

School Quality & Income Inequality

The Long-Term Effects of Early Childhood Education

by Raj Chetty and John N. Friedman
Harvard University

U.S. public schools vary significantly in quality, partly because most of their funding comes from local property taxes. As a result, spending per student in an overall wealthy state like Connecticut is nearly twice that in a poor state like Mississippi. The question is: Do disparities in school spending perpetuate income inequality by giving higher-income students access to higher-quality schools?

Tennessee's STAR

Although state and local policymakers have been concerned about the apparent differences in school quality across districts for years—and many states have implemented school finance equalization to try to address the concerns—there have not been any estimates of the actual long-run implications of these differences.

In a recent paper, we looked into that question, presenting new evidence on the long-term impacts of early childhood education.¹ We analyzed data from Project STAR—the largest and most widely studied education intervention conducted in the country.²

STAR was an experiment in 79 Tennessee schools from 1985 to 1989. Some 11,500 students and their teachers were randomly assigned to either a small class with an average of 15 students or a regular-sized class with an average of 22 students. In general, students remained in their randomly assigned classes in grades K-3 until the experiment concluded, and all students returned to regular-sized classes in 4th grade.

Previous work has shown that small classes increased students' standardized test scores by about 5 percentile rank points in grades K-3. And students who had better teachers also scored higher on tests in those grades. But the longer-run effects were less impressive:

The benefits from small class attendance fell to 1 to 2 percentile points in grades 4-8, as did the benefits from having a better teacher. This “fade out” effect has made some researchers skeptical about the long-run benefits of early childhood education.

Longer Tracking

We investigated the long-term effects of early childhood class quality by tracking the students in STAR over a 25-year period, until they were around 27 years old. We were able to measure outcomes such as earnings, college attendance, home ownership, and savings for 95 percent of the students in the experiment.

To start, we found that being randomly assigned to a small class improved students' adult outcomes relative to schoolmates who attended normal-sized classes. Small-class students went on to attend college at higher rates and to do better on measures such as retirement savings, marriage rates, and neighborhood quality. Small-class students did not have statistically different earnings levels as of ages 25 to 27, but earnings advantages may emerge over time as their careers develop and they reap the increasing benefits of higher rates of college attendance.

The larger surprise came from our findings that K-3 classroom quality has a big effect on adult outcomes. Classrooms vary in many ways beyond just size. Some have better teachers, some have better peers, and some just have better “classroom chemistry.” While we can't measure each of these classroom attributes directly, we can create a quality proxy using classmates' test scores. This measure captures teacher quality, peer quality, and any other factor that may have affected the quality of a child's classroom experience. Classmates doing well on tests suggests an effective environment (remember,

students were randomly assigned to classrooms, so there were no differences in student abilities across classrooms before the experiment started).

Using this measure, we found strong evidence that being assigned to a higher-quality classroom led to improvements in a broad range of adult outcomes. Even though the effect of better classes on standardized test scores quickly faded in later grades, being assigned to a higher-quality classroom was an important predictor of later earnings. Remarkably, we also found substantial improvements on virtually every other measure of success in adulthood that we examined. Students who were randomly assigned to higher-quality classrooms were eventually more likely to attend college, to own a house, to save for retirement, and to live in a better neighborhood.

Why does class quality improve adult outcomes despite having little effect on test scores in later grades? One possibility is that the effect works not through academic ability but through improved *non-cognitive* skills. We found that students in higher-quality classes not only scored higher on academic tests but also on teacher-rated measures such as class participation, playing well with others, and not disrupting the class. Although the academic gains fade in later grades, the improvements in noncognitive measures persist over time. Perhaps these students earn more in the labor market not because of their mastery of arithmetic or spelling but because they learned to play nicely and share.

Inequality

We now return to the question that motivated our analysis: Do differences in school quality perpetuate income inequality in the





iStockphoto

United States? Because we can link students to parents in our data, we can measure the intergenerational transmission of income directly in the STAR data. Consistent with earlier research, we find that children of richer parents grow up to earn substantially more themselves.³ A \$10,000 increase in parents' incomes is associated with a \$1,100 increase in a child's annual income between 25 and 27. But how much of that effect relates to school quality—that is, how much smaller would the dollar figure be if all children had access to schools of the same quality?

Our results from Project STAR imply that moving from a below-average (25th percentile) to an above-average (75th percentile) class raises earnings by approximately \$750 (5 percent) per year. In the STAR data, we find that parents with \$10,000 more of household income send their children to schools that are 0.7 percentage points higher in school quality by our test score measure.

Under certain strong statistical assumptions, this 0.7 percentage point increase in class quality would lead to a \$33 increase in students' annual earnings *just from kindergarten*.⁴ If class quality in grades 4 to 12 has the same effect as it does in grades K-3, then \$423, or roughly 40 percent of the total correlation between parents' and children's incomes, comes through school quality. That is, if school quality was unrelated to income in the United States, the intergenerational transmission of inequality would *fall by 40 percent*.

The 40 percent calculation should be interpreted with a great deal of caution because there is still much to learn about how education affects students' outcomes in the long run. For instance, we have assumed that school quality in all grades has the same long-run effect as that in kindergarten.

Future work may reveal that the effect of education increases or decreases as children age, and each year's school quality may be a complement or substitute (rather than adding up as we implicitly assumed). Furthermore, our results speak only to the effect of aggregate class quality. Future research may reveal that some aspects of class quality, such as high-performing teachers or peers, are more important than others.

Nevertheless, these results demonstrate that local financing of schools (and disparities in the ability to hire the best teachers or keep classes small) may contribute substantially to the growth of income inequality in the nation. Therefore, tax-policy reforms at the state or especially the federal level that generate more-uniform school quality could help substantially. Consider the benefits if, for instance, the government were to offer tax credits to offset expenditures for primary and secondary schools similar to the Hope Scholarship Credit that offsets spending on higher education. Or what if tax credits were available for investment in local schools similar to the New Markets Tax Credit program, which provides incentives for starting new businesses in underserved areas? Given the tremendous long-term impact of early childhood education, exploring such policies could significantly change the persistence of poverty and inequality in the United States.

Raj Chetty, a professor of economics at Harvard University, is co-director of the Public Economics Group at the National Bureau of Economic Research. **John N. Friedman** is an assistant professor of public policy at the Harvard Kennedy School and faculty research fellow at the National Bureau of Economic Research.

Endnotes

- ¹ Raj Chetty, John N. Friedman, Nathaniel Hilger, Emmanuel Saez, Diane Schanzenbach, and Danny Yagan, "How Does Your Kindergarten Class Affect Your Earnings? Evidence from Project STAR" (NBER working paper no. 16381, 2010).
- ² Other studies have evaluated the long-term outcomes of nonrandomized interventions such as HeadStart or smaller-scale randomized interventions such as those in the Perry or Abecedarian preschools. Their results are broadly consistent with those reported here. See Eliana Garces, Duncan Thomas, and Janet Currie, "Longer-Term Effects of Head Start," *American Economic Review* 92 (2002): 999-1012; James J. Heckman, Seong H. Moon, Rodrigo Pinto, Peter A. Savelyev, and Adam Yavitz, "The Rate of the Return to the High Scope Perry Preschool Program," *Journal of Public Economics* 94 (2010): 114-128.
- ³ See Gary Solon, "Intergenerational Income Mobility in the United States," *American Economic Review* 82 (1992): 393-408; and Frances A. Campbell, Craig T. Ramey, Elizabeth Pungello, Joseph Sparling, and Shari Miller-Johnson, "Early childhood education: Young adult outcomes from the Abecedarian Project," *Applied Developmental Science* 6 (2002): 42-57.
- ⁴ See Raj Chetty and John N. Friedman, "Does Local Tax Financing of Public Schools Perpetuate Inequality?" (National Tax Association proceedings, forthcoming).

► This Communities & Banking article is copyrighted by the Federal Reserve Bank of Boston. The views expressed are not necessarily those of the Bank or the Federal Reserve System. Copies of articles may be downloaded without cost at www.bos.frb.org/commdev/c&b/index.htm.