U.S. Elementary and Secondary Schools: Equalizing Opportunity or Replicating the Status Quo?

Cecilia Elena Rouse and Lisa Barrow

Summary

Although education pays off handsomely in the United States, children from low-income families attain less education than children from more advantaged families. In this article, Cecilia Elena Rouse and Lisa Barrow investigate why family background is so strongly linked to education.

The authors show that family socioeconomic status affects such educational outcomes as test scores, grade retention, and high school graduation, and that educational attainment strongly affects adult earnings. They then go on to ask why children from more advantaged families get more or better schooling than those from less advantaged families. For low-income students, greater psychological costs, the cost of forgone income (continuing in school instead of getting a job), and borrowing costs all help to explain why these students attain less education than more privileged children. And these income-related differences in costs may themselves be driven by differences in access to quality schools. As a result, U.S. public schools tend to reinforce the transmission of low socioeconomic status from parents to children.

Policy interventions aimed at improving school quality for children from disadvantaged families thus have the potential to increase social mobility. Despite the considerable political attention paid to increasing school accountability, as in the No Child Left Behind Act, along with charter schools and vouchers to help the children of poor families attend private school, to date the best evidence suggests that such programs will improve student achievement only modestly.

Based on the best research evidence, smaller class sizes seem to be one promising avenue for improving school quality for disadvantaged students. High teacher quality is also likely to be important. However, advantaged families, by spending more money on education outside school, can and will partly undo policy attempts to equalize school quality for poor and nonpoor children.

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In 1967 Martin Luther King Jr. wrote, "The job of the school is to teach so well that family background is no longer an issue." As King's remark suggests, Americans have long had high expectations for their educational system. One reason they demand so much from their schools is that education is closely linked both to income and to occupation. Better educated individuals earn more and work in more prestigious occupations. Indeed, because education affects both income and occupation, it is traditionally thought to be important in determining an adult's socioeconomic status.

Figure 1 shows the relationship between years of completed schooling and annual earnings, using data from the March 2003 and 2004 Current Population Survey (CPS). On average, high school graduates with twelve years of schooling earn nearly $26,000 a year, as against about $19,000 for high school dropouts with only eleven years of schooling. Completing a high school degree is also a prerequisite for college admission, and the value of a college degree, particularly a four-year college degree, has increased sharply over the past twenty-five years. In 1979, adults with a bachelor's degree or higher earned roughly 75 percent more each year than high school graduates. By 2003, their yearly earnings were more than double (2.3 times) those of high school graduates.[1]

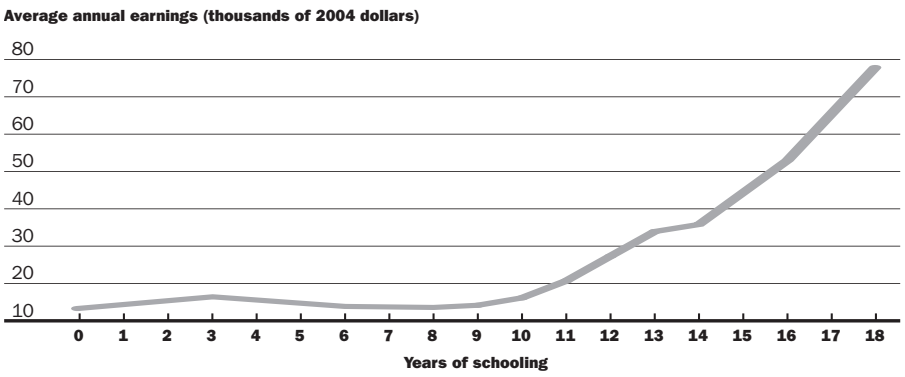
Even if an individual does not intend to go on to college, a high school diploma is a minimum education requirement for many jobs. Although direct information on occupational requirements is not available, high school graduates in the 2004 CPS Outgoing Rotation Group data are more likely than high school dropouts to work in the highest-wage occupation groups—management, architecture and engineering, computers, and the law. For example, 7.1 percent of adults aged twenty-five to sixty-five who have completed high school, but no college, work in one of those occupation groups, as against only 2.6 percent of adults who dropped out of high school. Conversely, 26 percent of high school dropouts work in the lowest-average-wage occupational groups—food preparation and service; farming, fishing, and forestry; and building and grounds cleaning and maintenance—compared with 11.5 percent of high school graduates.[2]

Education is thus an important driver of upward mobility in the United States. But as we document below, America's schools fail to fulfill King's vision. A U.S. child's educational attainment is strongly linked to his or her family background, and children of parents of low socioeconomic status are likely as adults to have the same socioeconomic status as their parents. In this article we investigate why family background is so important in determining a child's educational attainment, as well as how the nation's K–12 educational system perpetuates this pattern.

How Family Background Affects Educational Attainment

Theoretically if everyone, rich or poor, faces the same cost and reaps the same benefit from additional schooling, educational attainment should not differ by family background. In the real world, however, years of schooling completed, and educational achievement more generally, vary widely by family background. To illustrate we turn to data from the National Education Longitudinal Study (NELS) of 1988, which followed more than 20,000 eighth graders from 1988 through 1994 (for many, their sophomore year of college). This survey has rich information both about the educational experiences of the stu-

Figure 1. Average Annual Earnings, by Years of Completed Schooling



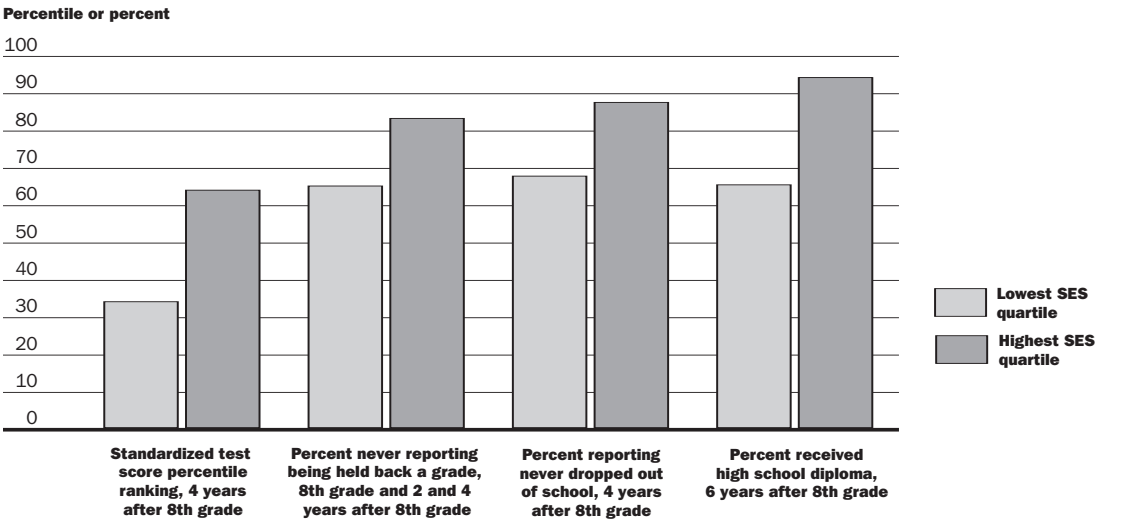
Source: Authors' calculations from the Current Population Survey, March 2003 and 2004.

dents and about their parents and schools. Figure 2 shows how students' educational achievements vary by family background. We have divided the students' families into four even groups (quartiles) based on an index of socioeconomic status. Those in the lowest quartile are the most disadvantaged, while those in the highest quartile are the most advantaged. The average family income in the lowest quartile is about $27,000 (in 2004 dollars), with an average family size of 4.6. In the second quartile the average family income is about $48,000 (average family size of 4.4); in the third quartile it is about $69,000 (average family size of 4.3); and in the fourth quartile it is nearly $110,000 (average family size of 4.4).

As the figure shows, children from families in the highest quartile have higher average test scores and are more likely never to have been held back a grade than children from families in the lowest quartile. Children from families in the top quartile are also more likely never to drop out of high school, and therefore much more likely to have a high school diploma six years after they entered the eighth grade.

Although these patterns are striking, it is not clear they reflect the *causal* effect of family background on a child's educational achievement. Inherited genetic ability confounds attempts to study the link between family background and educational achievement because to the extent that ability or intelligence is heritable, genetics helps determine whether children are successful in school. For example, evidence suggests that people with lower observed ability earn lower wages than those with higher ability.[3] Thus, less able people will have lower socioeconomic status than more able people. Further, more able people likely find it less costly to get more schooling, in the sense that it is easier for them to master the knowledge required at each new step of school than it is for an individual of similar background but with lower ability. If it is also true that ability is genetically determined, then less able parents whose socioeconomic status is low will also have less able children who will get less schooling than the children of more able parents whose socioeconomic status is high. In this example, the heritability of ability combined with the link between ability and educational achievement means that low innate ability explains both the parents' low socioeconomic status and the children's lesser educational achievement.

Figure 2. Educational Outcomes, by Family Socioeconomic Status



Source: Authors' calculations from the National Education Longitudinal Study of 1988.

To disentangle the effects of genetic makeup (which is not malleable) and family background (which is likely more malleable) on educational attainment, a researcher would ideally conduct an experiment. The experiment would begin with the random assignment of one group of children to disadvantaged families and another group to more advantaged families—without regard to the children's "innate" ability. Because assignment to families would be random, there would be no link between the genetic ability of the children and that of the parents. On average the only difference between the two groups of children would be their family background. Years later the researcher could compare the educational attainment of these children. With a large enough sample, differences between the two groups would provide a credible estimate of how much family background causally affects educational attainment.

In this experiment what the researcher wants to control is the wealth (or socioeconomic status more generally) of the family in which the child was raised. The researcher does not attempt to control which schools the children attended, whether the children had access to good medical care, their families' parenting practices, or other aspects of their lives that undoubtedly affect their educational attainment. Why not? Because the researcher is not interested in the effect of randomly assigning students to families of different backgrounds, assuming that the families do everything else the same.

Another way to see this is to consider possible policy implications. Suppose a new public policy aiming to increase the educational attainment of children were to give $10,000 to each family whose income fell below, say, the national poverty line. The policy's intent would not be for parents to put the money into the bank and not spend it on their children. Rather, the intent would be for them to use the money to buy nutritious food, enroll their children in better schools, purchase supplementary educational materials, get access to better medical care, or purchase other materials that would help their children's educational success. That is, the key policy

question is not whether wealth or social advantage affects educational attainment per se, but whether the behaviors and resources made possible by that wealth and social advantage affect educational attainment.

In a study that comes close to the ideal experiment just described, Bruce Sacerdote examines the educational attainment of children adopted from South Korea who were randomly assigned to U.S. adoptive families.[4] Because the children are adopted and randomly assigned to their families, there should be no relationship between the mother's innate ability and the child's innate ability; thus any relationship between the mother's educational attainment and that of the children is causal. Because many of these families also have biological children, Sacerdote compares the link between a mother's schooling and a child's schooling for adopted and biological children and estimates how much the mothers' educational attainment determines that of the biological children. He calculates that only 23 percent of schooling transmitted from mother to child is the direct effect of the mother's education, suggesting a very large role for genetics. In contrast, he finds that nurture plays a much larger role than nature in transmitting health habits such as drinking and smoking: these habits pass along to biological and adopted children at equal rates. Sacerdote, an economist, notes that under very strong assumptions his finding means that 23 percent of educational attainment is determined by environment, implying that up to 77 percent is determined by nature. Most psychologists who examine how genetics affects academic achievement in young children find smaller estimates, in the range of 30 to 40 percent.[5] Some also argue that adoption studies overstate the importance of genetics because adoptive families are not representative of families in the general population.[6]

Researchers have used other strategies to estimate the extent to which family income determines children's educational achievement. Again, because they cannot assume that family income is unrelated to other factors (such as inherited ability) that determine both children's socioeconomic status and their educational attainment, they must look for changes in family income that are unrelated to family characteristics such as whether the parents are highly educated or have high genetic "ability." Pamela Morris, Greg Duncan, and Christopher Rodrigues take advantage of variations in family income caused by experimental welfare programs in the United States and Canada during the 1990s to examine how income affects children's achievement.[7] The welfare programs were all designed to increase work, and several were also designed to increase income, either through wage supplements or by allowing participants to keep more of their welfare payments when they went to work. Because no direct family or child services (such as parenting classes or child care subsidies) were provided, any changes in children's achievement must be attributable to changes in their parents' em-

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ployment, income, and welfare receipt generated by random assignment to the different programs.

Morris, Duncan, and Rodrigues look at how these differences in income (all generated by random assignment) affect children's achievement. They find that a $1,000 increase in annual income (over three to five years) increases achievement by 6 percent of a standard deviation for children who are two to five years old. However, it has no effect on achievement for older children (six to nine years old and ten to fifteen years old). The cost and benefit of the increased income for preschool-aged children compare favorably to the cost and benefit of direct educational interventions such as reducing class size. (In one experiment, Alan Krueger and Diane Whitmore Schanzenbach find that class-size reductions costing $9,200 per pupil for grades K–3 increased children's achievement by 13 percent of a standard deviation.)[8]

Addressing the question of how changes in family income affect children's academic attainment in yet another way, Gordon Dahl and Lance Lochner use the fact that increases over the past twenty years in the earned income tax credit for working families have caused increases in family income to examine how child achievement is affected.[9] Families with two children with earned income of, say, $10,000 in 1993 would have been eligible for a tax credit of $1,511. That same family would have been eligible for a credit of $2,528 in 1994 and $3,110 in 1995. Thus with no change in nominal earned income, total family income would have increased each year. Did the added money improve student test scores?

Dahl and Lochner find that it did. A $1,000 increase in income raised math and reading scores by 2 to 4 percent of a standard deviation—an improvement large enough to close roughly 3 to 5 percent of the achievement gap between children in the bottom income quartile (average family income of $14,214 in 2000 dollars) and those in the top quartile (average income $81,137).[10] Furthermore, when Dahl and Lochner estimate how income affected test scores for various subgroups, they find even larger effects for children from disadvantaged families, who are more likely to receive the maximum increase in income.

Overall, the evidence suggests that parental socioeconomic status has a causal effect on children's educational outcomes. But the studies noted cannot identify precisely how increases in parental education or income improve children's educational outcomes. Economic theory suggests that people stay in school until the costs of doing so (direct costs as well as forgone earnings and the psychological costs of being in school) outweigh the benefits. Thus, if the children of advantaged families stay in school longer, it must be because they receive greater benefits or face lower costs than do less advantaged children (for example, forgone earnings are less important to a wealthy family than to a poor family). In the next sections, we investigate why the relationship between family background and educational attainment may be so strong.

Does the Economic Value of Education Differ by Family Background?

We first examine whether education has a different value for people of different socioeconomic backgrounds. If children from more advantaged families receive larger gains from each additional year of schooling, they will have a greater incentive to stay in school. Because research on the economic value of edu-

cation is extensive, while that on the extent to which that value varies by family background is more limited, we begin by discussing the overall relationship between education and income.

Estimating the Economic Value of Schooling Is Not Straightforward

Economists conventionally measure the economic value of additional schooling (or the "return to schooling") as the average percentage difference in mean earnings for each additional year of education.[11] Estimates based on the Current Population Survey, for example, suggest that on average for each year of schooling, a person's earnings increase by about 11 percent.[12] While the economic value of education has been well documented, the question of why education increases income is more controversial. Nobel Laureate Gary Becker theorizes that education provides skills, or human capital, that make a worker more productive.[13] If so, then because a worker's income reflects his or her productivity, education is a key determinant of upward social mobility. It follows that much of the gap between the rich and the poor arises from a lack of skills among the poor—with the policy implication being that education and training should form the cornerstone of programs aimed at reducing income inequality.

Other researchers, such as Nobel Laureate Michael Spence, argue that education may not *generate* higher incomes—that is, the relationship may not be causal.[14] Instead, education and income may be linked because people with greater "ability" complete more schooling and would likely earn higher wages and salaries even without the additional schooling. In this case, as with the relationship between family socioeconomic status and a child's educational attainment, the schooling-income connection may mostly reflect the fact that more able people command a premium for their (innate) skills in the labor market. Thus empirical estimates of the return to schooling such as the one just noted are too large. In this view, increasing funding for educational programs for the disadvantaged will have little or no effect because schooling cannot change innate ability.

Again, researchers have developed several methods to isolate the economic value of education in an effort to disentangle these two hypotheses. To determine definitively whether more schooling raises income, an ideal experiment would involve randomly assigning one group of students to complete high school and another group to drop out, regardless of the students' innate ability or family background. Years later researchers would compare how the two groups fared in the labor market. On average the only difference between the two would be whether they had graduated from high school. Differences in the earnings of the two groups would provide an estimate of the economic value of education—how much completing high school causes earnings to increase. To determine whether this economic value varies by family background, the researcher could simply estimate the earnings difference for subgroups of students based on their family background at the start of the experiment.

Empirical Estimates of the Economic Value of Schooling

Recognizing that no such experiment will ever be conducted, researchers have developed two broad approaches to empirical estimation of the economic value of education. The first approach—so-called natural experiments—locates events or policies that might be expected to alter the schooling decisions of some people, but would not be expected to

alter their income independently. The idea is straightforward. Suppose that researchers knew of an event or policy, such as an increase in the compulsory schooling age, that would increase a group's years of completed schooling. Suppose, further, that they were certain that the policy would have no direct effect on the group's earnings. They would then estimate the effect of education on earnings in two steps. First, they would estimate how much the policy increased the group's educational attainment. Next, they would measure how much the same policy affected their earnings. If they find that the group's earnings have increased, they can be sure that education caused the increase because they are certain the policy had no *direct* effect on earnings. The ratio of the increase in income to the increase in schooling is an estimate of the economic value of education. Many such studies estimate that the return to schooling is at least as large as estimates by conventional procedures that relate the level of schooling to income directly.[15]

The findings of all these empirical studies . . . are surprisingly consistent: the return to schooling is not caused by an omitted correlation between ability and schooling.

Other researchers have used sibling or twin pairs to estimate empirically the return to schooling. Because siblings and twin pairs share genetic material and are raised in similar household environments, their "ability" and other unobservable characteristics are much more similar than those of randomly selected members of the population. As a result, when researchers relate differences in siblings' schooling to their earnings, they implicitly account for these unobserved factors. Although the estimated return to schooling varies because of the widely different time periods covered by the studies, the various sibling and twin studies find a significant link between schooling and earnings.[16] Further, the more recent and more sophisticated estimates typically do not differ from conventional estimates of the return to schooling.[17]

The findings of all these empirical studies—those using natural experiments and those using family relationships—are surprisingly consistent: the return to schooling is not caused by an omitted correlation between ability and schooling. A conventional estimate of the economic value of education is thus likely to be quite close to that of the ideal experiment. In fact Nobel Laureate James Heckman, writing with Pedro Carneiro, concludes, "By now there is a firmly established consensus that the mean rate of return to a year of schooling, as of the 1990s, exceeds 10 percent and may be as high as 17 to 20 percent."[18]

Do Differences in the Value of Education Explain Differences in Educational Attainment?

Although researchers consistently find that education has a causal effect on earnings—that education has economic value—they have not come to a consensus on whether that value varies depending on an individual's family background. Importantly, they have not established whether people from more advantaged families complete more schooling because it has greater value for them. One study, for example, concludes that individuals

with higher "ability" or from more advantaged families do not enjoy greater returns to schooling.[19] Other studies find no variation in the returns to schooling by the race or ethnicity of the individual, or by IQ.[20] Still others, however, find higher returns to schooling for more able individuals.[21] Another important question is *why* the return to schooling might differ by family background. Differences in school quality, which we address below, provide one possible explanation.

Do the Costs of Education Differ by Family Background?

Education has various costs, the most obvious of which is the direct cost. For the 90 percent of U.S. K–12 students who attend public school, these direct costs may be minimal, but parents must still pay for such school supplies as notebooks, pencils, paper, and the like.[22] Based on our estimates using data from the 2002 Consumer Expenditure Survey, families with children under age eighteen who are headed by a high school dropout spend roughly $34 a year on school books and supplies, whereas families whose head has a graduate degree spend roughly $85. These differences, however, are likely too small to generate significant differences in educational attainment.

Education also has psychological costs, information costs, opportunity costs, and borrowing constraints (the cost of obtaining funds). At the elementary and secondary levels, it is these costs that are likely to be important in explaining differences in schooling caused by family background.

Differences in Psychological Costs

Learning can be frustrating, and mastering new material and studying for tests can be time-consuming. Anything that increases these psychological costs for disadvantaged students relative to their more privileged peers (that is, makes them dislike school more) may help explain why they get less schooling.

As one example, systematic differences in the expectations of parents and teachers may raise the psychological costs for less advantaged students. A child from a poorer family may face different expectations from parents and teachers than a child from a more privileged family, even if the two children have the same "ability." If these different expectations, in turn, affect the children's academic achievement, then expectations could be one reason why parental socioeconomic status affects schooling.

Data from the NELS indicate that more advantaged parents expect their children to complete more education than less advantaged parents do, although virtually all parents, regardless of socioeconomic background, expect their children to complete high school. If lower parental expectations cause children to have less confidence in their own ability, the children could face higher psychological costs. Although we are not aware of evidence that parental expectations causally affect children's academic achievement, some evidence exists that teacher expectations affect both student intelligence and achievement.

Robert Rosenthal and Lenore Jacobson's *Pygmalion in the Classroom* has been widely cited as providing just such evidence.[23] The authors administered a baseline intelligence test to elementary students in a single school and then randomly assigned 20 percent of the students to be identified as likely to show a dramatic increase in intelligence over the next school year because they were "late bloomers." The remaining students served as the control group. Rosenthal and Jacobson

then told the teachers which students had been identified as late bloomers and later administered follow-up intelligence tests. They found that one and two years after being labeled, the late-blooming children had gained more IQ points than the control group. Rosenthal and Jacobson's study has spawned many more studies and has been much criticized, but a recent review of the research by Lee Jussim and Kent Harber concludes that teacher expectations do affect student intelligence, though the effects are likely small.[24]

Findings from both economics and psychology suggest that teacher expectations may indeed help explain why family background affects student achievement.

A recent study by economist David Figlio also finds that teacher expectations affect academic achievement.[25] Starting with the assumption that teachers' perceptions of a child's family background may be based on the child's name, Figlio assigns socioeconomic status rankings to student names. Because siblings' names are often assigned different rankings, Figlio can look for differences in treatment and outcomes among students with identical family background. He finds that teachers are more likely to recommend students with high-status names to gifted and talented programs than students with similar test scores but low-status names. In addition, using standardized test scores, he finds that children with low-status names score lower in mathematics and reading than their siblings with higher-status names.

Findings from both economics and psychology suggest that teacher expectations may indeed help explain why family background affects student achievement. If teachers have lower expectations for children from disadvantaged families, regardless of their ability, and if their perceptions about which children are disadvantaged are on average correct, then the lower expectations for disadvantaged children may raise the psychological costs of education relative to their more privileged peers and thus help explain why children of disadvantaged parents attain less education.

Differences in social or cultural identity may also generate differences in the psychological costs of schooling. In other words, those who drop out may feel more peer or family pressure not to continue in school. Again, however, one might ask why these cultural or social norms about education vary systematically with socioeconomic status. Cultural norms may vary because education helps determine socioeconomic status, so that disadvantaged children may feel pressure not to raise their own status through education above the average for the social and cultural group with which they most identify.

Information Differences

Another potential cost to completing more schooling is that of acquiring accurate information about the costs and benefits of more schooling. If students from more privileged families can get more or better information about the ramifications of their decision at a lower cost than those from poorer families (for example, a better understanding of the potential benefits to continuing in school, perhaps because of better family social networks), then they may get more schooling.

Similarly, students who drop out may believe that the returns to schooling are much riskier than do students who continue, thus lowering their expectations of the value of a high school diploma. High school dropouts may also discount the future income benefits of more education at a much higher rate than those who graduate from high school, also leading them to have lower expectations of the value of more education.

Although such arguments could explain why some students decide to drop out of high school in spite of the seemingly large economic benefits of continuing, one needs to ask why perceptions of risk or discount rates vary systematically with family background. Further, low-income students appear to understand the potential economic benefits of college attendance about as well as more advantaged students.[26] Although research is far from conclusive, it suggests that a simple asymmetry in students' understanding of the costs and benefits of schooling is unlikely to fully explain differences in educational attainment.[27]

Opportunity Costs and Borrowing Constraints

Because students cannot work during the hours when they are attending school, they forgo income to attend school. In some families that income is a nontrivial share of family income. If instead the family could borrow money to allow the child to continue in school, then the increase in earnings from getting, say, a high school diploma would allow the family to repay the loan (and then some), assuming that interest rates are lower than the return to schooling. If credit markets are perfect—that is, if all families can borrow as much money as they need at the prevailing interest rate—then educational attainment should not vary by family background. If, however, poor families lack access to competitive credit markets and would have to borrow money at much higher interest rates, then the cost of continuing in school is higher for them than for wealthier families who do not need to borrow the money (or who can borrow it at competitive rates). In this case, students from wealthier families will complete more schooling than those from poorer families.

Whether borrowing constraints more generally explain differences in educational attainment, especially college attendance, by family background is an unresolved issue.[28] There is, however, growing evidence from outside education that individuals, particularly teenagers, are credit constrained.[29] Further, racial and gender discrimination in credit markets has long been documented.[30] For example, researchers at the Federal Reserve Bank of Boston investigating racial discrimination in mortgage lending in the Boston area in 1990 found that the loan rejection rates of African American and Hispanic applicants were 8 percentage points higher than those of otherwise similar white applicants.[31] Although race is certainly correlated with socioeconomic status, we know of no direct evidence of discrimination by socioeconomic status.

Overall, the evidence suggests that differences in the cost of education may help explain differences in educational attainment by family background. As we will show, many of these cost differences are potentially driven by variation in school quality by family background, which may also lead to differences in the value of schooling.

Can Differences in School Quality Explain the Patterns?

Finally, we consider whether differences in school quality help explain why more privi-

leged students complete more schooling than their less privileged counterparts. We begin by noting that the conventional measure of an individual's education—years of completed schooling—is rather limited. In particular, it ignores whether students with the same level of completed education may have received an education of different quality. By the conventional measure, completing one year of education should increase an individual's human capital by the same amount regardless of the school attended. But because one year at a poor school may increase human capital less than does one year at an excellent school, school quality could affect the value of education. It could also arguably affect the cost of education. A low-quality school, for example, may leave a student unprepared to master the skills of the next grade level, thus raising the costs in psychological terms (and also in time) of getting more education.

Does Family Background Affect the Quality of a Child's School?

In the United States, the school a child attends is largely determined by the neighborhood where he or she lives. To the extent that parental socioeconomic status affects the neighborhood where a child lives, it may thus also affect school quality. For example, less privileged parents certainly have fewer financial resources than more privileged ones. While many forms of financial aid are available to low-income students who want to attend college, no such credit is available to low-income parents who want to live in a high-quality school district. These borrowing constraints likely cause school quality to vary by family background. If poor school quality leads to lower educational attainment, then children of less privileged parents will have lower educational attainment than children of more privileged parents.

At the school or school district level, some potential indicators of school quality are clearly related to family background or income (which, in turn, is correlated with family socioeconomic status). An obvious first question is whether overall school spending differs from one district to the next by the average socioeconomic status of the residents of the district. Higher-income school districts, after all, have more money to spend on education, and in theory more money should buy higher school quality. Using data from the 2003 Common Core of Data, we calculate average per pupil spending in school districts with at least 70 percent of students eligible for free or reduced-price school lunch and districts with less than 20 percent of pupils eligible.

Not surprisingly, we find that average spending per pupil is rather similar. Districts with the larger share of disadvantaged children spend an average of $10,414 per pupil, as against $9,647 for districts with a smaller share of such children. The similarity in spending in part reflects school finance reforms since the 1970s that have tried to equalize school funding across poor and rich districts. But similar total spending per pupil does not necessarily reflect similar school quality, because different school districts may face different costs. Older school districts with aging buildings, for example, may have to spend more to maintain their facilities than newer suburban districts do. Some districts may have more special education students, who need smaller classes, which means hiring more teachers. And urban districts may face higher-wage labor markets than rural districts. Indeed, the recognition that some groups of students may need extra money to compensate for family disadvantage underlies the goal of closing achievement gaps between high- and low-performing children in Title I of the Elementary and

Secondary Education Act of 1965 (of which the No Child Left Behind Act of 2001 is the most recent reauthorization.)

Given that instructional salaries and benefits make up more than 50 percent of schools' total current spending, class size could be another way in which school quality could vary by family background.[32] Because data on class size are not readily available, we look at pupil-teacher ratios instead. We have also calculated the average pupil-teacher ratios for schools by family socioeconomic background. As with total school spending, the pupil-teacher ratios are quite similar: 16.9 for schools attended by children of disadvantaged family background, as against 17.4 for schools attended by more privileged children.[33] Does the lower ratio in schools serving poor children mean that the quality of schooling is better in those schools? Such an interpretation is not likely to be correct because those schools may have a larger share of special education or English-language-learner students than schools serving more privileged children, which have fewer special education classrooms.[34]

One aspect of school quality that is less prone to distortion by compensatory education policies is teacher quality. Although a district may be able to raise salaries as an incentive to high-quality teachers, it cannot force such teachers to accept its job offers. One measure of teacher quality is teaching experience, and it is telling that schools serving poorer students are likely to have fewer experienced teachers. In this case, schools' socioeconomic status is defined by the percentage of students who are eligible for free or reduced-price school lunch. Eighty percent of teachers in low socioeconomic status schools (those in the top quartile by share eligible for free or reduced-price lunch) have more than three years of experience, compared with 89 percent of teachers in high socioeconomic status schools (those in the bottom quartile by share eligible).[35]

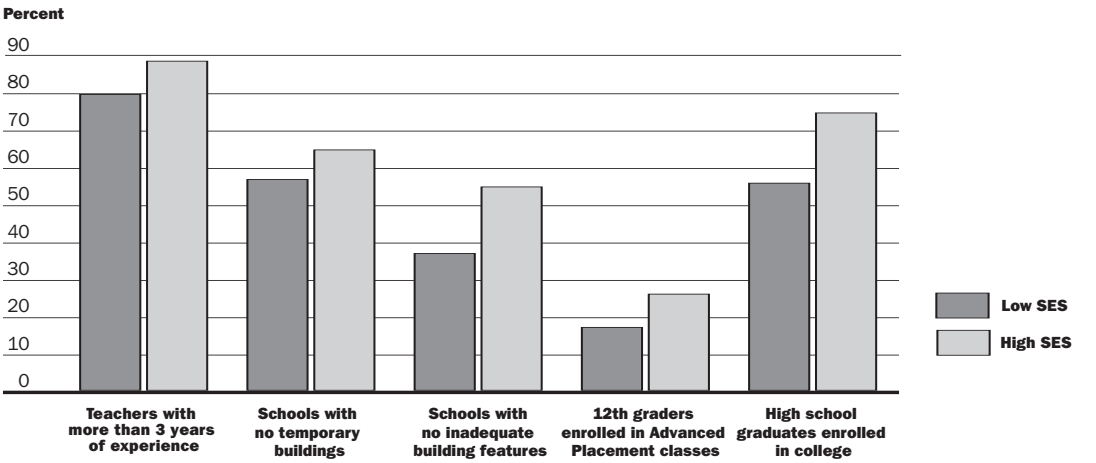
Hamilton Lankford, Susanna Loeb, and James Wyckoff look in more detail at differences in teacher quality by student characteristics for the state of New York. They find that poor students are more likely than non-

One measure of teacher quality is teaching experience, and it is telling that schools serving poorer students are likely to have fewer experienced teachers.

poor students to have a teacher who is not certified in any subject that he or she is teaching (21 percent versus 16 percent), who failed a certification exam on the first attempt (28 percent versus 20 percent), or who attended a college ranked "least competitive" by *Barron's College Guide* (25 percent versus 24 percent).[36]

Schools also vary in facility and peer quality. As figure 3 shows, low socioeconomic status schools (those with 70 percent or more children eligible for free or reduced-price school lunch) have worse facilities than high socioeconomic status schools (those with fewer than 20 percent of students eligible for free or reduced-price school lunch). Fifty-seven percent of low socioeconomic status schools have no temporary buildings, as against 65 percent of schools serving high socioeconomic status students. Similarly, 37 percent

Figure 3. School Quality, by Family Socioeconomic Status



Source: Daniel P. Mayer, John E. Mullins, and Mary T. Moore, *Monitoring School Quality: An Indicators Report* (NCES 2001-030) (U.S. Department of Education, National Center for Education Statistics, 2000), figure 2.3 (http://www.nces.ed.gov/pubs2001/2001030.pdf [September 5, 2005]); T. D. Snyder, A. G. Tan, and C. M. Hoffman, *Digest of Education Statistics,* 2003 (NCES-2005-025) (U.S. Department of Education, National Center for Education Statistics, 2004), table 101 (http://www.nces.ed.gov/pubs2005/2005025.pdf [February 26, 2005]).

of schools serving poor children (low socioeconomic status schools) have fully adequate building features, compared with 55 percent of schools serving nonpoor children (high socioeconomic status schools).[37]

Peer quality as measured by college enrollment rates and Advanced Placement courses is also lower for less privileged children. Data from the NELS show that low socioeconomic students (those with parents in the bottom quartile by socioeconomic status) attend schools in which only 56 percent of students go on to some college, as against 75 percent of students in schools serving high socioeconomic status students (those in the top quartile by socioeconomic status). The share of students taking Advanced Placement courses is 16.9 percent in schools attended by students with low socioeconomic status, compared with 26.2 percent for schools attended by high socioeconomic status students. In short, the peers of less privileged students are not as academically oriented as the peers of wealthier students.

Finally, we have found some evidence that school districts that are low in socioeconomic status may not spend resources as efficiently as districts with higher socioeconomic status, suggesting that they may be more poorly managed.[38] This finding, in combination with the descriptive data above (in figure 3), leads us to conclude that school quality varies according to parental socioeconomic status.

Does School Quality Affect Children's Educational Attainment?

The next question is whether these differences in school quality translate into worse outcomes for less privileged children. By the early 1990s, many people were convinced that once one took account of differences in family background, school resources—including money—did not matter for student achievement. In a 1996 article economist Eric Hanushek wrote, "Three decades of intensive research leave a clear picture that school resource variations are not closely related to variations in student outcomes and,

by implication, that aggressive spending programs are unlikely to be good investment programs unless coupled with other fundamental reforms."[39]

Although Hanushek's analyses of the effects of school resources on student achievement have been very influential, other researchers have criticized his findings on methodological grounds.[40] For example, one independent analysis of one of Hanushek's studies concludes that the effect of per pupil spending on student achievement is large and educationally significant.[41] More recent studies that make explicit attempts to account for the compensatory nature of much educational expenditure also provide evidence that money matters. One of our own studies finds that the market values school spending in terms of property values. And Jonathan Guryan finds that a $1,000 increase in per pupil spending in Massachusetts increases average test scores for fourth- and eighth-grade students by one-third to one-half of a standard deviation. Importantly, in summarizing the findings of seventeen federal studies, Geoffrey Borman and Jerome D'Agostino conclude that Title I of the Elementary and Secondary Education Act, which aims to provide additional funding to schools and districts serving disadvantaged students, has indeed improved the educational outcomes of children it has served. Further, in studying the effect of state efforts to equalize funding between wealthier and poorer school districts, David Card and A. Abigail Payne find that such reforms have narrowed gaps in spending as well as in educational outcomes.[42]

Whether money matters must depend in part on how the money is spent. Probably the best evidence to date on the effect of class size comes from the Tennessee Student-Teacher Achievement Ratio experiment (known as Project STAR), the nation's largest randomized experiment aimed at understanding how smaller class sizes affect student achievement.[43] In the 1985–86 school year some 6,000 kindergarten students in Tennessee were randomly assigned to one of three groups: small classes (13–17 students per teacher), regular-sized classes (22–25 students), and regular-sized classes with a teacher's aide. The experiment, ultimately involving some 11,600 students, lasted four years. After the third grade, all students returned to regular-sized classes.[44] The data have been analyzed by a variety of researchers, with a remarkably consistent finding: smaller classes result in higher student achievement.[45] One study finds that the class-size effects are larger for students eligible for free or reduced-price school lunch than for more well-to-do students. Another reports that the students who were (randomly) placed in smaller classes in grades K–3 performed better on standardized tests when they reached the eighth grade. They were also more likely to take a college entrance exam (such as the ACT or SAT)—a signal that they may have been more likely to attend college as well.[46]

Peer quality as measured by college enrollment rates and Advanced Placement courses is also lower for less privileged children.

Yet another study, by David Card and Alan Krueger, relating the quality of schooling received by people born between 1920 and

1949 to their earnings in 1979 found that a reduction in the pupil-teacher ratio of 10 students increased average earnings by 4.2 percent.[47] Other studies reviewed by these same authors in a later study find that reductions in pupil-teacher ratios are associated with increased average earnings, although several of the estimates are not statistically significant.[48]

Economic studies also broadly agree that teacher quality matters, though they agree much less about what makes a high-quality teacher.

Economic studies also broadly agree that teacher quality matters, though they agree much less about what makes a high-quality teacher.[49] Developing credible studies of the effects of particular teacher characteristics on student achievement is extremely difficult. Because teachers are not randomly assigned to schools, studies find ostensibly "better" teachers at schools attended by more advantaged students. Thus, as in other areas, the researchers can develop links between certain teacher characteristics and student outcomes but cannot be assured that the teacher characteristics *caused* the change in student outcomes. In addition, such studies typically rely on administrative data that do not contain many of the characteristics that likely make a good teacher, such as classroom management, motivation, professionalism, and a thorough understanding of how to communicate new concepts to students. That said, some studies have found that teachers improve greatly after one or two years of experience. If that finding is accurate, the fact that schools serving poorer students have more teachers with very little experience suggests that these students will have lower achievement as a result.

Does Improving School Accountability Improve Student Performance?

Given already high levels of educational spending, policymakers are looking for ways to provide incentives for schools to improve without large increases in revenues. "School accountability" programs come in two forms.[50] Institutional school accountability programs, such as the No Child Left Behind Act of 2001, set up a system of rewards and sanctions determined by school performance—typically, student performance on standardized tests. Significantly, No Child Left Behind makes each school's performance public. These reforms are popular because they are relatively inexpensive and because they aim to make school systems more transparent, so that parents can more readily compare their child's school with others. Although research on the effects of school accountability on student achievement is growing, it is still fledgling.[51] At best, such programs generate small improvements in student achievement. At the same time, researchers have documented several unintended consequences. For example, one study estimates that teachers cheat in 4–5 percent of elementary school classrooms each year in Chicago and suggests that cheating increases when teachers have an incentive to do so, as they have with high-stakes tests.[52] Other researchers find that administrators reclassify low-achieving students as learning disabled so that the (presumably low) scores of these students will not be included in the school's average test score calculation.[53] David Figlio reports that schools are more likely to suspend students during the testing

cycle, apparently to alter the composition of the testing pool. Brian Jacob finds some evidence that teachers focused more on the high-stakes test material than on the low-stakes test material following the introduction of Chicago's school accountability system.[54]

Another potential form of accountability is through the market. Because students are assigned to schools based on their neighborhood, many observers have argued that local public schools are not required to be accountable to local citizens. Thus, if parents could "vote with their feet," competitive pressure and the threat of losing students would force such schools to improve. Two often talked-about forms of competitive pressure are charter schools—public schools that are exempt from many of the regulations that apply to traditional public schools—and school vouchers for use at private schools. Both forms of competition would give parents alternatives to the local public school, thus presumably improving both the educational achievement of their children and the quality of the local public schools. Importantly, because the accountability is enforced by parental choices rather than the rules of a system, there is less scope for the unintended consequences noted above.

Although these arguments are theoretically persuasive, there is little empirical evidence that either charter schools or school vouchers improve student test scores (which should, in turn, improve educational attainment). For example, three sets of researchers, using statewide data from North Carolina, Florida, and Texas, respectively, have studied whether students who attend charter schools have higher test score gains than students in local public schools.[55] Their findings are remarkably similar: there are no achievement gains for students who attend charter schools, even after controlling for a rich set of student characteristics. In fact, the students in charter schools appear to perform worse, perhaps because these are often new schools.

Evidence on school vouchers is also decidedly mixed. The best-designed study of school vouchers was conducted by William Howell and Paul Peterson in New York City, beginning in 1997.[56] It randomly assigned 1,300 students to two groups. One group received a (privately funded) scholarship to attend a private school; the other, control, group did not. After three years, the study found that overall there were no test score gains among the students who were offered a voucher or among the students who actually took advantage of the voucher offer and attended private schools. Howell and Peterson reported educationally large and statistically meaningful gains among African American students, but their findings have been disputed in a reanalysis of the data by Krueger and Pei Zhu.[57]

Evidence from publicly funded voucher programs in Milwaukee and Cleveland does not help to clarify the issue. One study of Milwaukee's Parental Choice Program, the oldest publicly funded choice program in the United States, suggests that students gained in math but not in reading; another suggests no gains in either math or reading.[58] The most recent evidence from the Cleveland Scholarship and Tutoring Program suggests that vouchers have not significantly benefited the recipient students.[59] After five years the test scores of voucher students are generally quite similar to those of a group of students who applied for, but did not receive, a voucher.

Importantly, all these studies examine small-scale programs. None addresses the question

of whether a large-scale program would generate enough competitive pressure on the public schools to induce them to improve. Evidence from Florida's school accountability system (which includes a school voucher for students attending persistently "failing" schools) suggests that even the threat of losing students through vouchers may not be a prime motivator for school improvement.[60] Although schools faced with the possibility of becoming voucher-eligible appear to improve slightly, such improvement appears to spring from avoidance of the stigma of being labeled a failing school rather than the threat of vouchers per se.

Rather than encouraging upward mobility, U.S. public schools tend to reinforce the transmission of low socioeconomic status from parents to children.

Although these studies are not likely to be the last word on the effectiveness of institutional school accountability systems, charter schools, or school vouchers, together they indicate that the gains from improving school accountability are likely modest, at best.

Conclusions

While efforts such as Title I and state school finance equalizations have succeeded in smoothing school spending across school districts serving more and less advantaged students, they have not eliminated the link between socioeconomic status and educational outcomes. Family background continues to play an important role in determining a child's educational attainment. The costs and benefits of getting further schooling differ according to the socioeconomic status of a child's family, and these differences may be driven by differences in access to quality schools. Because school attendance boundaries are largely determined by neighborhood of residence and because families of different socioeconomic backgrounds live in different neighborhoods, children from more and less advantaged backgrounds attend different schools. Descriptive statistics and more sophisticated analyses find that school quality is positively correlated with family background. Children from well-to-do families attend better schools than children from poor families. As a result, rather than encouraging upward mobility, U.S. public schools tend to reinforce the transmission of low socioeconomic status from parents to children.

Policy interventions aimed at improving school quality for children from disadvantaged families thus have the potential to increase social mobility by reducing the transmission of low socioeconomic status from parents to children through education. Based on the best research evidence, smaller class sizes seem to be one promising avenue for improving school quality for disadvantaged students. Maintaining teacher quality at the same time is also likely to be important. These are but two of the many avenues that growing evidence shows are effective in raising school quality. Smaller schools, grade retention, and summer school are examples of others.[61] Despite the considerable political attention paid to charter schools and vouchers that would help the children of poor families attend private school, to date the best evidence suggests that increasing competitive pressure in this way will not significantly improve student achievement. In contrast,

growing evidence suggests that institutional accountability systems may generate small improvements in student achievement, although they are also vulnerable to unintended negative consequences.

Because a child's educational achievement depends on so many aspects of his or her life, many of which are outside school, education policy can go only so far. One particular challenge is that more advantaged families can afford to—and will—spend more on their children's education. Thus, these families can partly undo policy attempts to equalize school quality for poor and nonpoor children by spending more money outside school. As an example, based on data from the 2002 Consumer Expenditure Survey, parents who drop out of high school spend an average of $33 a year for recreational lessons or other instruction for children (not including tuition), whereas parents who have graduate degrees spend nearly $600. Under these circumstances, it will be extremely difficult for America's public schools to live up to Martin Luther King Jr.'s ideal of teaching students so well as to make their family background irrelevant. That said, such lofty goals are a standard by which to measure our efforts. We are reminded that we have a long way to go.

Notes

1. Based on authors' calculations using March Current Population Survey data available from Unicon. We limit the sample to individuals twenty-five to sixty-five years of age who worked at least one week in the past year.

2. Based on authors' calculations using 2004 Current Population Survey March Outgoing Rotations Group data available from Unicon. We limit the sample to individuals aged twenty-five to sixty-five, omitting those with wages of less than one-half of the minimum wage or above the 99th percentile of the wage distribution.

3. See, for example, Derek Neal and William R. Johnson, "The Role of Pre-Market Factors in Black-White Wage Differences," *Journal of Political Economy* 104, no. 5 (1996): 869–95; and Orley Ashenfelter and Cecilia Elena Rouse, "Income, Schooling, and Ability: Evidence from a New Sample of Twins," *Quarterly Journal of Economics* 113, no. 1 (1998): 253–84.

4. Bruce Sacerdote, "What Happens When We Randomly Assign Children to Families?" Working Paper 10894 (Cambridge, Mass.: National Bureau of Economic Research, 2004).

5. See William T. Dickens, "Genetic Differences and School Readiness," *Future of Children* 15, no. 1 (2005): 55–69.

6. See Mike Stoolmiller, "Implications of the Restricted Range of Family Environments for Estimates of Heritability and Nonshared Environment in Behavior-Genetic Adoption Studies," *Psychological Bulletin* 125, no. 4 (1999): 392–409.

7. Pamela Morris, Greg J. Duncan, and Christopher Rodrigues, "Does Money Really Matter? Estimating Impacts of Family Income on Children's Achievement with Data from Random-Assignment Experiments," unpublished manuscript, MDRC and Northwestern University, 2004.

8. Alan B. Krueger and Diane M. Whitmore, "The Effect of Attending a Small Class in the Early Grades on College Test Taking and Middle School Test Results: Evidence from Project STAR," *Economic Journal* 111 (2001): 1–28. This calculation assumes that per pupil costs increase 47 percent per year for 2.3 years, on average, and that per pupil costs equal the average U.S. total expenditure per pupil in average daily attendance in 1997–98 in 2001–02 dollars ($8,487). *Digest of Education Statistics 2003*, table 166.

9. Gordon B. Dahl and Lance Lochner, "The Impact of Family Income on Child Achievement," Working Paper 11279 (Cambridge, Mass.: National Bureau of Economic Research, 2005).

10. Based on calculations by the authors using data received through personal correspondence with Dahl.

11. As Jacob Mincer shows, if forgone earnings are the only cost of school attendance, this is the private marginal benefit (or "return") to the investment in a year of schooling. See Jacob Mincer, *Schooling, Experience, and Earnings* (Columbia University Press, 1974).

12. Based on a regression of the natural logarithm of hourly wages on years of completed education, a quadratic in potential experience controls for sex, race/ethnicity, marital status, and nine regions using the 2004 March Current Population Survey. The regression was weighted using the earnings weight.

13. Gary Becker, *Human Capital* (Columbia University Press, 1964).

14. Michael Spence, "Job Market Signaling," *Quarterly Journal of Economics* 87, no. 3 (1973): 355–74.

15. For example, Joshua D. Angrist and Alan B. Krueger, "Does Compulsory Schooling Affect Schooling and Earnings?" *Quarterly Journal of Economics* 106, no. 4 (1991): 979–1014; Thomas J. Kane and Cecilia Elena Rouse, "Labor Market Returns to Two- and Four-Year Colleges," *American Economic Review* 83, no. 3 (1993): 600–13; Jeffrey Kling, "Interpreting Instrumental Variables Estimates of the Returns to Schooling," *Journal of Business and Economics Statistics* 19, no. 3 (2001): 358–64; David Card, "Using Geographic Variation in College Proximity to Estimate the Return to Schooling," Working Paper 4483 (Cambridge, Mass.: National Bureau of Economic Research, 1993); and Philip Oreopoulos, "Average Treatment Effects of Education When Compulsory School Laws Really Matter," *American Economic Review* (forthcoming). Angrist and Krueger use an individual's quarter of birth as the natural experiment; Kane and Rouse, Card, and Kling use proximity to a two- or four-year college as the natural experiment.

16. For studies using siblings, see, for example, Orley Ashenfelter and David Zimmerman, "Estimates of the Returns to Schooling from Sibling Data: Fathers, Sons, and Brothers," *Review of Economics and Statistics* 79, no. 1 (1997): 1–9; and Joseph Altonji and Thomas Dunn, "The Effects of Family Characteristics on the Return to Education," *Review of Economics and Statistics* 78, no. 4 (1996): 692–704. For studies using twins, see Jere R. Behrman, Mark R. Rosenzweig, and Paul Taubman, "Endowments and the Allocation of Schooling in the Family and in the Marriage Market: The Twins Experiment," *Journal of Political Economy* 102, no. 6 (1994): 1131–74; Orley Ashenfelter and Cecilia Elena Rouse, "Income, Schooling, and Ability: Evidence from a New Sample of Twins," *Quarterly Journal of Economics* 113, no. 1 (1998): 253–84; and Cecilia Elena Rouse, "Further Estimates of the Economic Return to Schooling from a New Sample of Twins," *Economics of Education Review* 18, no. 2 (1999): 149–57.

17. Unfortunately, the measurement error in reported schooling poses an econometric challenge for these models. The reason is that classical measurement error is exacerbated in within-sibling (or within-twin) estimators because sibling education levels are so highly correlated. Zvi Griliches, "Estimating the Returns to Schooling: Some Econometric Problems," *Econometrica* 45, no. 1 (1977): 1–22. As a result, much of the more recent literature using this approach has focused on addressing the measurement error bias as well as the ability bias.

18. Pedro Carneiro and James J. Heckman, "Human Capital Policy," in *Inequality in America: What Role for Human Capital Policies*? edited by Benjamin M. Friedman (MIT Press, 2003), pp. 148–49.

19. Ashenfelter and Rouse, "Income, Schooling, and Ability" (see note 16).

20. Lisa Barrow and Cecilia Elena Rouse, "Do Returns to Schooling Differ by Race and Ethnicity?" *American Economic Review* 95, no. 2 (2005): 83–87; and Altonji and Dunn, "The Effects of Family Characteristics" (see note 16).

21. John Cawley and others, "Understanding the Role of Cognitive Ability in Accounting for the Recent Rise in the Economic Return to Education," in *Meritocracy and Economic Inequality*, edited by Kenneth Arrow, Samuel Bowles, and Steven Durlauf (Princeton University Press, 2000), pp. 230–65; Carneiro and Heckman, "Human Capital Policy" (see note 18); and Christopher Taber, "The Rising College Premium in the Eighties: Return to College or Return to Unobserved Ability?" *Review of Economic Studies* 68, no. 3 (2001): 665–91.

22. U.S. Department of Education, National Center for Education Statistics, *The Condition of Education 2005,* NCES-2005-094 (2005), appendix 1, table 2-2, "Trends in Private School Enrollments."

23. Robert Rosenthal, and Lenore Jacobson, *Pygmalion in the Classroom: Teacher Expectation and Pupils' Intellectual Development* (New York: Holt, Reinhart, and Winston, 1968).

24. Lee Jessim and Kent D. Harber, "Teacher Expectations and Self-Fulfilling Prophecies: Knowns and Unknowns, Resolved and Unresolved Controversies," *Personality and Social Psychology Review* 9, no. 2 (2005): 131–55.

25. David Figlio, "Names, Expectations and the Black-White Test Score Gap," Working Paper 11195 (Cambridge, Mass.: National Bureau of Economic Research, 2005).

26. For example, see Christopher Avery and Thomas J. Kane, "Student Perceptions of College Opportunities," in *College Choices: The Economics of Where to Go, When to Go, and How to Pay for It*, edited by Caroline M. Hoxby (University of Chicago Press, 2004), pp. 355–91; and Cecilia Elena Rouse, "Low-Income Students and College Attendance: An Exploration of Income Expectations," *Social Science Quarterly* 85, no. 5 (2004): 1299–317.

27. Clearly differences in information costs may be much more important in the transition from high school to college, when students need information about where and how to apply to college and how to go about getting financial aid. Children with college-educated parents have an advantage over other children in having parents who have "been there before." See the article by Robert Haveman and Timothy Smeeding in this volume.

28. See, for example, James J. Heckman and Lance Lochner, "Rethinking Education and Training Policy: Understanding the Sources of Skill Formation in a Modern Economy," in *Securing the Future: Investing in Children from Birth to College*, edited by Sheldon Danziger and Jane Waldfogel (New York: Russell Sage Foundation, 2000), pp. 47–83; and David T. Ellwood and Thomas J. Kane, "Who Is Getting a College Education? Family Background and the Growing Gaps in Enrollment," in *Securing the Future*, edited by Danziger and Waldfogel, pp. 283–324.

29. See John T. Warner and Saul Pleeter, "The Personal Discount Rate: Evidence from Military Downsizing Programs," *American Economic Review* 91, no. 1 (2001): 33–53; and David B. Gross and Nicholas Souleles, "Consumer Response to Changes in Credit Supply: Evidence from Credit Card Data," mimeo, University of Pennsylvania (2000).

30. See Helen Ladd, "Evidence on Discrimination in Mortgage Lending," *Journal of Economic Perspectives* 12, no. 2 (1998): 41–62, for a nice review of the evidence on discrimination in mortgage lending.

31. Alicia H. Munnell and others, "Mortgage Lending in Boston: Interpreting HMDA Data," *American Economic Review* 86, no. 1 (1996): 25–53.

32. T. D. Snyder, A. G. Tan, and C. M. Hoffman, *Digest of Education Statistics, 2003,* NCES-2005-025 (U.S. Department of Education, National Center for Education Statistics, 2004), table 164 (www.nces.ed.gov/pubs2005/2005025.pdf [February 26, 2005]).

33. Authors' calculations from the 2003 CCD.

34. See Michael A. Boozer and Cecilia Elena Rouse, "Intraschool Variation in Class Size: Patterns and Implications," *Journal of Urban Economics* 50, no. 1 (2001): 163–89, for a more complete discussion of this issue.

35. Daniel P. Mayer, John E. Mullins, and Mary T. Moore, *Monitoring School Quality: An Indicators Report,* NCES 2001-030 (U.S. Department of Education, National Center for Education Statistics, 2000) (http://nces.ed.gov/pubs2001/2001030.pdf [September 5, 2005]), figure 2.3.

36. Hamilton Lankford, Susanna Loeb, and James Wyckoff, "Teacher Sorting and the Plight of Urban Schools: A Descriptive Analysis," *Educational Evaluation and Policy Analysis* 24, no. 1 (Spring 2002): 37–62, table 6, p. 47.

37. Snyder, Tan, and Hoffman, *Digest of Education Statistics, 2003*, table 101 (see note 32). The building features considered are roofs; framing, floors, and foundations; exterior walls, finishes, windows and doors; interior finishes and trim; plumbing; heating, ventilation, air conditioning; electric power; electrical lighting; and life safety features.

38. Lisa Barrow and Cecilia Elena Rouse, "Using Market Valuation to Assess Public School Spending," *Journal of Public Economics* 88, no. 9–10 (2004): 1749–71.

39. Eric A. Hanushek, "Measuring Investment in Education," *Journal of Economic Perspectives* 10, no. 4 (1996): 9.

40. See Larry V. Hedges, Richard Laine, and Robert Greenwald, "Does Money Matter? A Meta-Analysis of Studies of the Effects of Differential School Inputs on Student Outcomes," *Education Researcher* 23, no. 33 (1994): 5–14; and Alan B. Krueger, "Economic Considerations and Class Size," *Economic Journal* 113 (2003): F34–63.

41. Hedges, Laine, and Greenwald, "Does Money Matter?" (see note 40); and Eric A. Hanushek, "The Impact of Differential Expenditures on School Performance," *Educational Researcher* 18, no. 4 (1989): 45–65.

42. Barrow and Rouse, "Using Market Valuation to Assess Public School Spending" (see note 38); Jonathan Guryan, "Does Money Matter? Regression-Discontinuity Estimates from Education Finance Reform in Massachusetts," Working Paper 8269 (Cambridge, Mass.: National Bureau of Economic Research, 2001); Geoffrey D. Borman and Jerome V. D'Agostino, "Title I and Student Achievement: A Meta-Analysis of Federal Evaluation Results," *Educational Evaluation and Policy Analysis* 18, no. 4 (1996): 309–26; and David Card and A. Abigail Payne, "School Finance Reform, the Distribution of School Spending, and the Distribution of Student Test Scores," *Journal of Public Economics* 83, no. 1 (2002): 49–82.

43. Other recent papers on the effect of class size use "quasi-experimental" designs. For example, Joshua D. Angrist and Victor Lavy, "Using Maimonides' Rule to Estimate the Effect of Class Size on Scholastic Achievement," *Quarterly Journal of Economics* 114, no. 2 (1999): 533–75, use the nonlinearity in the determination of class size in Israel to identify an effect of class size, finding effects on the same order of magnitude as those reported by Boozer and Rouse, "Intraschool Variation" (see note 34); and Caroline Minter Hoxby, "The Effects of Class Size on Student Achievement: New Evidence from Population Variation," *Quarterly Journal of Economics* 115, no. 4 (2000): 1239–85, exploits variation in the size of the school-aged population in Connecticut to identify an effect of class size, finding that small class sizes have no effect on student achievement.

44. Alan B. Krueger, "Experimental Estimates of Education Production Functions," *Quarterly Journal of Economics* 114, no. 2 (1999): 497–531.

45. See, for example, Jeremy D. Finn and Charles M. Achilles, "Answers and Questions about Class Size: A Statewide Experiment," *American Educational Research Journal* 27, no. 3 (1990): 557–77; and Alan B. Krueger, "Experimental Estimates of Education Production Functions," *Quarterly Journal of Economics* 114, no. 2 (1999): 497–531.

46. Krueger and Whitmore, "The Effect of Attending a Small Class in the Early Grades" (see note 8). Others believe the evidence on a positive impact of school quality on subsequent educational attainment and earnings is not very strong. See, for example, the volume edited by Gary Burtless, *Does Money Matter? The Effect of School Resources on Student Achievement and Adult Success* (Brookings, 1996), for differing viewpoints.

47. David Card and Alan Krueger, "Does School Quality Matter? Returns to Education and the Characteristics of Public Schools in the United States," *Journal of Political Economy* 100, no. 1 (1992): 1–40.

48. Card and Krueger, "Labor Market Effects of School Quality: Theory and Evidence," in *Does Money Matter?* edited by Burtless, pp. 97–140 (see note 46).

49. For example, see Daniel Aaronson, Lisa Barrow, and William Sander, "Teachers and Student Achievement in the Chicago Public High Schools," unpublished manuscript, Federal Reserve Bank of Chicago (2005); and Eric A. Hanushek, Steve G. Rivkin, and John F. Kain, "Teachers, Schools, and Academic Achievement," *Econometrica* 73, no. 20 (2005): 417–58.

50. Another form of accountability targets the student. In this case, students are not permitted to advance to the next grade until they have demonstrated a predetermined level of proficiency in academic subjects. Evidence on these so-called no social promotion policies, however, is mixed. The best evidence comes from Brian A. Jacob and Lars Lefgren, "Remedial Education and Student Achievement: A Regression-Discontinuity Analysis," *Review of Economics and Statistics* 86, no. 1 (2004): 226–44, who study the introduction of such a policy in the Chicago public schools. They find that retention increases achievement for third graders but not for sixth graders.

51. See Martin Carnoy and Susanna Loeb, "Does External Accountability Affect Student Outcomes? A Cross-State Analysis," *Education Evaluation and Policy Analysis* 24, no. 4 (2002): 305–31; Melissa Clark, "Education Reform, Redistribution, and Student Achievement: Evidence from the Kentucky Education Reform Act," mimeo, Princeton University (2002); David Figlio and Cecilia Elena Rouse, "Do Accountability and Voucher Threats Improve Low-Performing Schools?" *Journal of Public Economics* 90, nos. 1–2 (2006): 239–55; Eric A. Hanushek and Margaret E. Raymond, "Does School Accountability Lead to Improved Student Performance?" *Journal of Policy Analysis and Management* 24, no. 2 (2005): 297–327; Walt Haney, "The Myth of the Texas Miracle in Education," *Education Policy Analysis Archives* 8, no. 41 (2000); and Brian A. Jacob, "Accountability, Incentives and Behavior: Evidence from School Reform in Chicago," *Journal of Public Economics* 89, nos. 5–6 (2005): 761–96.

52. Brian A. Jacob and Steven D. Levitt, "Rotten Apples: An Investigation of the Prevalance and Predictors of Teacher Cheating," *Quarterly Journal of Economics* 118, no. 3 (2003): 843–77.

53. Julie Berry Cullen and Randall Reback, "Tinkering toward Accolades: School Gaming under a Performance Accountability System," mimeo, University of Michigan (2003); David Figlio and Lawrence Getzler, "Accountability, Ability and Disability: Gaming the System?" Working Paper 9307 (Cambridge, Mass.: National Bureau of Economic Research, 2002); and Jacob, "Accountability, Incentives and Behavior" (see note 51).

54. David Figlio, "Testing, Crime and Punishment," *Journal of Public Economics*, forthcoming; and Jacob, "Accountability, Incentives and Behavior" (see note 51). It is worth noting that while these unintended consequences may have short-run benefits, it is unclear whether any of them would persist in the long run. If a

school increases its average test scores by reclassifying students, for example, it is unclear whether the school will continue to experience large gains in the future, as it can only gain by reclassifying new students.

55. Robert Bifulco and Helen F. Ladd, "The Impacts of Charter Schools on Student Achievement: Evidence from North Carolina," Working Paper SAN04-01 (Durham, N.C.: Terry Sanford Institute of Public Policy, 2004); Tim R. Sass, "Charter Schools and Student Achievement in Florida," mimeo, Florida State University (2004); and Eric A. Hanushek and others, "Charter School Quality and Parental Decision Making with School Choice," Working Paper 11252 (Cambridge, Mass.: National Bureau of Economic Research, 2005).

56. William Howell and Paul Peterson (with Patrick Wolf and David Campbell), *The Education Gap: Vouchers and Urban Schools* (Brookings, 2002).

57. Alan B. Krueger and Pei Zhu, "Another Look at the New York City Voucher Experiment," *American Behavioral Scientist* 47, no. 5 (2004): 658–98.

58. Cecilia Elena Rouse, "Private School Vouchers and Student Achievement: An Evaluation of the Milwaukee Parental Choice Program," *Quarterly Journal of Economics* 113, no. 2 (1998): 553–602; and John Witte, "Achievement Effects of the Milwaukee Voucher Program," mimeo, University of Wisconsin (1997).

59. Kim K. Metcalf and others, "Evaluation of the Cleveland Scholarship and Tutoring Program, Summary Report, 1998–2003," mimeo, Indiana University (2004).

60. Figlio and Rouse, "Do Accountability and Voucher Threats Improve Low-Performing Schools?" (see note 51).

61. Janet Quint and others, "The Challenge of Scaling up Educational Reform: Findings and Lessons from First Things First, Final Report," monograph (New York: MDRC, 2005); Jacob and Lefgren, "Remedial Education and Student Achievement" (see note 50).