th century, and paternity leave in the country was introduced in the 1980s. Today, Danish parents generally receive a combined 48 weeks of paid parental leave after birth, and they have access to low-cost childcare starting when the child is about six months old until they reach school age.

As in many other countries, women in academia are

underrepresented in top positions in Denmark. In 2022, about 25% of full professors in Denmark were women. In the US, 36% of full professors in the 2022–23 academic year were women, according to a survey by CUPA-HR, an association of human resources professionals in higher education. Research has shown that many women are driven out of STEM fields. (See Jennifer Blue, Adrienne Traxler, and Ximena Cid’s 2018 *PT* article, “Gender matters.”) In 2024, about 15% of physics and 17% of astronomy full professors in the US were women, according to the statistical research team at the American Institute of Physics (which publishes *Physics Today*).

Job outcomes

For the latest study, Denmark’s national statistical authority assisted Tartari, Cairo, and their coauthors in matching individuals in the national population registers with academic publishing metrics from Elsevier’s Scopus database and responses from a Danish academic survey conducted in 2017. The anonymized dataset—which Tartari has been working on for more than 10 years—comprises more than 13 000 academics who were enrolled in a PhD program from 1996 to 2017 and had children.

Tartari and colleagues examined, by gender, the academic career trajectories of academics who enrolled in a PhD program and subsequently became parents. Individuals included those who were single and those who were coupled with same- or opposite-sex partners. Then, the researchers took an event-study approach, a common economics modeling method that estimates an event’s impact on subsequent outcomes. For example, the birth of a first child constitutes an event, and a parent’s academic employment and tenure are outcomes.

The researchers found that the careers of men and women progressed similarly until the birth of their first child. Then, the average trajectories diverged. The researchers modeled the trajectories that mothers’ careers would have taken had they not had children. Mothers’ likelihood of being employed in academia eight years after they became parents was 29% lower than the likelihood if they hadn’t had children. The mothers who stayed in academia were 23% less likely to obtain tenure eight years after having their first child than had they not become parents. Mothers who left academia mostly chose work outside of research, according to the Danish registers, and on average took a 12% pay cut.

Fathers, on average, were 14% less likely to have academic employment eight years after the birth of their first child than if they hadn’t had children. Fathers, however, had the same likelihood of receiving tenure than had they not become parents, and they did not experience a drop in earnings.

Fathers’ likelihood of receiving tenure dropped for those who took parental leave compared with those who did not take it. That and similar findings related to taking leave, the researchers write, is “consistent with the idea that time away from research and greater childcare involvement carry substantial career costs, regardless of the caregiver’s gender.”

Dissecting the child penalty

The researchers found that child penalties remained stubbornly entrenched even in the face of interventions. The penalty stayed consistent despite a mother’s access to a retired grandmother or a partner who took parental leave. But one factor that lessened women’s child penalties was their academic employment status when they became parents. If women secured a job in academia before having their first child, the child penalty on tenure decreased.

In the 2017 survey of Danish faculty and doctoral students, mothers and fathers reported different caregiving behaviors. Respondents who were mothers were five times as likely as fathers to be the primary parent for sick care, doctor visits, and nighttime care. For instance, 55% of mothers said that they would take care of a child during the night all or most of the time, compared with 11% of fathers. “We know from a long sociological tradition that parenthood is a moment where gender roles and the specialization in households become more relevant,” says Tartari.

The study’s findings do not capture the breadth of parents’ personal experiences and family structures. Analyzing the career impacts of parenthood for same-sex couples only or single parents only was not possible due to the small sample sizes, Tartari says. She says that she frequently hears from men who say that they are more involved in raising their children than other fathers and that the study’s findings do not resonate with them. But the average effects described in the study are still important, she says, particularly for shaping academic department policy pertaining to tenure and employment.

Petra Moser, an economist at New York University who provided feedback on an early manuscript of the study, says that the research complements a 2025 analysis of more than 80 000 scientists who worked in the US in the mid 1950s. In that work, Moser and Scott Kim, a University of Pennsylvania graduate student at the time, found that the scientific careers of women were significantly more affected by having children than those of men. “Comparing [the Denmark study’s] results with ours suggests that unfortunately not much has changed since the 1950s, or at least not as much as we had hoped,” says Moser.

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