The Urban Education Problem

Arthur O'Sullivan

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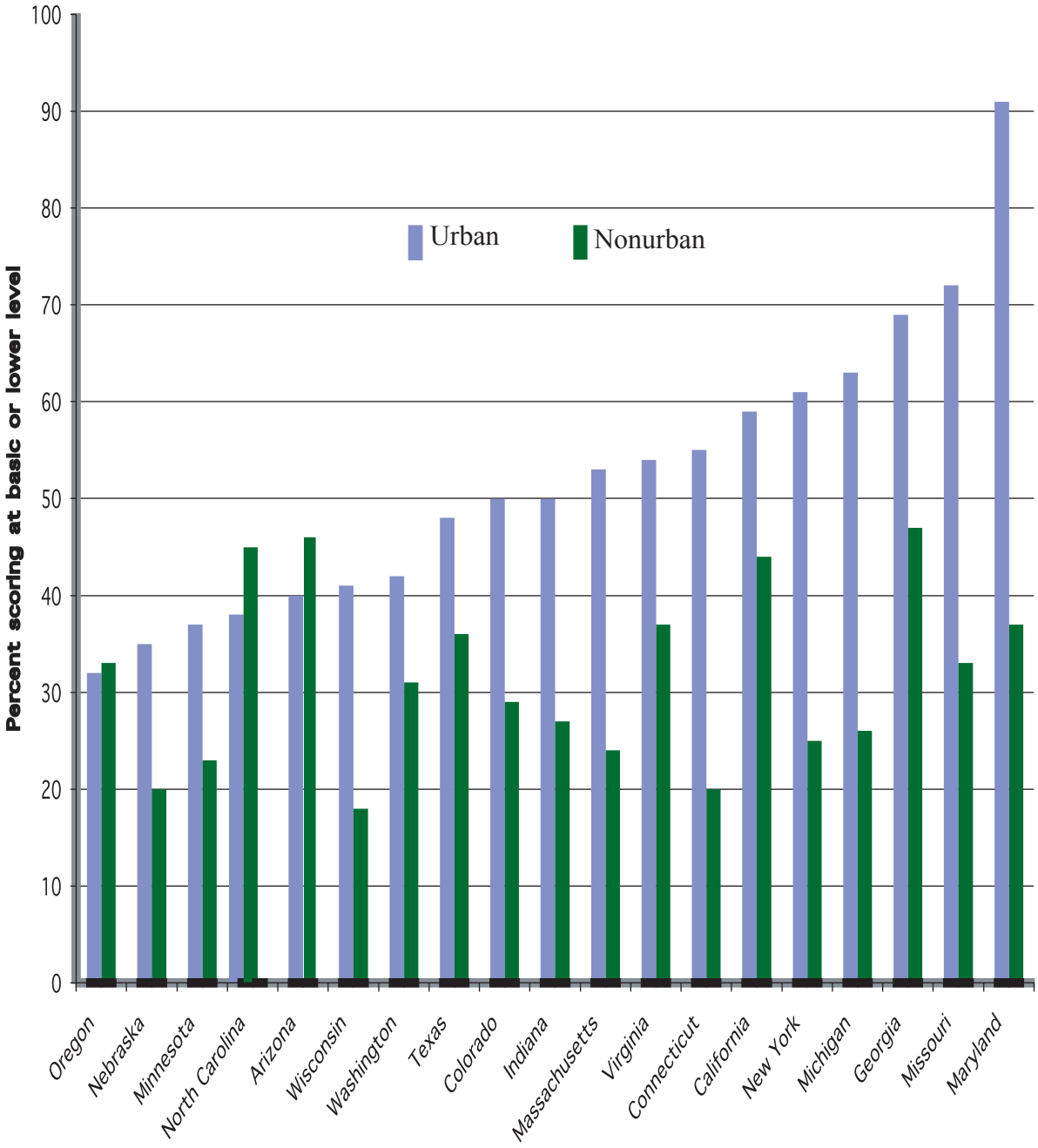
This chapter, drawn from the Fifth Edition of *Urban Economics* (McGraw-Hill/Irwin, 2003) explores the issues concerning urban education. The chapter explores the causes and consequences of low educational achievement in central cities. We know from earlier chapters that education is a key factor in determining a person's employment prospects and earnings potential. So it is not surprising that central-city neighborhoods with low levels of educational achievement also have high poverty rates and high crime rates. The urban education problem is that students in many central-city neighborhoods are poorly educated, contributing to the problems of poverty and crime.

We can use Figure 15-1 to compare educational achievement in central cities to achievement outside central cities. The figure shows the percentage of eighth graders who scored at or below the basic level on the NAEP math exam. The "urban" school districts are ones for which at least 75 percent of students live in central cities. For all but three states, a larger percentage of urban students score below the basic level, with substantial differences in many states. For example, in California 59 percent of urban students scored below the basic level, compared to 44 percent of nonurban students. The percentages are 61 percent and 25 percent for New York, 53 percent and 24 percent for Massachusetts, and 91 percent and 37 percent for Maryland.

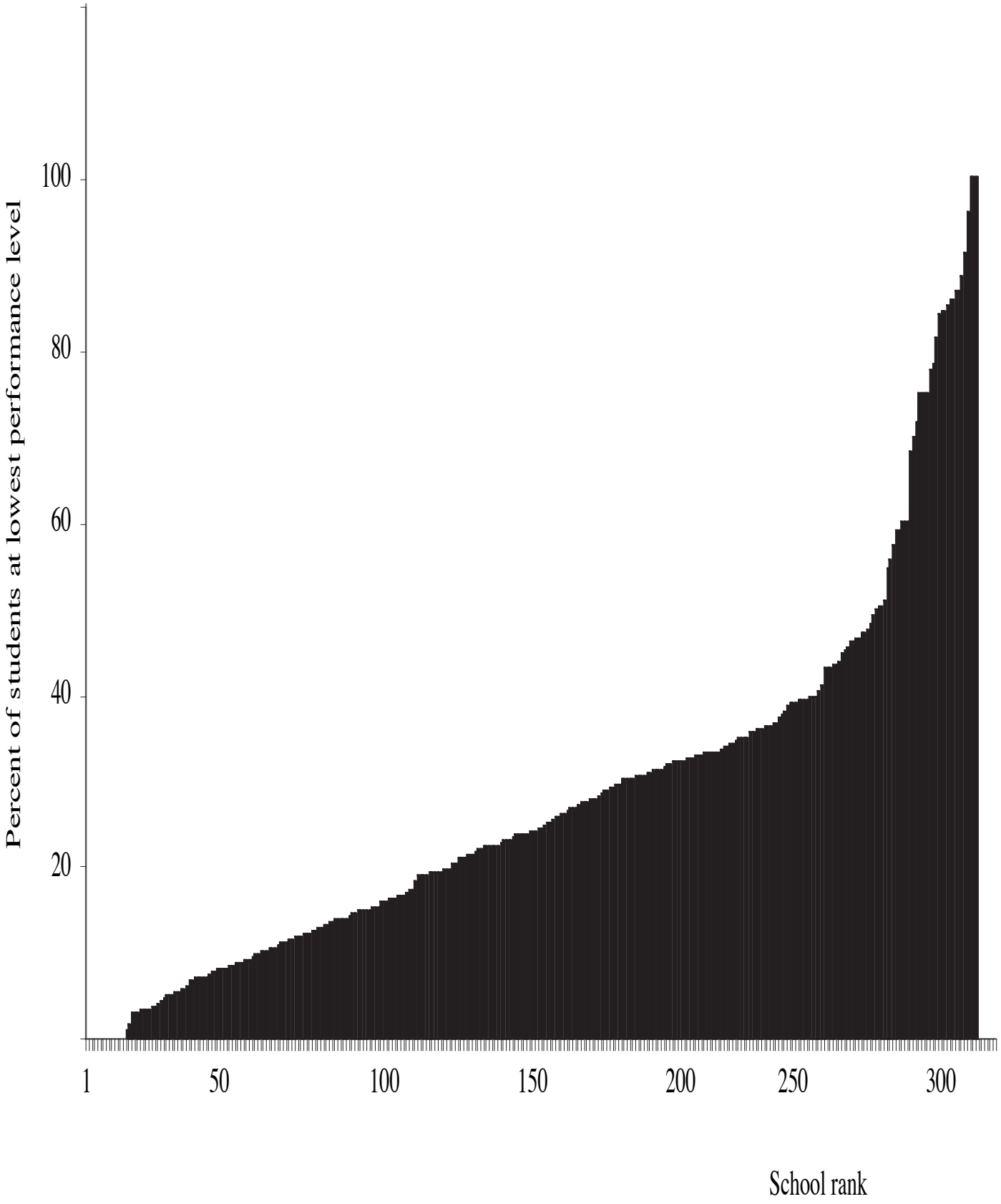
Figure 15-2 shows the differences in educational achievement within a particular central city, New York. The graph shows, for each of the city's 312 schools, the percentage of students in the lowest performance level. Starting with the highest ranked schools shown on the left side of the graph, for the top 128 schools fewer than 20 percent

Figure 15-1: Achievement in Urban and Nonurban Schools



Source: Education Week, Quality Counts 1998

Figure 15-2: Performance in New York City Schools



of students perform at the lowest level. At the other end, for the bottom 15 schools, more than 80 percent of students are at the lowest level. For the 32 lowest ranked schools, over half of students perform at the lowest level.

One measure of the educational attainment of a community is the share of the population that has graduated from high school. In Figure 15-3, the horizontal axis measures the percentage of the adult population that did not complete high school for the 95 neighborhoods in the Cleveland metropolitan area. Most of the neighborhoods with high dropout rates were in the central city. There was only one central-city neighborhood with a dropout rate less than 20 percent, and only 8 with dropout rates less than 30 percent. At the other end, there were 11 central-city neighborhoods with dropout rates above 50 percent. The vertical axis in Figure 15-3 measures poverty rates.

THE EDUCATION PRODUCTION FUNCTION

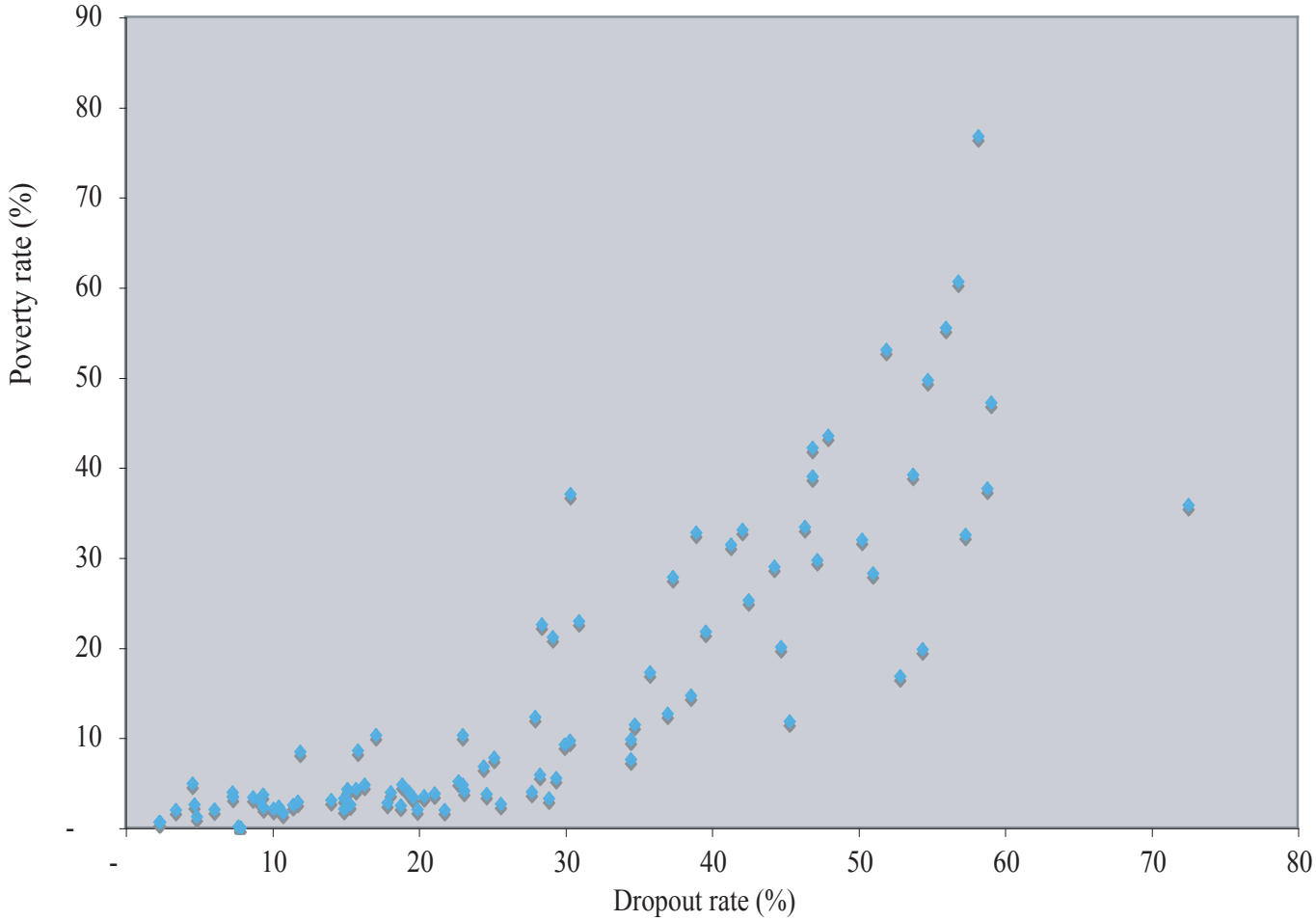
What determines the educational achievement of a particular child? The education production function provides a framework to address this question. The production function shows the relationship between inputs to the educational process and output (achievement). We can use the production function to estimate the relative importance of the various inputs to the education process.

Inputs and Outputs of the School

What is the output of a school? The purpose of education is to develop cognitive, social, and physical skills. The basic cognitive skills (reading, writing, mathematics, logic) are necessary for employment and participation in a democracy. These skills also increase the enjoyment of leisure activities: they allow people to read books, understand jokes, and compute bowling scores. Schools also develop social skills: they teach children how to exchange ideas and make group decisions. Finally, schools develop physical skills: they teach children how to exercise and play games.

Education is different from other production activities because the output (educational achievement) is difficult to measure. While tests have been developed to measure basic cognitive skills, it is virtually impossible to accurately measure social and physical skills. Consequently, any empirical study of schools can, at best, measure only

Figure 15-3 High School Dropout Rates and Poverty Rates



Source: Author's calculations based on data from Center for Urban Policy Research. http://povertycenter.cwru.edu

one component of the output of schools. Because empirical studies ignore social and physical skills, they provide an incomplete picture of the education process and must be interpreted with caution.

The production-function approach explores the contributions of different inputs to the cognitive achievement of students. Cognitive achievement is measured by scores on standardized achievement tests. Suppose that achievement is defined as the change in the test score of a particular child over a one-year period. If the output of the school is defined as the change in the test score, the production function can be written as

$$\text{Achievement} = f(C, E, T, S, H, P)$$

Achievement depends on several inputs: the school's curriculum (C) and educational equipment (E), the quality of the classroom teacher (T), class size (S), the home environment (H), and the achievement level of the child's classmates or peer group (P).

Consider first the inputs controlled directly by the school. Under the supervision of the local school district, the school designs a curriculum, purchases instructional equipment (e.g., building, books, science labs, computers) and hires teachers. Teachers vary in educational background, experience, and quality. The school also controls class size, and can increase the teacher input per student by reducing class size.

Consider next the role of the student's home environment. Educational achievement is influenced by the home environment of the child in three ways. First, parents set the rules of the household, establishing an environment that is either favorable or unfavorable to education. For example, an unfavorable environment is one in which children watch television instead of reading books or doing their homework. Second, parents can motivate their children by encouraging reading, helping with homework, and rewarding success. Third, parents can provide instructional materials such as books and home computers, encouraging independent learning. The quality of the home environment depends in part on the income and education level of the parents. The children of wealthy and educated parents learn more because they receive more encouragement and assistance at home, and also pick up verbal and quantitative skills in everyday interactions with their parents. In contrast, children from poor and less educated families learn less because there is often less encouragement to achieve, and less learning

from parents. In addition, children living in poverty are often malnourished, inhibiting their ability to learn.

Consider next the role of the student's peer group. A child learns more if he or she is surrounded by smart and motivated children. Smart peers promote achievement because of cooperation (children learn from one another) and competition (children compete with one another). Motivated peers promote achievement because the teacher can spend less time disciplining and motivating students, and more time teaching them. In addition, an unmotivated student provides an undesirable role model for other students.

Empirical Results

Dozens of studies have explored the relationship between educational inputs and output. The key question is, Which inputs are most productive in increasing educational achievement? There is widespread agreement that the most important factors are the home environment and the peer group. In general, the higher the income and education level of the parents, the better the home environment and the higher the child's educational achievement.

What about the effect of peer groups? The same parents who provide good home environments provide good peers as their child's classmates. As a result, educational achievement in a school is positively related to the average income and education level of the families patronizing the school. There is some evidence that the largest peer group effects are experienced by low achievers: the students at the bottom of the class have the most to gain from adding smart and motivated students to the class. There is also evidence that these peer effects are most important in the middle and upper grades (grades 5 through 12).

There is also agreement that teachers differ in their ability to teach students. In other words, teachers are not like blackboards, but vary in effectiveness. The most effective teachers are the ones that are smart, motivated, innovative, and flexible. A study of inner-city schools found that during a single academic year, a student with a high-quality teacher outperforms a child with a low-quality teacher by up to one full grade level (Hanushek, 1992). For example, consider a child who starts third grade at grade level 2.0, right on schedule. With a high-quality third-grade teacher, the child could move

up to grade level 3.2 by the end of the year and be ahead of schedule; with a low-quality teacher, the child could move up slightly, to grade level 2.2, and not be ready for fourth grade. More recently, Rivkin, Hanushek, and Kain (1998) provide evidence of substantial variation in teacher productivity, with the largest difference among math teachers.

Although teachers differ in effectiveness, the list of characteristics that makes a productive teacher has eluded researchers. The process of teaching requires subtle skills that cannot be easily measured, so it is difficult to predict which teachers will be the most productive. In looking for teacher characteristics that explain productivity differences, researchers have focused on education level (years of postgraduate study), communication skills (verbal ability), and experience (years of teaching). The results of the studies are as follows:

- **Education level.** There is no evidence that teachers who complete graduate courses in education are more productive than those who do not. It seems that students do not learn more from teachers with Master's degrees.
- **Verbal skills.** The most effective teachers have superior communication skills. Students learn more from teachers who score high on standard tests of verbal ability.
- **Experience.** There is mixed evidence concerning the effects of experience on teaching skills. Murnane (1975, 1983, 1985) suggests that teaching effectiveness increases for the first few years of teaching and then levels off. In contrast, Hanushek (1971, 1981) suggests that teaching skills are independent of teaching experience. Summers and Wolfe (1977) found that low achievers learn more from inexperienced teachers, while high achievers learn more from experienced teachers. More recently, Rivkin, Hanushek, and Kain (1998) have found evidence for rising productivity for just the first two years of a teaching career.

Until recently, the evidence concerning the effects of class size on achievement was mixed. Hanushek (1981) identifies 112 studies of the relationship between class size and achievement, and shows that 9 found a negative relationship, 14 found a positive relationship, and 89 found no significant relationship. Summers and Wolfe (1977) suggest that low achievers learn more in small classes, and high achievers learn more in large classes.

A series of recent studies provides evidence that class size matters, especially for low-income students. Rivkin, Hanushek, and Kain (1998), show that small classes improve educational achievement for low-income students, but not other students. Krueger (1997) shows that smaller classes increase achievement for students at all income levels, with the largest gains for low-income students. In a recent study of schools in South Africa, Case and Deaton (1999) show that smaller classes lead to higher achievement. In a study of high school students in Illinois, smaller classes were associated with higher graduation rates and a larger fraction of graduates attending college. Rouse (1998) shows that schools in low-income areas in Milwaukee that have relatively small classes have higher achievement levels in math and reading.

Do schools differ in their production of education? Rivkin, Hanushek, and Kain (1998) show that there are large differences among schools in their effects on student achievement. The difference are not related to leadership, organization, or financial conditions. Instead, the differences result from the impact of teachers. The most effective schools are the ones with the best set of teachers, not the best organization or instructional equipment.

Alternative Approach: School Resources and Market Earnings

The traditional studies of the education production function use test scores as a measure of the output of education. An alternative approach looks at the relationship between schooling and future earnings, using the wages earned by adults as a measure of the output of their earlier education. The production question is: Does the wage earned by an adult depend on the quantity of resources used in her K-12 education? For example, consider two adults who differ only in the class sizes they had during grade school. If school resources matter, we would expect the adult who had smaller classes to have a higher skill level and thus earn a higher wage.

Card and Krueger (1996) summarize the results of several studies that examine the relationship between school resources and earnings. There is evidence that school resources matter: students who were educated in schools with relatively high spending levels earn higher wages. The estimated elasticity of wages with respect to per pupil spending is about 0.15, meaning that a 10 percent difference in spending generates a 1.5

percent difference in wages. The elasticity of wages with respect to class size is about 0.07, meaning that a 10 percent difference in class size generates a 0.7 percent difference in wages. As Card and Krueger note, some studies suggest that the relationship between educational spending and wages is weak or nonexistent, so the issue has not been resolved.

Private versus Public Schools

We can gain some insights into the education production function by comparing public schools to private schools. In general, educational achievement is higher in private schools. Why?

According to Murnane (1986) differences in peer groups explain half the difference between achievement levels of public and private schools. To quantify the peer effect, he poses two questions.

> *How would the test score of the typical public-school student change if the student transferred from the public school to a private school?*

The answer is that the student's score would increase from 24.4 to 26.1. By transferring to a private school, the typical student would experience a 7 percent increase in achievement.

> *How would the test score of the typical public-school student change if the student, along with his public-school classmates, transferred from the public school to a private school?*

The answer is that the student's score would increase from 24.4 to 25.1, an increase of about 2.9 percent. If the student brings his public-school peers along with him to the private school, he experiences less than half the achievement gain that occurs if he leaves his public-school peers behind. The other half of the achievement difference is presumably caused by differences in curriculum, teachers, educational methods, and discipline. An important advantage of private schools is that they have more flexibility in expelling troublemakers.

More recent studies suggest that the differences in achievement between public and private schools are small, at least as measured by test scores. Goldhaber (1996) finds no difference in achievement between comparable students in public and private schools,

and Gamoran (1996) finds a very small advantage for students in private schools. Rouse (1996) found a small private-school advantage in mathematics, but no difference in reading.

Although the differences in achievement between public and private schools appear to be small, the differences in educational *attainment* may be large. Achievement is usually measured by test scores in a particular grade, while attainment is measured by the years of schooling. The key measures of attainment are high school graduation rates, college attendance rates, and college graduation rates. Neal (1997) found that urban minority students attending private (Catholic) high schools have much higher graduation rates than comparable students in public high schools. In addition, private-school students are more likely to get a college degree. These higher attainment rates translate into higher earnings after high school; on average, students who attend private high schools earn 8 percent more than comparable students who attend public schools (Neal, 1997).

SPENDING INEQUALITIES AND PUBLIC POLICY

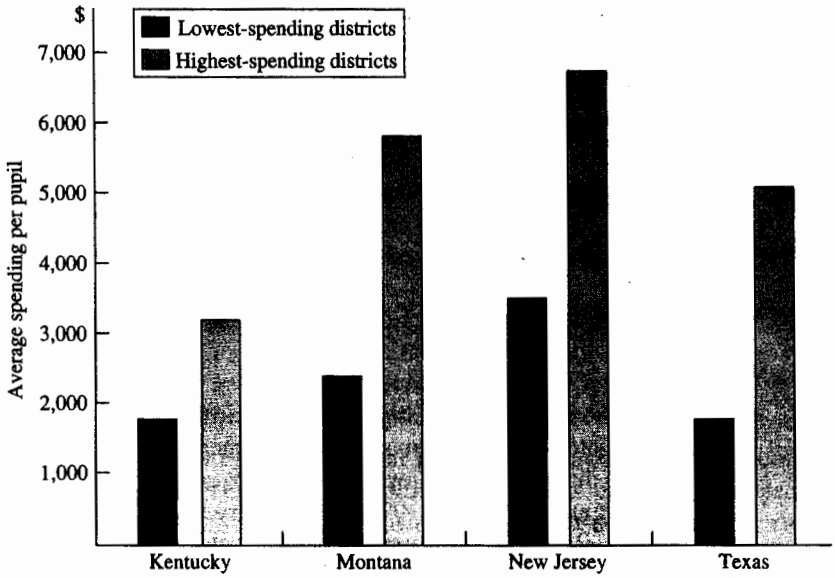
The property tax is the traditional funding source for local education. Property-tax bases varied from one school district to another, and this variation has contributed to spending inequalities. Starting in the 1970s, a number of court cases have challenged the traditional school finance system, leading many states to change their finance systems.

Figure 15-4 shows inequalities in education spending for four states whose education-finance systems were eventually declared unconstitutional and reformed. For each state, the taller bar shows the average spending per pupil in the 10 highest spending districts, and the shorter bar shows spending in the 10 lowest-spending districts. In three of the four states, the high-spending districts spent more than twice as much as the low-spending districts. In the 1980s, spending ratios above 1.5 were common in other states (Katz, 1991).

The Legal Mandate to Equalize Expenditures

In most states, education is considered a fundamental right, meaning that all citizens are to receive the same quality of education. In response to suits filed by parents against state governments, state courts found that inequalities in educational spending

FIGURE 15–4 Inequalities in Spending per Pupil in Selected States, 1986–1987



Source: Jeffrey Katz, "The Search for Equity in School Funding," *Governing*, August 1991, pp. 20–22.

violated the equal-protection clauses of state constitutions. The courts developed the **principle of fiscal neutrality:**

The quality of education may not be a function of the wealth of the local community.

In other words, children from poor school districts must receive the same quality of education as children from wealthy school districts. The courts also directed state governments to equalize spending on primary and secondary education.

The most frequently cited court case is *Serrano v. Priest,* decided in 1974 by the California Supreme Court. When John Serrano complained about the low quality of the local high school's education program, the school's principal suggested that Serrano move his family to a school district where per pupil spending was higher. Instead of moving, Serrano sued the state of California, arguing that spending inequalities were unconstitutional.

TABLE 15-1 Taxes and Spending in Baldwin Park and Beverly Hills

	Baldwin Park	Beverly Hills
Property value per student	$4,169	$49,501
Property tax rate	3.34%	2.55%
Educational spending per student	$272	$1,535

Source: James Guthrie, "United States School Finance Policy 1955-1980." In *School Finance Policies and Practices* ed. James Guthrie (Cambridge MA: Ballinger, 1980), p 14.

To illustrate the spending disparities, Serrano cited the differences between two school districts in the Los Angeles area, Beverly Hills and Baldwin Park. As shown in Table 15-1, Beverly Hills used its larger property tax base to spend more per student while charging a lower tax rate. In ruling in favor of Serrano, the court ruled that the property tax system violated the equal-protection clause of the state's constitution. The court ordered the state legislature to develop a financing system under which per pupil spending would vary by no more than $100.

Limits on Reform

Two court cases established the limits on education reform. In *McInnis v. Ogilvie,* the plaintiffs argued that the Constitution guarantees the right to equal educational *outcomes* rather than equal educational *spending*. They argued that government should eliminate inequalities in educational achievement, spending more on low-achieving students to bring them up to the level of high achievers. The court ruled against the plaintiffs, arguing that there was no practical way to enforce an equal-achievement standard. Given this decision, the objective of reform efforts has been to equalize spending, not achievement.

Another case, *San Antonio Independent School District v. Rodriguez,* established the limits for federal involvement in school finance. The court ruled that education is not a fundamental right guaranteed to U.S. citizens. This ruling was based on the fact that education is not mentioned in the U.S. Constitution. Consequently, the equal-protection clause of the Constitution does not apply to education, and variation in per pupil spending is not proscribed by the Constitution. There are two implications from the *San Antonio* decision. First, any reform of the school finance system must come from state governments, not the federal government. Second, although the court system may promote equalization of spending within individual states, the courts will do nothing to promote equalization of spending across states.

Foundation Grants

Most states use foundation grants to help narrow the gaps in education spending across school districts. The foundation grant per pupil is determined by the following formula:

Grant = Foundation level - Foundation tax rate • Local property value per pupil

Suppose a state picks a foundation level of $5,000 and a foundation tax rate of 1.5 percent (0.015). For a school district with $200,000 of local property value per pupil, the foundation grant is $2,000:

$$\text{Grant} = \$5{,}000 - 0.015 \bullet \$200{,}000 = \$2{,}000$$

In effect, the foundation grant equals the difference between the foundation level and the amount of money the school district could raise locally if it were to impose the

foundation tax rate. A district with a lower tax base will receive a larger grant; for example, a district with only $100,000 of property value per pupil would receive a grant of $3,500. Note that the foundation grant is independent of the school district's actual tax rate; it depends only on the local tax base and the state's foundation variables.

We can use a simple example to illustrate how a foundation plan affects the tax and spending options of a local school district. Table 15-2 shows spending options with different tax rates. The district has $200,000 of property per student, so per pupil spending increases by $2,000 for every percentage point of the property tax. One option is to pick a tax rate of 2.0 percent, which generates $4,000 of local revenue per pupil. If the foundation grant is $2,000, the district has a total of $6,000 per pupil. If the district picks a tax rate of 2.5 percent, it would collect an additional $1,000 in local revenue; because the grant doesn't depend on the district's tax rate, education spending increases by only $1,000.

TABLE 15-2 Tax and Spending Options under a Foundation Grant

Tax Rate	Local Tax Revenue	Grant	Education Spending
2.0%	$4,000	$2,000	$6,000
2.5	5,000	2,000	7,000

How does a foundation grant affect spending in the school district? As explained earlier in the book, a local school district is likely to pick the preferred budget of the median voter. Figure 15-5 shows the budget lines and indifference curves of Marian, the median voter. The horizontal axis measures per pupil education spending and the vertical axis measures spending on other goods. The budget line *BC* shows the initial trade-off between education and other goods: Marian has a total of $10,000 per pupil to spend on education and other goods and every dollar spent on education decreases spending on other goods by one dollar. Before the foundation grant, Marian maximizes utility at point *i* (Education spending = $4,000), and this is the point chosen by the local school district.

The foundation grant shifts Marian's budget line outward from *BC* to *BDF*. Point *D* is in the new budget set because Marian can use the $2,000 grant to get $2,000 worth

of education while spending all of her own money ($10,000) on other goods. The points along the line connecting *D* and *F* are in the new budget set; starting from point *D*, Marian faces a dollar-for-dollar trade-off between education and other goods. The shift of Marian's budget line moves the utility-maximizing point from *i* to *f* . In other words, the grant increases education spending by $400 (to $4,400) and spending on other goods by $1,600 (to $7,600).

How can the foundation grant increase spending on other goods? The district can fund its $4,400 education program with the $2,000 grant and only $2,400 of local tax revenue. The grant decreases the local contribution to education from $4,000 to $2,400, so the school district cuts local taxes by $1,600 and allow its citizens to spend that much more on other goods. From the perspective of local citizens, the foundation grant is equivalent to an increase in consumer income, which increases the demand for all "normal" goods, including education and other goods. By cutting taxes, the school district is simply responding to the demands of its citizens.

In principle, foundation grants can be negative for some wealthy school districts, meaning that a school district would transfer money to the state government. In our example, if a wealthy district has a tax base per pupil of $400,000, the foundation grant would be negative:

$$\text{Grant} = \$5{,}000 - 0.015 \bullet \$400{,}000 = -\$1{,}000$$

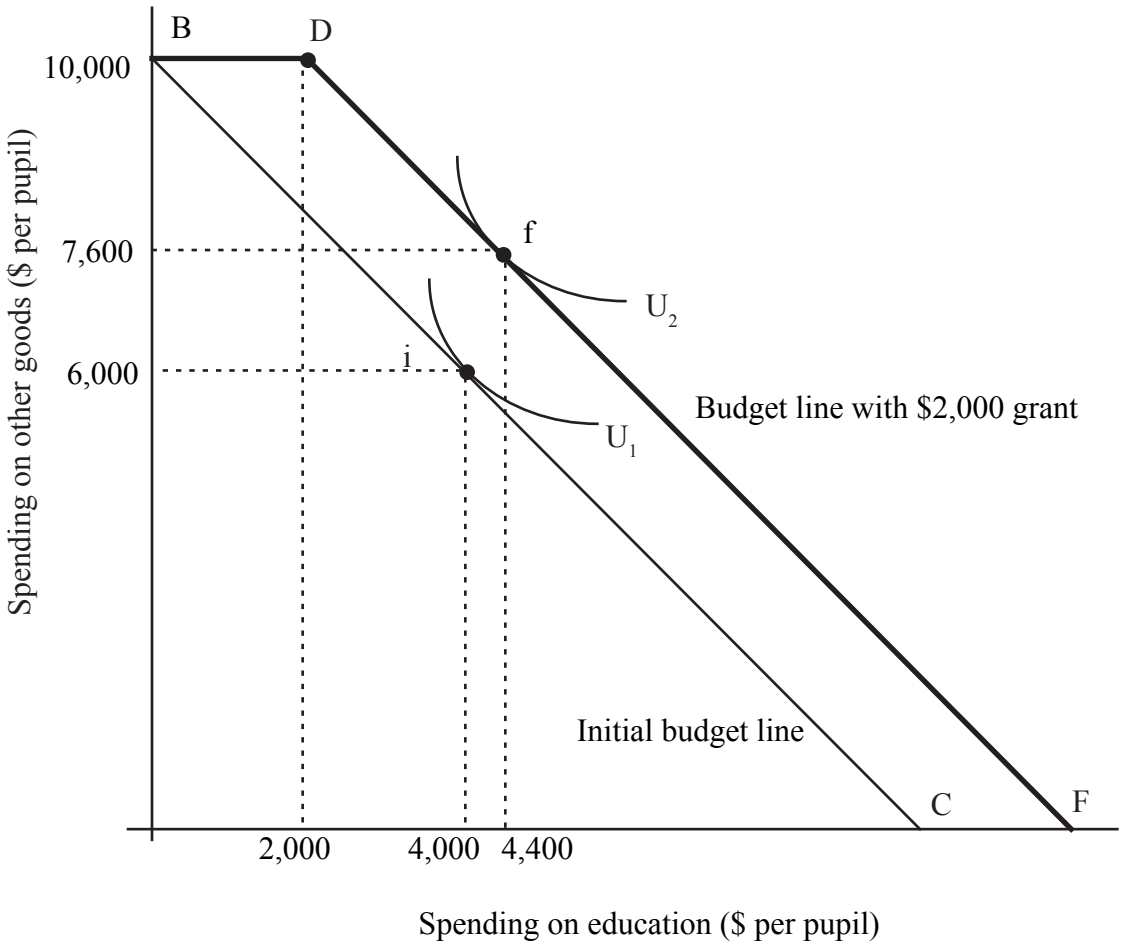
Under a pure foundation system, the district would transfer $1,000 to the state. The transfer would shift the budget line of the median voter to the left, decreasing the desired spending on education and other goods.

How does a foundation plan affect spending inequalities? The largest grants are given to the school districts with the lowest property values, so the greatest stimulus for education will occur in low-wealth districts. If the foundation plan is pure in the sense that high-wealth districts are taxed, education spending in these districts will actually decrease, and the spending gaps will narrow even more.

Guaranteed Tax Base or Power Equalization

A more aggressive approach to equalization involves an attempt to equalize the revenue-generating capacities of school districts. Under a **guaranteed tax base** (GTB)

Figure 15-5 Foundation Grant and Spending Per Student



A $2,000 foundation grant shifts the budget line of the median voter from BC to BDF, and the utility-maximization point moves from point i to point f. One fifth ($400) of the grant is spent on education, and the remaining four fifths is spent on other goods. The school district cuts its tax rate from 2.0 percent (raising $4,000 in local revenue) to 1.2 percent (raising $2,400), allowing citizens to spend part of the grant on other goods.

plan (a.k.a. **district power equalizing**), a state specifies a "guaranteed" tax base per pupil, meaning that each school district has access to the same *effective* tax base. The grant per pupil is determined by the following formula:

GTB Grant=Local tax rate • (Guaranteed tax base per pupil -Local tax base per pupil)

The tax base per pupil is the same as the property value per pupil. Once the state picks the guaranteed tax base, it's up to each school district to pick a tax rate, which then determines how much tax is collected locally and how big the grant is.

We can use a simple example to illustrate how a GTB plan works. Suppose the guaranteed tax base is $300,000 and the local tax base is $200,000, so the gap between the two tax bases is $100,000. Table 15-3 shows the implications of two different tax rates. With the lower tax rate (2.0 percent), the district raises $4,000 locally and gets a grant of $2,000, for a total of $6,000. With the higher tax rate (2.5 percent), local tax revenue is $5,000 and the grant is $2,500, for a total of $7,500. Because a tax-rate hike increases the grant as well as local tax revenue, the local cost of getting an additional $1,500 in school spending is only $1,000.

TABLE 15-3 Options under a Guaranteed Tax Base Plan

Tax Rate	Local Tax Revenue	Grant	Total
2.0%	$4,000	$2,000	$6,000
2.5	5,000	2,500	7,500

The GTB plan decreases the opportunity cost of spending on education. Before the grant program, there was a dollar-for-dollar trade-off between spending on education and other goods; every dollar spent on education required one dollar of local taxes, so every dollar of education decreased spending on other goods by one dollar.

Under the GTB plan, the trade-off is lower. In Table 15-3, increasing the tax rate from 2.0 percent to 2.5 percent increases local tax revenue by $1,000 (and decreases local spending on other goods by the same amount), but increases spending on education by $1,500. On average, the school district gets a dollar's worth of education by sacrificing about 67 cents' worth of other goods. In this example, the GTB plan is equivalent to a matching grant with a match rate of one-half; an additional $1,000 of local taxes increases the grant by $500.

How does the GTB plan affect the choices of the median voter? In Figure 15-6, the plan pivots Marian's budget line from *BC* to *BD*. The slope decreases because the grant decreases the opportunity cost of education spending from $1 to 67 cents. Marian chooses point *g* instead of point *i* , so school spending increases from $4,000 to $4,800. As in the case of the foundation plan, part of the GTB grant is spent on other goods, with spending on these goods increasing by $800. In this example, the GTB grant is split equally between education and other goods.

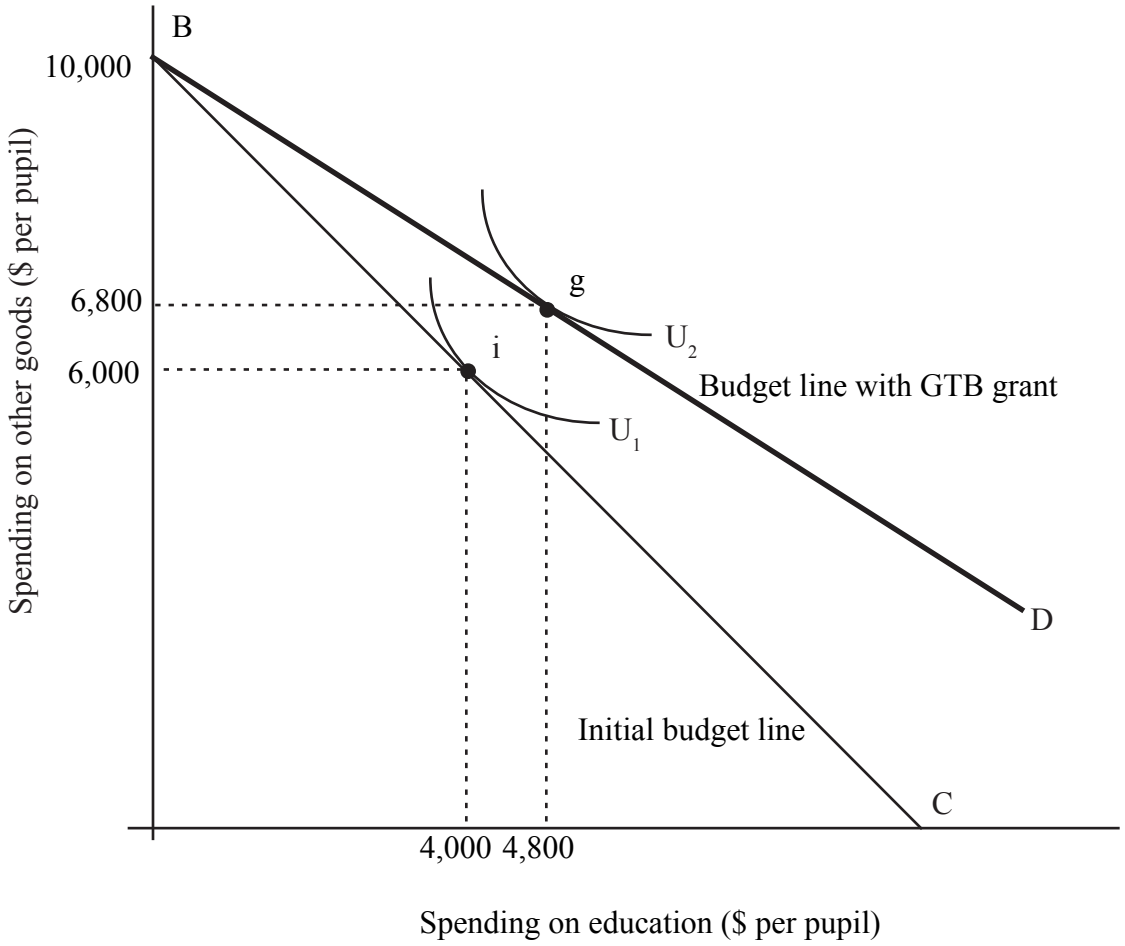
A GTB grant has a larger stimulative effect than a foundation grant because the GTB grant has both an income effect and a substitution effect. Like the foundation grant, the GTB grant increases Marian's real income, increasing her desired spending on all "normal" goods, including education (the income effect). The GTB grant also decreases the opportunity cost of education spending from $1 to 67 cents, causing Marian to substitute education for other goods (the substitution effect). In Figure 15-5, one-fifth of the foundation grant is spent on education. In Figure 15-6, one-half of the GTB grant is spent on education.

Under a pure GTB plan, wealthy districts would transfer money to the state government. If a district's tax base exceeds the guaranteed tax base, the local revenue will exceed guaranteed revenue, and the surplus revenue will go to the state. Since the district must transfer to the state a fraction of each dollar collected, the GTB plan increases the opportunity cost or price of education. In a wealthy district, the income and substitution effects of the GTB plan combine to decrease spending on education.
Would a pure GTB plan equalize spending on education? The GTB plan provides each school district with the same effective tax base. If every community chooses the same tax rate, education spending would be the same in all districts. If, however, communities chose different tax rates, spending inequalities would persist. Under a pure GTB plan, any remaining differences in education spending are the result of differences in chosen tax *rates,* not differences in tax *bases*.

Effects of Equalization Plans on Spending Inequalities

A recent study explored the changes in spending inequalities between 1972 and 1992 (Evans, Murray, Schwab, 1997). During this period, a total of 37 states reformed

Figure 15-6 Guaranteed Tax Base Grant and Spending Per Student



A GTB grant tilts the budget line of the median voter, reflecting the decrease in the opportunity cost of education spending. The utility-maximization point moves from point i to point g. Half ($800) of the grant is spent on education, and the other half is spent on other goods. The school district cuts its tax rate from 2.0 percent (raising $4,000 in local revenue) to 1.6 percent (raising $3,200), allowing citizens to spend part of the grant on other goods.

their school finance systems, with 16 of these states under court orders to reform their systems. In the states adopting court-ordered reform, state spending on local education increased by 22 percent ($437 per pupil). Local support of education didn't change much over the period, so the states' share of education funding increased from 44 percent to 52 percent.

In the states implementing court-ordered reform, spending inequalities decreased significantly. Spending per pupil increased in low-spending school districts, but didn't change much in high-spending districts, so reductions in inequalities resulted from "leveling up." For example, for a school district in the 25th percentile (25 percent of districts initially spent less per pupil), education spending increased by 27 percent. In contrast, spending in the median district increased by only 15 percent, and spending in the district in the 75th percentile did not change. Another study of equalization programs suggests that the degree of spending inequality decreased between 16 percent and 38 percent (depending on how one measures inequality).

What about the 21 states that reformed their education finance system without the pressure of court orders? The reform plans in most of these states were ineffective; they did not have significant effects on either spending per pupil or spending inequalities across school districts (Evans, Murray, Schwab, 1997). It appears that court mandates are necessary for real reform.

Michigan is the exception to the rule that real reform requires a court order. In 1993, the state eliminated the local property tax as a source of education funding. The elimination of the local property tax was combined with a moderate reduction in income taxes and a large increase in the sales tax (Courant and Loeb, 1997). The state now determines educational spending in all but the 28 wealthiest school districts. Spending per pupil increased in small rural districts, and decreased in poor urban areas and rich suburban areas. The other states with complete state control of school finance are California, Hawaii, Florida, and Wisconsin.

A recent study shows that the greatest disparities in education occur at the low end and high end of income distribution (Terman and Behrman, 1997). In 1990, schools in the wealthiest 10 percent of communities spent about 21 percent more per pupil than the national average. In contrast, schools in the poorest 10 percent spent 11 percent less

than the national average. Spending per pupil in the remaining 80 percent of households was within 6 percent of the national average. In other words, most of the spending inequality occurs in the poorest and wealthiest communities.

Education Finance Reform and Central City Schools

How did central-city schools fare under the reform of the education finance system? As explained earlier in the book, central-city schools have relatively high costs because a large fraction of their students come from poor families. These schools devote more time and resources to security measures, dealing with family and health crises, and trying to teach children who do not speak standard English and children with weak educational preparation. Because these schools have relatively high costs, they have above-average spending levels and do not benefit from equalization programs. In fact, some high-cost, high-spending districts actually do worse under equalization programs (Courant and Loeb, 1997; Duncombe and Yinger, 1997). If the formulas were modified to incorporate cost differences, some central-city school districts would receive two or three times as much grant money.

SCHOOL SEGREGATION AND DESEGREGATION

How segregated is the U.S. school system? In 1995, about two-thirds of black students attended schools that had a majority of minority students, and about one-third attended schools in which at least 90 percent of students were minorities. The figures for Hispanics are a bit higher; 74 percent were in minority-majority schools and 35 percent in schools where minorities made up 90 percent of the students. Segregation is most pronounced in urban schools. In the 10 largest school districts, white students comprised more than 22 percent of the student population in only one district (Institute on Race and Poverty, 1998). In 1995, the student body of the entire Chicago school district was only 11 percent white; the student body of Detroit school district was only 6 percent white.

There is also segregation inside schools. Under the ability-tracking system, students are segregated with respect to ability and achievement: the high achievers are put in one class and the low achievers are in another class. Because minority students

often are behind white students in the early grades, ability tracking in the later grades contributes to racial segregation within the schools.

Causes and Consequences of Segregation

What causes racial segregation in the schools? One reason for segregation is racial prejudice. Some white parents are unwilling to let their children be educated with racial minorities, regardless of the achievement level of the minority children (and their peer group effects). Others use race as a signal about the likely achievement level of students; if minority children have, on average, a lower achievement level, a simple way to produce a more favorable peer group is to exclude all racial minorities.

Racial segregation can be accomplished in a number of ways. The first approach is to use explicit segregation, a method used in many southern cities until the early 1970s. A more subtle approach, used by many northern cities, is to manipulate attendance boundaries to send most black children to predominantly black schools. The third approach is to set up neighborhood schools and let households sort themselves with respect to race: households interested in sending their children to white schools can move to wealthy suburban school districts that exclude most blacks. Sending children to private schools may increase segregation because many private schools are too expensive for minority households.

How does the educational achievement of blacks and Hispanics compare to that of whites? Here are some facts on educational achievement (Institute on Race and Poverty, 1998):

1. In grades K-6, 31 percent of urban black students had above-average reading scores, compared to 61 percent for urban white students.
2. In grades K-6, 38 percent of urban black students had above-average math scores, compared to 67 percent for urban white students.
3. In grades 9-12, 31 percent of urban black students had above-average scores on standardized math tests, compared to 65 percent for urban white students.
4. In grades 9-12, 29 percent of urban black students had above-average scores on reading achievement tests, compared to 67 percent for urban white students.

Court-Ordered Desegregation

The courts have outlawed both methods of segregation. In *Brown v. Board of Education of Topeka* (1954), the Supreme Court declared that explicit racial segregation is unconstitutional. This *Brown* case reversed *Plessy v. Ferguson* (1896), which established the constitutionality of "separate but equal" schools. The *Brown* decision required the desegregation of schools only in areas where local governments pursued a policy of explicit segregation. Most of the cities forced to desegregate their schools under the *Brown* decision were in the South.

The mandate for desegregation was extended in the 1970s to northern cities that used attendance boundaries and other subtle techniques to promote segregation (Clotfelter, 1979). The courts ordered several large northern and western cities to desegregate their schools. The objective was to integrate the schools to the extent that would have occurred in the absence of earlier government policies that had encouraged segregation. In other words, the courts did not require the cities to develop truly integrated school systems, only ones in which government policy had a neutral effect. The segregation that results from the individual location choices of households (the Tiebout shopping process) is considered constitutional.

How did white households respond to forced desegregation? One of the lessons from the history of desegregation policy is that it often increases rather than decreases segregation. There are powerful forces behind segregation that are not neutralized by court-ordered desegregation, and households can counteract desegregation plans by moving to another school district. In the South, many central cities had marbled spatial distributions of households: black areas were interspersed within white areas.

The cities used explicit segregation to send whites and blacks living in the same area to different schools. When the courts outlawed explicit segregation, many central-city white families moved to the predominantly white suburbs to keep their children in all-white schools.

Clotfelter (1979) examined the various responses to desegregation in Baltimore and Atlanta and came to the following conclusions:

- The fleeing of whites to the suburbs decreased the demand for central-city housing and decreased housing prices. In stable neighborhoods, the price of

central-city housing decreased by about 4.7 percent for a 10 percent increase in the proportion of blacks in local public schools.

- Families with school-age children were the most likely to move to the suburbs when central-city schools were integrated.

The same phenomenon occurred in other cities that used busing to integrate their schools; some white households moved from desegregating school districts to predominantly white school districts.

Another possible response to desegregation plans is to switch to private schools. Clotfelter (1976) hypothesizes the following relationship:

$$E = f(S, I, B)$$

where E =Proportion of white students enrolled in private schools; S =Family size; I =Household income; and B =Percentage of public-school students who are black. Using data from Mississippi, he showed that white enrollment in private schools increases with the number of blacks in the neighborhood public school. The relationship is especially strong when black enrollment in the neighborhood public school exceeds 50 percent. For B less than 50 percent, a one-unit increase in B (one percentage point increase) increased E by 0.40 percentage points; for B greater than 50 percent, a one-unit increase in B increased E by 2.8 percentage points. In other words, the tipping point (where the relationship between B and E suddenly becomes much stronger) is about 50 percent.

EDUCATION IN CENTRAL CITIES

We started this chapter with the facts on the relatively low educational achievement of children in central cities. The production-function approach provides some insights into why the educational achievement in central cities is so low.

The first reason for low achievement in central cities is household sorting. As we saw earlier in the book, households tend to sort themselves with respect to the demand for local public goods such as public safety and education. Because the demand for local public goods is relatively income-elastic, sorting for these goods causes sorting with respect to income. Similarly, because local public goods are financed in part by the property tax, households sort with respect to housing demand, and thus with respect to income. In addition, households base their residential location decisions in part on school

peer groups, and this encourages sorting with respect to income and education level. In terms of the education production function, low-income neighborhoods will generally have less favorable home environments and peer groups, so educational achievement in the schools will be lower.

A second reason for lower achievement is that it costs more to produce education in central cities. The large number of low-income households in central cities make the delivery of an education program more costly, so a given budget generates less in terms of student achievement. Given the problems associated with a less favorable home environment and peer group and higher costs, what is the role of public policy?

Increase Spending in Central Cities

One policy option is to increase the funding for central-city schools. The simplest approach would be to adjust equalization formulas to account for the higher production costs of central cities. A more aggressive approach would be to increase spending in central cities beyond the level required to equalize real spending across schools. Given the powerful influence of home environments and peer groups, equalizing educational spending will not equalize educational achievement.

What would be the most efficient way to spend additional money for central-city schools?

- **Hire better teachers.** As shown by the studies of the education production function, teachers vary in their effectiveness, and a central city that used extra money to hire better teachers would experience an increase in achievement.
- **Reduce class size.** As we saw earlier in the chapter, there is evidence that smaller classes have higher achievement levels, with the largest gains in achievement for low-income students.

In both cases, spending more money in central-city schools could partly offset the disadvantages associated with coming from a low-income family in a low-income neighborhood.

Education Vouchers

Should the government subsidize students who attend private schools? Under a pure education-voucher system, each child would be issued a voucher or coupon that could be used to pay for either public or private schooling. The face value of the voucher would be equal to the current cost per pupil for public schools (for example, $5,000), allowing a family to choose either the public school or a private school charging up to the public cost per pupil. The school would collect vouchers from its patrons and redeem them from the state government. To qualify for the voucher program, a school would teach basic cognitive skills and civics, and admit students without regard for race, sex, or religion.

Would a voucher plan increase educational achievement? The advocates of education vouchers view the public-school system as an inflexible and inefficient monopoly. They argue that vouchers would make private schools competitive with public schools and thus force public schools to compete with private schools for students. One possible consequence is that public schools would be more concerned about efficiency and more responsive to parental concerns. If so, achievement could increase, even for the students who remain in public schools.

The opponents of vouchers suggest that wider school choice is likely to increase segregation with respect to income, race, and academic ability. Although a parent who receives a voucher can pick any school--public or private--not all parents will exercise this option. The experience with school-choice programs suggests that parents with the most education and the highest incomes are more likely to switch schools (Levin, 1997). The children in these families are above-average in terms of achievement and parental involvement, so the movement of these children to other schools makes the peer groups at their original schools less favorable. As a result, students of low socioeconomic status will have less favorable peer groups and thus lower educational achievement and attainment.

A recent study of vouchers generates some predictions about the effects of vouchers on different types of students (Epple and Romano, 1998). The study assumes that private and public schools are equally effective, and that peer group effects are important in educational achievement and parental choices. The simulated effects of a

$2,000 universal voucher system (covering only part of the cost of private schools) are as follows.

1. The share of students in public schools drops from 90 percent to 70 percent.
2. A large number of high-ability students switch from public schools to private schools, and the average ability level of public schools drops by about 16 percent.
3. There is a large per capita benefit for high-ability, low-income students, most of whom switch to private schools and benefit from a more favorable peer group.
4. There is a small per capita loss for low-ability, low-income students, most of whom stay in public schools and suffer from a less favorable peer group.
5. The total gains experienced by high-ability students exceed the total losses of low-ability students by a small margin, so there is a net gain in achievement.

Targeted Vouchers for Low-Income Families

Most of the proposals for education vouchers provide vouchers for low-income families only. In recent years, there have been experiments with income-targeted vouchers in Milwaukee, Cleveland, New York, Dayton, and Washington, D.C. By targeting low-income families, the voucher programs do not cause the sort of income segregation that would occur with a universal program. In fact, if the face value of the voucher is high enough, it would encourage private schools to accept more low-income students, promoting integration rather than segregation.

How do targeted vouchers affect achievement? Using data from Milwaukee, Rouse (1998) shows that students in the voucher program experienced faster gains in math test scores, but no differences in reading scores. One fascinating result of the Rouse study is that low-income students attending special public schools with reduced classes did just as well or better than the students in the voucher program, who attended private schools. The students in small public classes had about the same gains in math scores, but larger gains in reading scores. Since the private (voucher) schools had smaller classes than the regular public schools, this suggests that the achievement advantage of voucher (private) schools comes in part from their smaller classes.

One of the arguments in favor of vouchers is that they would increase competition between schools and thus increase student achievement. Achievement will increase if

competition causes schools to invest in the most productive inputs to the education production function. As shown by Rivkin, Hanushek, and Kain (2000), most of the differences between schools is explained by differences in the quality of teachers, not by differences in school organization or other education resources. What really matters is teachers, so vouchers could increase achievement if the greater competition for students causes schools to hire better teachers.

Another input that affects achievement is class size. As we saw earlier in the chapter, students in smaller classes have higher achievement levels, with the largest gains for low-income students. Of course, it costs money to reduce class size. If the benefits associated with smaller classes exceed the cost, then reducing class size is an efficient way to increase achievement. The question is, Will the competition fostered by vouchers result in smaller classes and higher achievement?

SUMMARY

1. The production function summarizes the relationship between education inputs and achievement. The most important inputs are the home environment, the peer group, and teachers.
2. Teacher productivity increases with verbal skills and with the first few years of experience, but is unaffected by graduate education.
3. Achievement increases as class size decreases, with the largest achievement gains for low-income students.
4. Education spending varies considerably across school districts, a result of differences in desired spending and property tax bases.
5. A foundation grant is negatively related to the district's tax base per pupil. The grant would increase spending on education and decreases taxes, so households can spend part of the grant on other goods.
1. 6. Under the guaranteed tax-base (GTB) plan, every school district has access to the same effective tax base. The pure version of GTB would decrease spending inequalities by a relatively large amount because it would have both an income and a price effect.

6. Under a voucher system, each child is issued a coupon to pay for either public or private education. The limited experience with vouchers suggests that achievement will increase in some subjects, with smaller class sizes playing an important role.

EXERCISES AND DISCUSSION QUESTIONS

1. According to Summers and Wolfe (1977), low achievers learn more in small classes and with inexperienced teachers, while high achievers learn more in large classes with experienced teachers. Why?

2. Consider a school district that can hire teachers from a large pool of applicants that differs in their verbal abilities and the number of credit hours of graduate study in education. Under the current salary structure, a teacher's annual salary increases by $100 for a one-unit increase in credit hours and increases by $200 for a one-unit increase in verbal ability.

a. Use the available empirical evidence to draw the education isoquant, with verbal ability on the horizontal axis and graduate credit hours on the vertical axis.

b. Show the cost-minimizing combination of verbal ability and graduate education and explain your choice.

3. The objective of the state of Egalitaria is to equalize educational opportunity (defined as the same average achievement level in every school). Comment on the following: "To achieve its objective, the state must equalize educational spending (spending the same amount per student in every school)."

4. Your task is to predict the effects of a state's foundation plan on the school district and the state budget. The foundation tax rate (t) is 2 percent, and the foundation level is $6,000. The income elasticity of demand for education is +1.20.

a. Fill in the blanks in the table that follows.

Tax base per pupil	$200,000
Initial spending per pupil	$4,000
Tax rate	_____
Foundation grant	_____
Initial income of median voter	$20,000
(Percentage change of median-voter income)	_____

New (post-grant) spending per pupil _____

Local contribution to education (per pupil) _____

New tax rate _____

b. If the school district has 1,000 students, how much does the foundation plan cost the state?

c. What is the bang (increase in education spending) per buck of the foundation grant?

5. Compute the price elasticity of demand for education given the following facts: (*i*) the local school district has a property value per student of $300,000; (*ii*) the state's guaranteed tax-base (GTB) is $400,000; (*iii*) as a result of the GTB plan, the school district increases spending per student from $4,000 to $4,200.

6. As the budget analyst for a state government, your task is to estimate the fiscal impact of a guaranteed tax-base plan. Assume the following: (*i*) price elasticity of demand for education is -0.80; (*ii*) The guaranteed tax base is $400,000; (*iii*) the typical school district has 100 students, a property tax base of $300,000 per student, and initially spends $3,000 per student. Compute the effects of the GTB on the following:

a. Spending per pupil.

b. The local contribution to education (per pupil).

c. The state contribution to education (per pupil) and the total budgetary cost of the GTB plan.

d. The bang (increase in education spending) per buck (budgetary cost).

7. Use the median-voter model (explained) to predict the effects of desegregation on spending (per pupil) in public schools. Will spending increase or decrease?

8. One of the criticisms of a voucher program for education is that it would increase spending inequalities and achievement inequalities. Design a new voucher plan that would narrow--rather than widen--spending and achievement differences across schools. How would you change the conventional voucher proposal to decrease spending and achievement inequalities?

9. Consider Creditland, a state that recently implemented a system of income tax credits for private schools. The characteristics of the state and the program are as follows: (*i*) Each family has one child in school; (*ii*) The government spends $4,000 on each child in

the public schools; (*iii*) tuition in private schools is $3,500; (*iv*) the tuition tax credit is 50 percent of private-school tuition.

a. What additional information do you need to compute the fiscal effects of the tax-credit program?

b. Make up some numbers and compute the fiscal effect.

c. Choose the word in parentheses that makes the following statement correct and then explain your choice: "The net budgetary cost of the tax-credit plan increases as the price elasticity of demand for private education (increases, decreases) in absolute value."

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