SIDEBAR

## Early Gender Gaps in Mathematics and Teachers' Perceptions

Women are appreciably underrepresented in many high-paying science, technology, engineering, and mathematics (STEM) fields (National Science Foundation [NSF] 2017). Early achievement and self-concepts may matter for STEM career paths. For example, grade 12 mathematics achievement and mathematics self-concepts influence eventual STEM career choices (Eccles and Wang 2016; Mann and DiPrete 2013).

In their examination of Early Childhood Longitudinal Study, Kindergarten (ECLS-K) data from two longitudinal series beginning in 1999 and 2011, Cimpian and colleagues (2016) found that gender gaps in mathematics worsen in early education and that teachers misperceive girls' mathematics ability. ECLS-K data have advantages over other data sources because they use computerized adaptive testing—in which the test questions become progressively easier or harder based on how students are performing on the test. Such testing more accurately discerns student ability at various points on the ability spectrum, particularly the extremes.

Cimpian and colleagues found that, for the 2011 cohort, about equal numbers of boys and girls scored below the 85th percentile in mathematics achievement upon entry into kindergarten. Above the 85th percentile, however, there were fewer girls than boys: girls made up 45% of all those above the 85th percentile and only 33% of those above the 99th percentile. The gender gap worsened and spread further down the distribution with more schooling. By the spring of second grade, the most recent data available to the researchers, male students were favored at all points above the 15th percentile, and female students constituted only 20% of those above the 99th percentile. Examining students with comparable demographic characteristics, learning behaviors, and past mathematics achievement does not remove gender gaps throughout the distribution.

The authors found virtually no significant differences between the 1999 and 2011 cohorts. There were a few percentile points in the upper range of the distribution in which boys were doing better than girls in 2011, but otherwise, there were no differences. This suggests that efforts to improve mathematics education during this time did not lift the relative performance of female students.

This study also asked teachers to give their subjective estimation of every student's proficiencies in various mathematical skills, which were then converted to single scores that were ranked among all students to yield each student's percentile (e.g., student x is at the 90th percentile in mathematical ability). For each student, this subjective percentile was then directly compared with the student's actual percentile. For the 2011 cohort, the study found that teachers' subjective ratings of mathematical proficiency underestimate the proficiency of girls at the higher end of the ability spectrum, above the 75th percentile, by the spring of first grade. Robinson-Cimpian and colleagues (2014) present evidence that teachers' more negative perceptions of girls' proficiency are substantially related to their future performance.