COMMENTS ON "YOUR CHILD LEFT BEHIND"

"Your Child Left Behind" (*The Atlantic*, December, 2010) describes an analysis by Eric Hanushek that ranked states in comparison with the countries participating in PISA based on the percentage of high scorers on mathematics tests. Hanushek used the 2006 PISA data to rank countries. Since PISA reports only national data, however, he used the 2005 NAEP data to estimate the percentage of students in each state who would have been high scorers on PISA. He then drew on these estimates to rank states in comparison with countries.

My comments pertain to both the *Atlantic* article and the research report on which it is based. They focus on three main issues: factors that might influence the accuracy of the estimates; the rationale for conducting the study; and the interpretation of the results.

The accuracy of Hanushek's estimates depends on the consistency of sampling across states. Although NAEP has standard sampling guidelines, the fact is that states vary in their decisions about which schools and students will actually participate. It is unclear how these differences affect state rankings. It is also unclear whether the domains tested for PISA and NAEP are similar and, where they are not, how the variation has a differential impact on different states.

The validity of Hanushek's estimates is also affected by the fact that different student cohorts participated in PISA and NAEP. Hanushek claims that the same cohort of students took the NAEP test in eighth grade and the PISA test in ninth, and, therefore, are representative of the same population of students. His claim, however, is based on the assumption that most U.S. 15-year olds, the age at which students take PISA, are in ninth grade, when in fact the large majority of U. S. students who took PISA were in either tenth or eleventh. (Data from the 2006 PISA report show that only 11 percent of the U. S. students were in ninth grade, 2 percent were in seventh or eighth, 71 percent were in tenth and 17 percent were in eleventh.)

Even assuming the validity of Hanushek's methodology, the value of conducting this convoluted study is questionable. The 2009 PISA, the most recent comparison, was released the same month the *Atlantic* reported on Hanushek's analysis of 2006 data. Ranking states against countries does not provide information about the key variables that contribute to the results: for example, poverty rates; social and educational inequalities; the distribution of highly qualified teachers across affluent and low-income communities; sampling artifacts; the proportions of low-income, special education, and language minority students who are excluded from the test; the allocation of classroom time across different subjects; the time spent in test-preparation courses outside regular schools; and student selection and tracking practices. We have only limited information about how these variables affect the results in each country. What is clear, however, is that adding yet another ranking will not strengthen either our understanding of problem areas or the best policies to address them.

But my main concern is the misleading interpretations of the rankings, both by Hanushek and in current rhetoric more generally.

First, Hanushek argues that the test-score rankings are linked to a country's economic competitiveness. Yet the data for industrialized countries consistently show this assumption to be unwarranted. For example, the 2010 comparison of economic competitiveness by the World Economic Forum ranks the United States second only to Switzerland and above every other OECD country, including the countries scoring highest on PISA mathematics tests. The 2010 comparison of economic competitiveness by the Swiss business school, International Business School for Management Development, ranks the United States third, exceeded only by Singapore and Hong Kong. The fact is the test-score rankings of industrialized countries (all of which educate a large proportion of their population) are not good predictors of economic competitiveness. The reason is that other variables, such as financial incentives for outsourcing to gain access to lower-wage employees (both professional and non-professional), the climate and incentives for innovation, tax rates, the extent of government subsidies and partnerships, intellectual property enforcement, and natural resources, all overwhelm mathematics test scores in predicting economic competitiveness.

Even if we focus, however, only on the education system, clearly mathematics test scores are a narrow measure of the long-term benefits and disadvantages of different education policies. When Hanushek infers from mathematics test scores that "schools are failing to teach students effectively" he ignores the broad range of goals and practices that ultimately determine the effectiveness of any education system.

Second—and closely related to the economic competitiveness argument—is the claim that U. S. students' performance on mathematics tests is leading to shortages of scientists, engineers, and mathematicians. The data, however, give a very different picture; there is clear evidence that the United States has both a large pool of students with the academic background to enter science and engineering programs and an ample supply (and sometimes oversupply) of trained personnel to meet the labor market demand (see, for example, reports by the Bureau of Labor Statistics, RAND, and the Urban Institute). Although some slippage occurs between the number of graduates in science and engineering and the proportion who choose to work in these fields, that is often because some graduates choose, for example, finance or investment banking where monetary rewards are greater. Moreover, when companies claim they need to hire from other countries because they cannot find qualified Americans to fill science and engineering positions, it is more likely that they cannot find Americans at the wages they would prefer to pay and find it cheaper to outsource. This is not the fault of our international test-score rankings!

Although the overall supply of scientists and engineers is adequate, what is clear is that participation in these fields is unequally distributed across our society, with low-income populations and regions substantially underrepresented. This gap is a reflection of the gap found in educational opportunities and in the society more generally. It will not be closed by continuing rhetoric about shortages of scientists and engineers.

Third, Hanushek argues that mathematics skills are more likely to lead to higher-paying fields than are other skills learned in high school; for that reason, he has focused on mathematics rankings rather than giving equal weight to science and reading tests on which U. S. students score higher. Bureau of Labor Statistics data do show that the 10 highest-paying college majors in 2009, as measured by starting salary and salary 10 years after graduation, were in science and engineering fields—fields that require mathematics courses (although it is unclear why Hanushek considers science skills less important than mathematics as predictors of success in science and engineering). When all occupations were considered, seven of the top 20 highest-paying occupations were in science and engineering fields.

Clearly, many science and engineering fields are providing good job opportunities, but there is no evidence of shortages or of a potentially strong job market if applications to these fields were to increase significantly. Of the 20 *fastest-growing* occupations, for example, only five are in science and engineering fields (and 11 do not require a college degree). More important, of the 20 occupations expected to provide the largest *numerical* growth in jobs, only one (computer software engineer) is in science and engineering (and 15 of the 20 do not require a college degree). When only occupations that require a college degree or above are considered, 10 of the top 20 fastest-growing occupations are in science and engineering, but only five of the 20 occupations expected to provide the largest numerical growth in jobs are in science and engineering (all in computer fields).

Simplistic generalizations about shortages of scientists and engineers are also inconsistent with Bureau of Labor Statistics projections that show large variations in job opportunities among science and engineering fields. A few examples: employment in biomedical, civil, and environmental engineering is expected to grow much faster than the average for all occupations, while growth in electrical, mechanical, and marine engineering is expected to be slow. In the computer engineering field, excellent opportunities are projected for computer software engineers, while employment opportunities for computer programmers are expected to decline. Biological science, driven by

biotechnology, is expected to grow faster than average; job markets will be more difficult for new entrants into chemical and materials science fields because of declining chemical manufacturing industries. Although mathematics and physics are expected to have faster than average growth, the employment opportunities in mathematics, and in physics for those who seek basic research positions, are quite small. Young people who act on the generalized proclamations about shortages of scientists and engineers could easily be led into fields where they would find a difficult job market.

Finally, Hanushek argues that education expenditures are unrelated to school achievement as demonstrated by the fact that the United States is among the highest-spending countries internationally. It is not useful, however, to base conclusions on comparisons of total spending because the comparisons give no information about how each country chooses to allocate its resources for education and how these choices might influence student achievement. If, for example, we compare teacher salaries rather than total expenditures, the United States is no longer among the top countries. Further, when the measure is ratio of teacher salary to GDP per capita, the United States is in the lower fourth of the distribution—an indication that teacher salaries are less competitive with other occupations in the United States than in most other OECD countries. (The comparisons are based on OECD data for experienced primary education teachers.)

Rather than simply concluding that money doesn't matter, it might be more useful to analyze the reasons for the apparent differences in spending patterns to determine whether they are artifacts of the way the comparisons are conducted, or "real" differences. We would then have the basic information to assess the educational implications of a country's choices about resource allocation. In the case of teacher salaries, for example, the first step would be to determine why several of the countries with higher teacher salaries than the United States have considerably lower per-pupil expenditures—a finding that is counterintuitive since salaries account for a large proportion of educational expenditures. Are the inconsistencies a reflection of differences in accounting procedures? Does the United States budget expenditures in schools for social

services, health services, and sports as school expenditures while in other countries they are budgeted separately? Are countries consistent in accounting for capital expenditures? Does the United States spend more on transportation and security? Do the comparisons reflect greater efficiencies in some countries than in others? Or fewer services--for example, less attention to low-income students, or students with disabilities, or language-minority students? Or more focus on elite schools? Are average per-pupil expenditures particularly misleading in the United States, which has high inequalities in school finance? Hanushek's overly-generalized conclusion that money doesn't matter ignores these issues.

Why does rhetoric about global competitiveness, shortages of scientists and engineers, and educational spending matter? It matters because it detracts attention from our most important problems and leads to public policies that are unlikely to address those problems. In his State of the Union address, President Obama described his goals for strengthening science and mathematics education, reducing high school drop-out rates, and increasing the number of students graduating from four-year colleges. He did not mention, however, that problems in these areas are disproportionately concentrated in high-poverty communities and are part of a much broader set of problems faced by these communities. One fifth of our children live in poverty, and we have one of the largest gaps between rich and poor in the industrialized world. It is the low-income populations who are underrepresented among high school and college graduates, in science and mathematics, and in professions generally—and it is these populations who are at the most severe disadvantage in competing in the global economy. Researchers have a responsibility to help clarify these issues.

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