



Can Economics Help to Save Our Schools?

When asked about their national priorities, Americans consistently put education at the top of the list. According to one recent survey, 55 percent of Americans ranked education as the most important issue facing our nation today—even more important than health care, jobs, Social Security, and terrorism. Moreover, we recognize that our educational system is going to require some tough financial decisions on our part: More than half of those polled said education should be spared from state budget cuts, even if that means increasing taxes.¹

What makes education a top public policy priority right now is our large and growing concern that our schools are failing us. We fear our kids are not getting the quality or equality of education that, as one of the world's richest nations, we should be able to provide. In some of our country's largest school districts, we are graduating barely half of our students. According to an ACT report, only 22 percent of the 1.2 million students who took the ACT test in 2003–04 were adequately prepared for college-level courses in English, math, and science. Business leaders see the results every day when their employees lack the basic skills they need to do their jobs: Nobel laureate James Heckman and coauthor Dimitriy Masterov estimate that more than 20 percent of the U.S. workforce is functionally illiterate and lacks an understanding of basic mathematical concepts—a much higher fraction than in some European countries, such as Germany and Sweden.²

Why is the Federal Reserve Bank of Cleveland interested in education? First, as an institution engaged in economic policy, we seek to promote conditions that foster the greatest potential for long-term economic growth. Education has a very real, measurable impact on individuals, on our workforce, and on our national economy. Countries with better-educated citizens generally enjoy higher standards of living than less-educated nations.

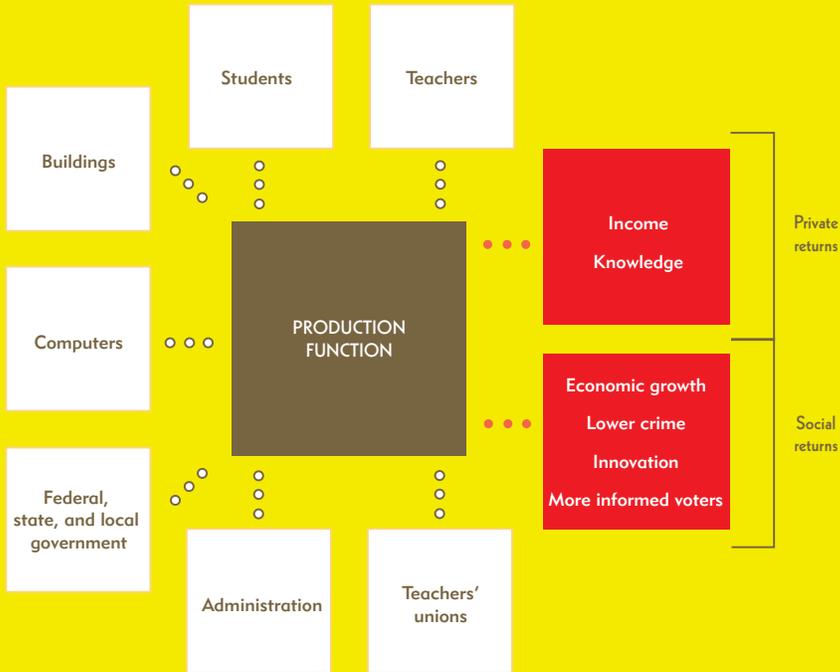
Second, because we employ economic analysis in our policy responsibilities, it seems natural to extend this analysis to the study of education. We believe that an “economic” approach to this volatile public policy debate will shed light on aspects that have been forgotten or ignored. Educators, taxpayers, families, and civic leaders all want better results, but better results seem hard to achieve. Economists teach us to pay attention to the incentives that individuals and institutions face as they make everyday decisions. Good public policies create incentives that will prompt us to use our resources in ways that will yield the highest possible social returns to education spending—given the monetary and other constraints we confront. By highlighting the differences between how we are *actually* using our resources and how they could *otherwise* be used, we believe the economic approach provides insights into possible solutions.

Surprisingly, it is useful to think about “producing” education in the same way we think about producing any other good or service, even though monetary profit is not the bottom line in public education (see “The Production of Education,” below). For some time, economists have studied the organization of industries—that is, how market forces guide the allocation of limited resources and when government intervention can improve the welfare of society.³ Analyzing education with economic tools can help us to define the best and most efficient way to combine inputs—such as teachers, students, classrooms, computers, or books—to produce better educational outcomes and channel scarce resources to their highest-valued use. It can help us see when more money might make a difference, and when changing public policy might yield the desired results. The fact is, a large body of economic research already suggests that there are ways to improve the social rate of return on our education investments.

The Production of Education

Economists use a “production function” to describe how raw materials and other inputs such as labor and services are transformed into the goods and services we consume. The production function, often referred to as a “black box,” tells us how best to combine them to produce output—in the education production function, this may occur through school administration. For education, the inputs include classrooms, teachers, computers, students, parents, maintenance staff, and so on. These inputs can be combined in different ways to produce an output—in this case, knowledge.

Some methods of combining inputs produce better outputs than others. For instance, if another producer is using the same inputs but producing more output at a lower cost, we’ll want to find out what’s inside their black box! Over time, businesses that adapt to new technologies or follow best practices in combining inputs will be the ones that succeed.



Measuring the Output of Education

Often, we sit up and take notice of our schools when the headlines tell us they are failing, when our school district falls behind our neighbor's in a particular test score, or when our city, state, or country ranks below others on some education measure.

Though it is difficult to measure knowledge—the output of education—standardized tests provide one way for us to compare the outputs of our national or local educational system to those of others. One such measure often used to direct education policy is the Trends in International Mathematics and Science Study (TIMSS), which compares the math and science achievement of fourth- and eighth-grade students in the United States with that of students in 45 countries. Another commonly cited comparison comes from the Program for International Student Assessment (PISA), which tests 15-year-olds in at least 58 countries not only on their mastery of reading, math, science, and problem solving, but also their ability to actually use these skills in real life. Though the United States' performance in the 2003 TIMSS study was respectable, if not impressive, we ranked below average in the PISA study⁴ (see figures 1–3).

Figure 1: Average TIMSS Scores of Fourth-Grade Students

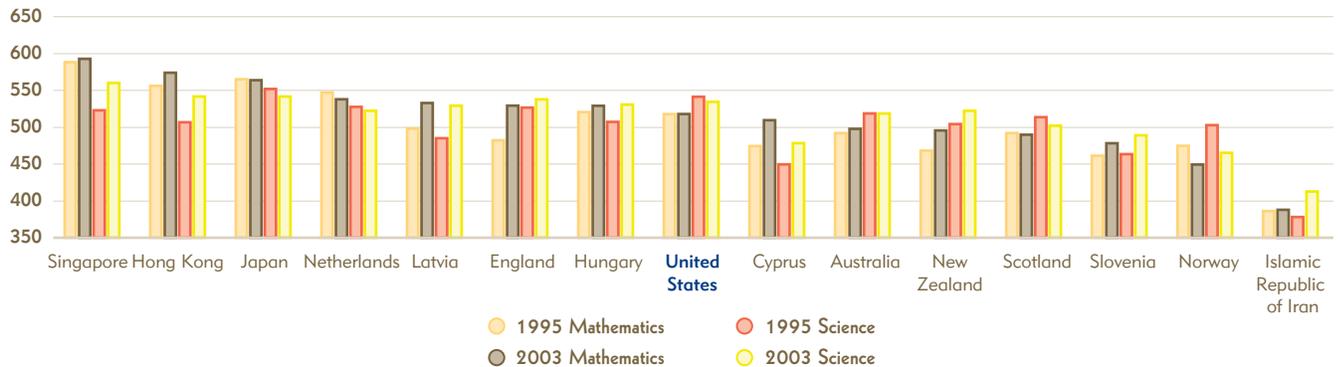
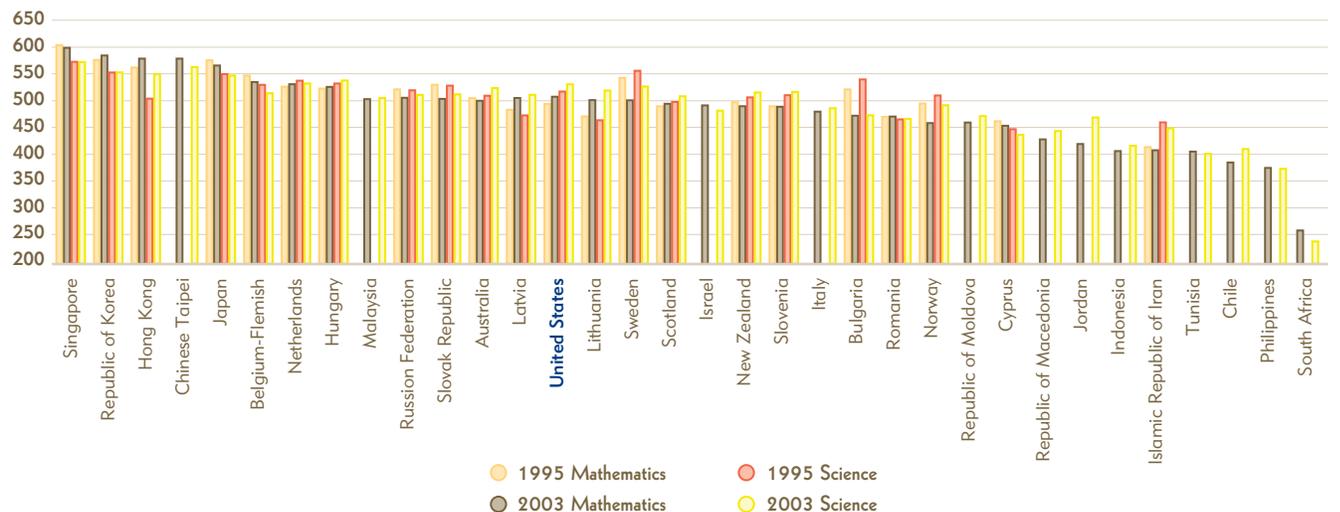
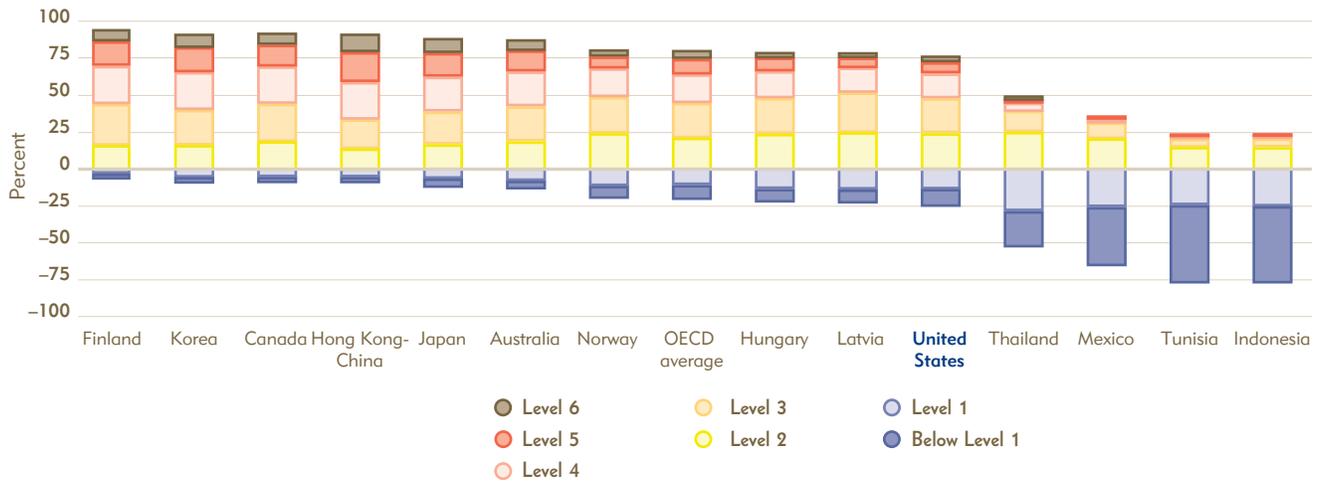


Figure 2: Average TIMSS Scores of Eighth-Grade Students



Note: Countries are ranked in descending order based on the 2003 average math score. In Figure 2, data not available for some countries in 1995.
Source: International Association for the Evaluation of Educational Achievement, Trends in International Mathematics and Science Study, 1995 and 2003.

Figure 3: Levels of Proficiency in Mathematics

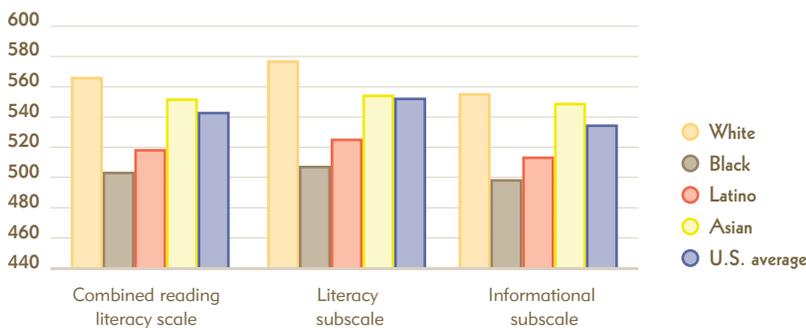


Note: Countries are ranked in descending order based on the percentage of 15-year-olds in levels 2, 3, 4, 5, and 6.
 Source: Organisation for Economic Co-operation and Development, Program for International Student Assessment, 2003 database.

Far more troubling than our international performance, however, are the large and striking disparities in the quality and equality of education *within* the United States. For instance, the Progress in International Reading Literacy Study, which measures literacy and reading comprehension among young students, found in 2001 that African American and Latino students scored well below white and Asian students⁵ (see figure 4).

Graduation rates provide another indicator of differential educational progress within the United States. A new report from the Manhattan Institute for Policy Research shows that graduation rates for white and African American students vary tremendously by state. Nationally, the class of 2002 graduated 71 percent of students—78 percent of white students, but only 56 percent of African American students.⁶ New Jersey had the highest overall rate, at 89 percent, while South Carolina came in with the lowest rate, 53 percent. For states where minority graduation rates were available, the study reports a range of 42 percent to 70 percent for African American students. Here in the Fourth Federal Reserve

Figure 4: U.S. Fourth Grade Literacy and Reading Scores, 2001



Source: International Association for the Evolution of Educational Achievement, Progress in International Reading Literacy Study.

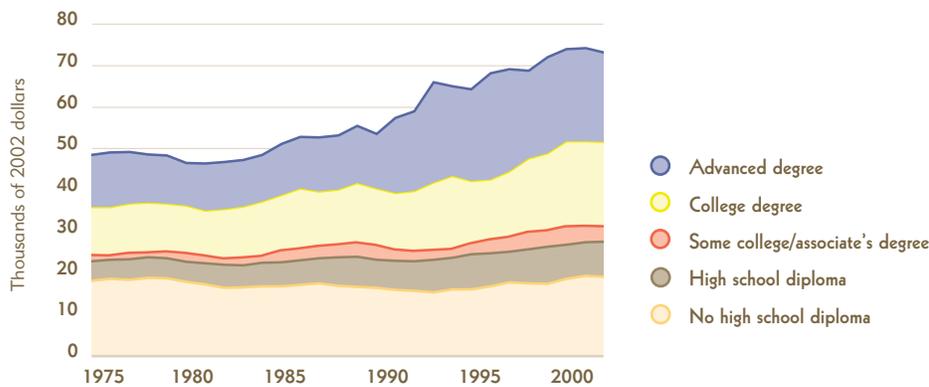
District, overall graduation rates for Ohio, Pennsylvania, West Virginia, and Kentucky ranged from 68 percent to 78 percent, and rates for African American students ranged from 55 percent to 67 percent.

Disparities also exist across cities. For example, among the 50 largest school districts in the United States, the Manhattan Institute study calculated that in 1998, the graduation rate of the best-performing district (nearly 90 percent) exceeded that of the worst-performing district (about 30 percent) by nearly three times.⁷

One of the many reasons these statistics are troubling is that individuals with no high school education have been falling farther and farther behind in terms of wages and income. Without the necessary educational foundation and skill sets, these individuals will have a much harder time finding jobs and will certainly earn much lower pay. We also know that parents' education and income have a significant effect on their children's educational attainment. Taken together, these facts create a situation in which some Americans are stuck in a low-education, low-income environment for generations (see figure 5).

Nationwide, our very best school districts are excelling and performing comparatively well—but our worst-performing districts are striking in their distance from the top. This suggests that in order to improve our overall graduation rates and test scores, much of the increase will have to come from the bottom of the distribution. How can we best increase educational attainment, especially among the poor? To find out, we examine the production of education to help us see the problem in a new light.

Figure 5: Real Average Annual Earnings by Educational Attainment



Source: U.S. Department of Commerce, Bureau of the Census.

The Production of Education

The production of education is like the production of any other good or service, such as a car or a financial service. We take raw inputs and combine them with buildings and machines and human effort to produce outputs. Some businesses combine the inputs in a more efficient way, producing output at a lower cost—and generating higher profits. When we view education as a business, then, we also must consider the efficiency of our production process and the rate of return on our investments.

One other factor that must be considered is the difference between the public and private returns to education. Individuals derive what economists refer to as “private returns to schooling”—in other words, gains that directly benefit the person receiving the education. These gains come in many forms. First, a strong positive correlation has been established between education and income. Second, there is a strong negative correlation between education and the probability of unemployment. Finally, those with more education are better able to adapt to changing technologies. Individuals or families face strong incentives to invest in their own and their children’s education because they stand to reap large benefits from doing so.

On a broader scale, the general public also receives “social returns to schooling”—that is, the gains society derives from education above and beyond the private returns to individuals. First, educated people produce ideas and contribute to innovation, a key driver of economic growth. Economists such as Claudia Goldin of Harvard University, for instance, believe the introduction of mass secondary education during the early twentieth century helped to push the United States to the forefront of economic growth by 1940.⁸ Furthermore, educating citizens produces more informed voters and improves public policy outcomes in areas such as public health and transportation. Higher education levels have also been linked to lower crime rates, in turn leading to lower spending on law enforcement and safer city streets.

It is no wonder, then, that every town, state, and nation seeks ways to increase the educational attainment of its citizens. The social returns on our investments in education are significant—in other words, the education of one person benefits all of us. As we will explore in this section, these social returns provide a role for governments to subsidize or mandate higher levels of education. Otherwise, we will individually spend less on education than we collectively should. Governments are uniquely positioned to ensure a socially optimal level of education through tax and spending programs.

How should governments use their fiscal and regulatory policies to promote the best use of resources, thus producing an optimal level of education? A half-century ago, Milton Friedman explained why it makes sense for government to finance general-purpose public education. But he also warned that when the government has a monopoly in the actual provision of education, public schools may not have incentives to operate as efficiently as possible because they face no competition. Again, we can understand this by looking to the business world. Businesses must continually respond to their customers' demands and change their strategies and practices when necessary. This is the nature of the competitive market. Firms that learn how to produce more output at a lower cost will garner a larger market share and drive other companies out of business. The firms that survive learn to combine their scarce resources most efficiently to produce the output customers demand.

Our education system, however, is not structured in such a competitive framework and differs from the marketplace in several ways. First, public schools do not have shareholders, and their goal is not to maximize profits. Instead, school districts use the funds available to them—usually from tax receipts—to provide education to the general public. Second, families' choice of public schools is dictated by their residence; therefore, families who want their children to attend a different public school must move to another location. For many of us, the decision about where to live is determined by the quality of the schools. True, we can exercise choice by voting for or against school board members and tax levies. Schools, however, do not worry about going out of business in the way that private firms do. Therefore, they may not have incentives to operate as efficiently or effectively as possible.

Given these economic realities and the history of U.S. public education policies, we outline two areas where taking an economic approach to education, such as we have described here, could improve educational outcomes, and each illustrates a different facet of this approach. The first example concerns the selection and compensation of teachers, and it demonstrates the difficulty school districts face in using their inputs efficiently, even if there is no difference between the private and social returns to education. We show that it may be possible to improve educational output without increasing resources.

The second example draws on research showing the large social returns to be gained from investment in early childhood education. In this case, we see that even if all of our education resources deliver consistent and appropriate private returns, additional gains may be "left on the table." Private decisions do not necessarily produce the highest returns for society as a whole, and so they may cause us to under- or overproduce.

Private Efficiency: The Case of Teacher Selection and Compensation

Between 1970 and 2000, the United States more than doubled the amount of (inflation-adjusted) money spent on each student in our primary and secondary schools, yet student achievement did not change much during this period, and in fact even declined in science. This suggests that spending more money is not necessarily the answer to our education problems. Indeed, Eric Hanushek, an economist at Stanford University's Hoover Institution, argues there is little measurable benefit from increasing expenditures.⁹ Over the last 40 years or so, increased spending per pupil has largely been devoted to reducing class sizes—from 26 in 1960 to about 17 today—and providing more formal education for teachers—more than doubling the share of teachers with master's degrees. Rather than simply increasing the *quantity* of expenditures, Hanushek and others argue, it is necessary to give school districts incentives to improve the *quality* of the inputs to the education production process.

For instance, there is a growing body of literature on economics and education suggesting that school systems could significantly improve student outcomes by hiring better teachers and compensating them for results. Although this sounds intuitive and straightforward, school districts have a hard time implementing this practice. Most school boards, in conjunction with teachers' unions, implicitly define teacher quality as a function of the teacher's tenure and education, and pay them for more of each. Ideally teachers would be paid for the value and knowledge they impart to their students, but this has traditionally been difficult to measure because there are so many factors that influence students' learning.

Researchers such as Daniel Aronson of the Federal Reserve Bank of Chicago, though, are now able to take advantage of new data that give us the ability to link student achievement scores directly to specific teachers using administrative school records.¹⁰ This has allowed us to confirm that some teachers do, in fact, consistently deliver more value—in the form of their students' achievement gains—than others. However, Aronson finds, neither a teacher's tenure nor postgraduate education is a reliable predictor of his or her "quality." Therefore, school districts may benefit from redefining teacher quality, as Eric Hanushek argues:

*I use a simple definition of teacher quality: good teachers are ones who get large gains in student achievement for their classes; bad teachers are just the opposite. Looking at the range of quality for teachers within a single large urban district, teachers near the top of the quality distribution can get an entire year's worth of additional learning out of their students compared to those near the bottom. That is, a good teacher will get a gain of one and a half grade-level equivalents, whereas a bad teacher will get a gain of only half a year for a single academic year.*¹¹

These findings suggest that school districts could improve the overall quality of the education they deliver by retaining teachers for the long term only when they have enough data to evaluate their ability to improve student achievement. By the same reasoning, schools could use variable compensation—“pay for performance”—to link teacher performance with student achievement more directly. It would not be surprising if school districts found taxpayers willing to pay higher taxes to increase teacher salaries if they could see a direct link between pay and performance.

Social Efficiency: The Case for Public Investment in Early Childhood Education

Government also has a stake in the education process when individuals do not take into account the greater benefits to society when they make private decisions. One area that seems to promise large social returns, in addition to the private returns to individuals, is early childhood education.

Here we return to our business analogy. Before purchasing new equipment or hiring new employees, a business calculates the return on its investment: How much will the investment cost? How long will the investment generate returns? Are there other investments that may produce even greater returns? When private companies make these kinds of decisions, they account only for the costs and benefits that directly affect them. But often an investment comes with costs and benefits that affect others—economists call these effects “externalities,” and they may be positive or negative.

Should Teachers Get Paid for Performance?

As parents, school boards, and policymakers focus more on educational outcomes, some school districts are experimenting with alternative pay programs to boost teacher quality and to channel good teachers into low-performing schools. In fact, more than half the states have passed legislation requiring that at least a portion of teachers’ pay be based on performance.

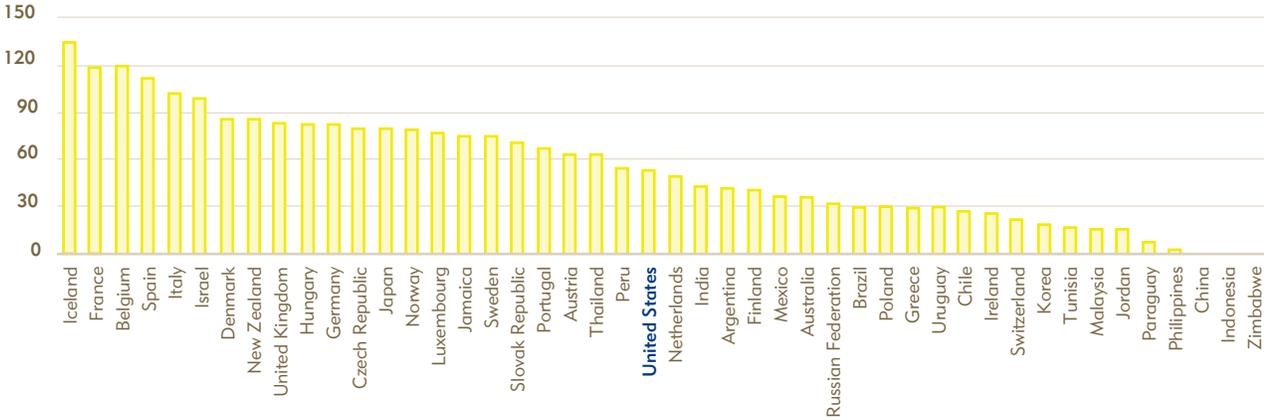
This approach seems to be succeeding in the Denver Public Schools, where the local school board and teachers’ union came together to launch a pay-for-performance pilot program that rewards teachers for improving student achievement, receiving high performance evaluations, working in low-performing schools, and furthering their own education. If the new system is implemented, teachers will exchange guaranteed annual increases based on years of experience—the hallmark of the traditional teacher pay system—for raises that are tied to performance, giving them a chance to earn higher salaries early in their careers.¹² The key to the program’s success seems to be the collaboration between the school board and the teachers’ union—similar pilots in cities like Cincinnati failed because they lacked union support.

Other programs focus on channeling teaching resources to the most academically needy schools. Often, poor and minority students in underperforming schools are assigned the least experienced teachers, according to a 2004 report from the Teaching Commission.¹³ In the Hamilton County, Tennessee, school district, which includes Chattanooga, administrators experimented with giving bonuses to high-performing teachers for working in low-performing schools and to faculties for schoolwide progress on test scores or other measures. Although the school board reported increases of 10–12 percent in reading and math scores since the new teachers arrived, the program’s funding may be gone after the 2004–05 school year.¹⁴

Positive externalities exist for education. For instance, when one person makes a private decision to continue his or her education—or a parent or the state makes that decision for a child—that decision has spillover effects to society as a whole. Economists studying early childhood education have found that investments in preschool programs for children aged three to four can generate social returns—that is, positive externalities—that may be even greater than the private returns. Clive Belfield of the City University of New York shows that in some preschool programs, the excess social return is as much as 8 percent annually, and even larger returns may be possible for children from severely disadvantaged households. The benefits of preschool education seem to come not so much from improved cognitive skills such as reading or math, but more often from improved social and emotional development, which, in the long run, have been shown to reduce spending on criminal justice and welfare programs.¹⁵

Here it may be helpful to illustrate the large returns to be gained from educating young children before they enter kindergarten. Belfield analyzes the impact of a proposal to double the number of children in Ohio receiving two years of publicly provided prekindergarten education, from 28 percent to 57 percent. Belfield calculates that providing this two-year education to about 42,000 additional children would cost approximately \$480 million—just under \$6,000 per pupil—but the investment would yield roughly \$780 million in cost savings. In other words, the state would get back \$1.60 for every dollar it invested. The returns show up in the form of reduced adult crime, greater tax revenue

Figure 6: Preschool Enrollment Rates



*Note: The rate represents students aged four and under as a percentage of all children aged three to four.
Source: Organisation for Economic Co-operation and Development, Education at a Glance 2.*

from higher earnings (because the children are more likely to attain higher educational levels), and, most important for the state's education budget, reduced future spending on special education, grade repetition, school security, and so on. The benefits of preschool education accumulate throughout the children's primary and secondary education.

Today, the United States actually lags many other developed countries in the share of children under age four who are enrolled in preschool (see figure 6). But more to the point, there is a strong, positive correlation between the enrollment of children under four in prekindergarten programs and increases in TIMSS scores. Prekindergarten education, then, seems a likely place to channel resources and a tremendous opportunity for improvement—it is hard to argue against a return on investment of nearly 60 percent.

An obvious question that arises is how to implement an early childhood program. Should it be universal or targeted? Although the returns are much higher when at-risk children are targeted, it is not always clear how well we are hitting the targets. A universal program has lower returns, and therefore public policy might find other endeavors with equal or higher returns. It is beyond the scope of this essay to answer such questions, but this is the kind of issue that needs to be addressed as we work to improve our educational outcomes.

If our nation is to improve its primary and secondary education systems, school administrators, families, teachers, and taxpayers will have to find better ways of doing business together. The challenges confronting us are large—but not as great as the cost of failure.

Some say we should be spending more on our education system, while others contend we are spending enough but need to allocate those resources more efficiently. Which argument is right? Both, in fact. It is likely that changing our allocation of resources—for instance, the way we compensate teachers—will have a payoff; it is also likely that devoting more resources to specific areas, such as early childhood education, will bring payoffs as well. As these two examples indicate, simple arguments that focus only on how much we are spending miss the point. Policy decisions must also consider the incentives for participants to use their resources most efficiently and whether the public could obtain greater returns on its tax dollars by putting them to use elsewhere.

Conclusion

For many of us, the subject of public education is emotionally charged and personally felt—after all, what is more important to us than our children? To those outside the economics profession, it may seem foreign to think about education in terms of efficiency and returns on investments. We know it will take time and money to achieve better educational outcomes. But progress also requires a willingness to think in new ways about our educational goals and the trade-offs that may be necessary to achieve them.

We have learned that the quality of our teachers is a key input to the production of education—but it is up to parents, school boards, community groups, and business leaders to find new ways of improving teacher quality. We have already begun to see innovation in this area in school districts that are experimenting with incentive-based pay systems that aim to promote excellence.

We have also learned that investments in prekindergarten education can have a tremendous impact on student achievement. Today, more than 40 states have invested in early childhood education programs, and states such as Ohio have more than tripled their expenditures in this category over the past decade. The growth of preschool programs is likely to return very large financial and social rewards.

Our public school systems are headed for a change. The real question facing states and local school districts is not whether they will change, but whether they can muster the political will to do so sooner rather than later, and in ways that make the best use of public resources that are already stretched to the limit. The rewards for schools that do will be significant and the losses for schools that do not—both for their students and their economies—are likely to be devastating.

Notes

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3. See Milton Friedman, “The Role of Government in Education,” in *Economics and the Public Interest*, ed. Robert A. Solo (New Brunswick, NJ: Rutgers University Press, 1955).
4. International Association for the Evolution of Educational Achievement, Trends in International Mathematics and Science Study, 1995, 2003; and Organisation for Economic Co-operation and Development, “Education at a Glance 2004,” and “First Results from PISA 2003.”
5. International Association for the Evolution of Educational Achievement, Progress in International Reading Literacy Study, 2001.
6. Jay P. Greene and Marcus A. Winters, “Public High School Graduation and College-Readiness Rates: 1991–2002,” Manhattan Institute for Policy Research, Education Working Paper No. 8, February 2005.
7. See Jay P. Greene, “High School Graduation Rates in the United States,” Manhattan Institute for Policy Research, April 2002 (revised), table 6.
8. See Claudia Goldin, “A Brief History of Education in the United States,” National Bureau of Economic Research, Working Paper No. 119, 1999, and “The Human Capital Century and American Leadership,” National Bureau of Economic Research, Working Paper No. 8239, 2001; and Claudia Golden and Lawrence F. Katz, “Why the United States Led in Education: Lessons from Secondary School Expansion, 1920 to 1940,” National Bureau of Economic Research, Working Paper No. 6144, 1997.
9. Eric Hanushek, “The Economic Value of Improving Local Schools,” Paper presented at the Federal Reserve Bank of Cleveland, Conference on Education and Economic Development, November 18–19, 2004.
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