The Changing Distribution of Education Finance: 1972 -1997

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I. Introduction

In his best-selling book *Savage Inequalities* (1991), former school teacher Jonathon Kozol offered a searing indictment of the American system of public education, painting a bleak portrait of inner-city students in over-crowded classrooms and dilapidated buildings. He contrasted them with suburban students who attended well-funded schools with large campuses, modern scientific equipment, and highly-paid and well-trained faculty. Inner-city students, Kozol told us, were often fortunate to graduate from high school; in sharp contrast, students from suburban schools were not asked if they will attend college, but where.

These extremes, according to Kozol, were a result of the decentralized structure of education in the U.S. As we show in Section II, the Federal government provides only seven percent of all of the funds devoted to K-12 education. The states and the nearly 16,000 school districts each provide roughly one half of the rest. The local districts rely heavily on the property tax, a cornerstone of the U.S. education system. Kozol argued persuasively that funding local schools through local property taxes was inherently unfair because large disparities in tax bases across school districts lead inevitably to large differences in spending.

In this paper we show that while significant inequality remains, we have in fact made a great deal of progress in reducing some of the glaring disparities Kozol described. In Section III of this paper, we look at several measures of inequality in spending across school districts. All of these measures follow a similar pattern. All show a sharp decline in inequality through 1982. As the recession took hold, inequality increased between 1982 and 1987. Inequality stayed fairly constant between 1987 and 1992; two measures showed slight declines and two measures showed small increases in inequality. Since 1992, however, all measures show a dramatic drop in inequality. School spending is now distributed much more equally

than in the early 1970s. Depending on how we measure inequality in school spending, we find that inequality fell by 20 to 35 percent between 1972 and 1997.

We also focus on the role of the states in reducing inequality in school spending. We argue in Section III that the states have assumed a much larger role in education finance over the last 25 years (in part as a response to court-ordered school-finance reform). We show that state aid for schools is designed to offset differences in local spending. As we describe in more detail below, we calculate the within-state Gini coefficient for education revenues for each state in 1997. Next, we consider a "counterfactual" where each state leaves its total education expenditure unchanged but distributes these funds equally on a per student basis to each district. Under this counterfactual, we then calculate a synthetic Gini coefficient. Comparing the two Gini coefficients, we see that inequality is much lower under the current system, indicating that states actively redistribute resources to lower-spending districts.

We argue that state courts played an important role in reducing inequality in school spending. As we show in Section IV, a long string of court cases, beginning with *Serrano v. Priest* in 1971, have challenged the constitutionality of local funding of public schools. Opponents of local funding for primary and secondary schools have now brought cases in 43 states. By 1999 the courts had overturned the school finance system in 19 states. In this paper we argue that successful litigation has three important implications for school finance. First, we find that court-mandated education-finance reform reduced within-state inequality significantly. Depending on the way we measure inequality, our results imply that reform in the wake of a court decision reduced spending inequality within a state by anywhere from 16 to 38 percent. Second, as a result of court-ordered reform, we found that spending rose by an estimated 11 percent in the lowest-spending school districts, by 7 percent in the median district, and remained roughly constant in the highest-spending districts. Therefore, court-ordered reform reduced inequality by raising district spending at the

bottom of the distribution while leaving spending at the top unchanged. Third, finance reform caused states to increase spending for education and leave spending in other areas unchanged, and thus by implication states fund the additional spending on education through higher taxes. As a consequence, the state's share of total spending rises as a result of court-ordered reform.

We have focused primarily on the distribution of education dollars across districts. But the concern is not only dollars but also the education resources those dollars can purchase. We show in Section V that this distinction is important. We argue that while the gap in spending between rich and poor schools has shrunk, important differences in education inputs persist. We show, for example, that the qualifications of teachers, access to computers, and class size vary systematically across socioeconomic groups.

II. The Changing Level of Education Finance and Spending

We focus on the distribution of education resources across schools and over time throughout the paper. We will often define education resources as current education expenditures deflated by a broad measure of prices -- the consumer price index (CPI). Although this is the standard practice in the education literature, there are however, several limitations to using a general price index. For example, indexes such as the CPI or the GDP deflator tend to understate the rising costs of educational inputs because the indices do not take into account the fact that education and other service sectors have to raise salaries to compete successfully with other sectors for workers. But education and other labor-intensive sectors, as Baumol (1993) explains, do not benefit as much as the rest of the economy from technological change. Because the CPI understates the rise in costs, adjusting spending by the CPI leads to an overestimate of the growth of real resources. The resulting error could be very large.

Rothstein and Miles (1995), for example, develop an index that measures inflation in the service sectors in their study of the growth of school spending. They find that real education spending defined according to their measure rose roughly 40 percent less then real expenditures based on the CPI.

While we are sympathetic to these concerns, given the goals of this paper we do not think the limitations should substantively change our research methodology. The goal here is to find the appropriate deflator to measure the growth of inputs. The Baumol argument therefore seems to be irrelevant here. The following example makes this point clear. Compare two sectors of the economy, A and B. Both produce output with a single input, labor. Suppose the wage rate doubles and the labor force remains unchanged in both sectors. Labor productivity (and therefore total factor productivity since labor is the only input) doubles in A but is unchanged in B. As a consequence, output doubles in A but remains constant in B. The cost index doubles in both industries. The appropriate index to measure output is halved in A and remains constant in B, but this is irrelevant if we are trying to measure inputs.

We would agree, however, that the CPI is far from the perfect measure. A better measure would look specifically at input prices in education. Since labor costs represent roughly 55 percent of the total cost of education, this means that a better measure would incorporate changes in the necessary wage to attract "constant quality" teachers. This is a difficult problem to tackle. There have been profound changes in the market for teachers. The vast majority of K-12 teachers are women and labor market opportunities for women have expanded dramatically over the last 40 years. As a consequence, as Corcoran, Evans, and Schwab (2002) find, the most capable women are now far less likely to enter teaching; almost certainly, schools

would have to offer significantly higher wages to attract the same quality teachers they once did.[1]

With these qualifications in mind, Figure 1 presents real per pupil revenues for K-12 education from the 1971/72 through the 1998/99 school years. The data are aggregated from all school districts in the country and amounts are reported in real 1992 dollars. These data are taken from the National Center for Education Statistics *Digest of Education Statistics.* The top line of the graph represents total revenues from all sources; the lower lines report the cumulative expenditures from Federal, state, and local government.

There are a number of important trends illustrated in Figure 1. First, per pupil spending rose from just over $3,800 in 1970 to just under $7,000 in 1998 and thus real revenues per student nearly doubled during this 28-year period. The rise in spending over the past 30 years continues a trend established late in the 19th century; Hanushek and Rivkin (1997) examine the growth in school spending over the last 100 years and show that real expenditures per student (in 1990 dollars) quintupled every 50 years, from $164 in 1890, to $772 in 1940, and $4,622 in 1990.

While real expenditures on education have doubled in the past 30 years, academic performance has not kept pace with revenues during this time period. Scores on the National Assessments of Educational Progress (NAEP) exams, commonly referred to as the "Nation's Report card," show that between 1973 and 1999 math scores for 9, 13, and 17 year olds have risen by only 5.9, 3.8, and 1.3 percent, respectively.[2] Scores on the NAEP reading exams for these three age groups over the 1971-1999 period have only increased by 1.9, 1.6, and 1.1 percent, respectively.[3] Not all outcomes show such

[1] Using any broad national deflator, such as the CPI, assumes implicitly that differences in the cost of providing education across schools at a point in time are small. We return to this issue below.
[2] http://nces.ed.gov/nationsreportcard/mathematics/trendsnational.asp.
[3] http://nces.ed.gov/nationsreportcard/reading/trendsnational.asp

small gains over this period. Among those aged 25-29, high school completion rates have increased from 78 percent in 1971 to 88 percent in 2000.[4] Similarly, increasing numbers of high school graduates are entering college immediately after high school. In 1972, about half of all high school graduates enrolled in a 2- or 4-year college immediately after high school; by 1999, this number had risen to 63 percent.[5]

Many have interpreted the disconnect between education spending and test scores as evidence that there is something fundamentally wrong with the education system (see, for example, [Niskanen, 1991]). Others have challenged this view. Rothstein and Miles (1995) and others, as we explained above, argue that this standard measure of real resources is misleading because the cost of education has risen faster than the Consumer Price Index would suggest. Lankford and Wyckoff (1995) find that much of the higher spending in New York (and presumably in other states as well) is attributable to increased demands for special education. We cannot add much to this debate, but we note that real resources, as they have traditionally been measured, have risen significantly.

Hanushek and Rivkin (1997) offer some interesting insights on the growth in per student revenues in the post-1970 period. They show that as a result of the baby bust, enrollment in public schools fell from roughly 45.5 million students in 1970 to 40.4 million in 1990.[6] Even though the number of students fell 11 percent during this period, the number of teachers actually rose by about 16 percent.[7] In the 1980 to 1990 period, they show that the average teacher salary rose by about 27 percent. Hanushek and Rivkin go on to note that much of the change in the size of the instructional staff is related to a growing special education population.

[4] http://www.nces.ed.gov/programs/coe/2001/section3/indicator31.html
[5] http://www.nces.ed.gov/programs/coe/2001/section3/indicator26.html.
[6] http://www.nces.ed.gov/pubs2001/digest/dt038.html.
[7] http://www.nces.ed.gov/pubs2001/digest/dt065.html.

The source of education revenues also changed dramatically over the last 30 years. The states now play a much larger role in education finance than they once did. In the early part of the 20th century, nearly 80 percent of revenues were from local governments. By the mid 1940s, the local share of revenues had fallen to about 60 percent.[8] In Figure 1, we graph the share of revenues for K-12 education from Federal, state, and local government sources in the 1970-1998 period. As that figure illustrates, in 1970, local governments were responsible for about 53 percent of K-12 revenues, while the state share was less than 40 percent. By the 1998/99 school year, states were now largest funding source for K-12 education providing roughly half of all resources. We will delay until later a discussion of why the states have taken a larger role in education finance.

The Federal government has always played a small role in education finance and that role has not changed much over time. Although there has been an increase in the real dollars the Federal government provides to education (57 percent over the 1970-1998 period) the share of resources coming from the Federal government has actually declined from 8.4 to 6.8 percent over this period.

III. The Changing Distribution of Education Expenditures and Revenues

There are about 16,000 school districts in the United States. Given the variety in the size, demographic composition, and wealth of people in these school districts, it is not surprising that there is also considerable heterogeneity in what some districts are willing and able to spend on K-12 education. In this section, we describe the changing distribution of education spending over the past 25 years.

Although we can obtain estimates of the aggregate level of spending for each school year, estimates of the distribution of spending across districts are available only for

[8] http://www.nces.ed.gov/pubs2001/digest/dt158.html.

limited periods. Our primary data source is the U.S. Census Bureau's *Census of Government School System Finance (F33) File*. The *Census of Governments* is conducted in years that end in a 2 or 7, and the F33 file contains data on district revenue, expenditures, and fall enrollment from all of the more than 16,000 public school districts in the United States. We have used data from the 1972 through 1992 surveys in the past (Evans, Murray and Schwab, 1997; Murray, Evans and Schwab, 1998) and in this paper, we extend our analysis to include information from the 1997 *Census of Governments*.

Combining data from more than 16,000 school districts from 50 states over a 25-year time period required a significant amount of editing in order to obtain consistent measures of school resources. In this section, we define the sample used in our study. The data edits are described in detail in our previous papers and are only briefly outlined here. Given the differences in costs of operating primary and secondary schools, we limited out analysis to only unified school districts, which are districts that provide K-12 education. More than 90 percent of all public school students are enrolled in unified school districts.[9] Similarly, only regular operating districts are included in the sample.

School districts raise part of the money they spend by levying their own taxes. They rely heavily on the local property tax, but also generate revenues from other sources such as income and sales taxes and fees. In addition, virtually all districts receive at least some funds from state and Federal governments. Because the *Census of Governments*' treatment of those funds has changed over time, we will not try to separate Federal and state funds. Thus, what we call money from the states is actually the sum of money from the states and the Federal government. It is unlikely

[9] This definition of unified districts encompasses districts that offer kindergarten, pre-kindergarten and some vocational programs in addition to elementary and secondary education.

that this decision will seriously distort our results since, as we argued above, the Federal government's contribution to public education has always been small.

In analyzing per pupil revenue data at the district level, we detected some extremely large and small values. These values could be valid, but it is more likely that some districts incorrectly reported enrollments or revenues.[10] Finally, we delete all districts in some states. Data from Montana and Vermont were dropped from the sample because these states have virtually no unified districts.[11] We deleted data from Hawaii because it has a state-based system and the District of Columbia because it is the sole system in the jurisdiction. Data for Alaska were also dropped. The final sample has data for over 10,000 districts from 46 states for 6 years. In 1997, these districts represent 91 percent of the pupils in the United States.

In the first rows of Table 1, we present data on the source of per pupil revenues for our selected sample of unified districts in 46 states. The results from this analysis mirror the numbers in Figure 1. Specifically, our sample shows rapidly rising real revenues per student and a shrinking share of revenue from local governments.

The second panel in Table 1 presents several measures of inequality in district spending. All of these measures rise when spending inequality rises.[12] The ratio of the 95th percentile in per pupil spending to the 5th percentile in spending is a simple ranking that treats transfers to the top or bottom of the distribution the same; changes in spending in the rest of the distribution do not change the 95 to 5 ratio. Changes throughout the distribution of spending contribute to the values of the coefficient of variation, the Theil index, and the Gini coefficient. The Theil index gives

[10] For example, because of differences in the way districts count regional vocational high school students, some Pennsylvania districts under-report enrollments (McLoone et al, 1981, p. 165).
[11] There are some unified districts in Vermont, although most districts are composed entirely of either elementary or secondary grades. In addition, Vermont communities bordering New Hampshire send some of their public school students Vermont to private schools.
[12] See Berne and Stiefel (1984) for a thorough discussion of the properties of measures of equity in public school resources.

more weight to changes in the tails of the distribution; it is attractive in part because it is relatively easy to decompose the Theil into disparity in spending between and within states.

All of the inequality measures in Table 1 follow a similar pattern. They show a sharp decline in inequality through 1982. As the recession took hold, inequality increased between 1982 and 1987. Inequality stayed fairly constant between 1987 and 1992; two measures showed slight declines and two measures showed small increases in inequality. Since 1992, however, all measures show a dramatic drop in inequality. In aggregate, inequality in school spending across districts in the U.S. is now much more equal than in the early 1970s. The Gini, 95/5 ratio, coefficient of variation, and Theil index fell by 20, 23, 35, and 30 percent, respectively.

The next two panel of Table 1 breaks spending inequality into two components: inequality due to differences in spending within states and inequality due to differences across states. This panel of Table 1 makes a number of interesting points. We find that between-state inequality is much larger than within-state inequality. In nearly all years, variation across the states represented about two-thirds of the total variance in per pupil spending whereas within-state inequality accounted for about a third of total national variation in inequality. Between-state inequality has also been the source of much of the decline in national inequality in spending. Between 1972 and 1997, declining between-state differences in spending accounted for about 70 percent of the reduction in the Theil index over this period. The time-series patterns of the between- and within-state Theil index are, however, not very consistent. The within-state Theil index was roughly flat from 1972-1992 and then dropped sharply between 1992 and 1997.

Table 2 offers further evidence on the dramatic decline in between-state inequality in the 1990's. This table lists the 10 states (in our sample of 46 states) with the lowest per student revenues in 1992. The last column of this table ranks each of those states

in terms of the growth rate in revenues over the 1992-1997 period. Table 2 shows that spending in initially low-spending states rose sharply. In particular, it shows that eight of the ten lowest spending states were among the ten states with the largest increases in spending. Given those patterns, it is not surprising that between-state inequality has fallen as dramatically as it has.[13]

The large fluctuations in the between- and within-state measures of inequality are happening in a time period when nearly all measures of income inequality were rising monotonically. In the final rows of Table 1, we report real median household income and the national measure of the Gini coefficient for median household income. While most measures of spending inequality were declining by 20 to 30 percent, household income inequality at the national level, as measured by the Gini coefficient, was increasing by about 15 percent. Notice as well that some of the losses in median household income experienced during the 1980s were nearly erased by 1997, but real median household income was lower in 1997 than in 1992.

A. Variation in the Cost of Education Across Districts

We would like to adjust our data on school resources using a measure that consistently adjusts spending for differences across districts and over time. There are several alternative cost indices but none are available before 1987. We therefore limit our investigation to the impact of these adjustments on the level and the disparity in per pupil resources at a point in time, 1992.

We use three indices to adjust for differences in the cost of real education resources: the Barro index, Chamber's Teachers' Cost index (TCI), and McMahon and Chang's Cost of Living index (COL). All three develop separate cost indices for urban

[13] Table 2 should be interpreted cautiously because of the possibility that it reflects, in part, a "reversion to the mean." That is, if part of education spending is random, and random events are uncorrelated over time, then on average large increases in spending will follow low spending.

and non-urban districts in each state; in some states, separate indices for the largest urban areas are also available. The Barro measure is an index of average teacher salaries that adjusts for teachers' education level and experience. Because a given district can influence teachers' wages by hiring only candidates with graduate degrees, this measure would overstate the adjustment necessary for purchasing power parity among districts. The TCI measure adjusts for regional variations in the cost of living and amenities. This measure removes the impact of within-state differences by adjusting for district level characteristics that, unlike average teacher's educational attainment or tenure, are not subject to district control. Finally, the McMahon and Chang index is a geographic index that only controls for the differences in housing values, income, and population growth across districts; the McMahon and Chang index yields the smallest inflation adjustment.[14]

Table 3 summarizes our attempts to adjust for cost differences between metropolitan and non-metropolitan school districts in 1992. The first column gives the unadjusted estimates and the remaining columns give the estimates using the Barro, TCI and COL indices. After controlling for the higher costs associated with urban school districts, we find a noticeable decline in our measures of inequality. For example, the 95th to 5th ratio and the coefficient of variation decrease between 10 to 20 percent, respectively; the Theil index falls by 16 percent (COL) to 37 percent (Barro).

[14] While these cost indices are the best available, it is not clear that they successfully capture the full difference in the costs of education across districts. Ideally, a cost index would account for the difference in wages that a central city school district would have to offer in order to attract teachers with the same qualifications, ability, and training that wealthy suburban districts attract. We suspect that these indices do not capture those differences and that it is therefore likely that they overstate the resources available to central city students. The available indices look at differences in the cost of inputs, but do not address variation in student needs; see Duncombe, Ruggiero, and Yinger (1996) for an important discussion of this issue.

The second panel of Table 3 breaks revenue inequality into inequality due to differences in revenue within states and inequality due to differences across states, and thus parallels our decomposition of expenditure inequality in Table 1. The cost of living adjustments change our view of the magnitude of differences in revenue between states, but within-state Theils do not change appreciably. The cost-adjusted between-state Theils are 20 to 40 percent lower than the unadjusted Theils. Once we account for differences in costs, we find that differences in revenue between states accounts for 53 to 60 percent of the total disparity in per pupil resources in the United States; when we do not adjust for cost differences, between-state inequality accounts for 66 percent of total inequality.[15]

B. The Role of the States

All state governments provide aid to local school districts and, as we showed in the previous section, the share of revenues coming from the states has increased over time. Depending on how these resources are distributed, state revenues can either increase or decrease inequality across districts. In this section we show that state aid reduces inequality in education across districts and that the growing roles of the states in education finance can explain much of the changes in within-state inequality that has occurred over the past 25 years.

Before we begin, it is helpful to look at the policies states use to distribute funds to local school districts. These aid programs vary across states, but fall into three broad categories--flat grants, equalization grants, and full state funding. Flat grants are lump sum payments to districts that are independent of the district's ability to pay for education or the district's actual expenditures. Flat grants were once the major

[15] We were also able to re-estimate our decomposition using the individual district TCI available from the National Center of Education Statistics. The results of that decomposition are very similar to the estimates in Table 3; 57 percent of the overall inequality as measured by the Theil index is due to differences in resources between states.

source of state funds in many states, but they have become far less popular over time. In 1971, 10 states used flat grants as their primary funding mechanism. By 1994, however, only North Carolina distributed funds simply on a per pupil basis.

Foundation grants are equalization grants that are designed to guarantee that every district in a state receives at least a specified minimum level of funding. Under a foundation grant, the state establishes a minimum uniform tax rate and determines the ability of districts to raise the minimum amount given their tax base. State aid then fills the gap between the minimum acceptable level and the amount a district could raise under the minimum uniform tax rate. As Thompson, Wood, and Honeyman (1994) show, foundation grants are the most popular school finance plan; in 1991, 38 states relied in whole or in part on foundation grants.

District power equalization (DPE) programs allow all districts to act "as if" they all had the same tax base per student. More specifically, under a DPE the state would choose a tax base per student V. If district j sets a tax rate t_j and has a tax base V_j, it will raise t_jV_j from local sources, receive state aid of $t_j(V - V_j)$ and thus spend t_jV on education.

The last type of system is full state funding. Hawaii is the only state that explicitly has a fully state-funded system. The changes in education finance in California, Florida, Wisconsin, and Michigan have implicitly made their states' finance system fully state funded.

In Figure 3, we graphically illustrate the impact of state funding of education on inequality in school resources. For each state in 1972, we calculated the within-state Gini coefficient in education revenues. Next, we consider a "counterfactual" where each state leaves the total amount they provide to school districts unchanged, but distributes these funds equally on a per student basis such as would occur under a flat-grant system. For example, suppose a state has two districts, both districts have the same number of students, the first district receives $1,500 per student from the

state, and the second receives $500; in our counterfactual, each district would receive $1,000. We then ask in our counterfactual, how much inequality would we see? In Figure 2, we graph the actual within-state Gini coefficient on the vertical axis and the flat-grant counterfactual on the horizontal axis. All points that lie below the 45-degree line are states that would have higher measures of inequality had they distributed resources evenly on a per student basis. The fact that nearly all points lie below the 45-degree line indicates that on average, states actively redistribute resources to lower-spending districts.

Interestingly, part of the reduction in the within-state inequality of education spending has been generated by the fact that states have become more redistributive over time. We can see this in two additional figures. In Figure 3, we redo the analysis from Figure 2 using 1997 data. As in the previous figure, the vertical axis is the actual Gini coefficient in within-state student revenues while the horizontal axis is the synthetic Gini that would arise if local spending stayed the same but states redistributed money equally to all districts on a per student basis. Notice that more states now lie below the 45-degree line than in 1972, indicating the Gini would be much higher under a flat-grant system than actual spending. Notice also that the vertical distances between the points below the 45-degree line and the line itself are now much larger than before, again indicating more redistribution.

This final point can be seen more clearly in Figure 4. In this graph, we let G^a_{is} be the actual Gini coefficient in year i (1972 or 1997) for state s and let G^c_{is} be the counterfactual Gini that would arise under a flat-grant system. The difference in these terms $D_{is} = G^c_{is} - G^a_{is}$ represents a measure of how much states redistribute resources. In Figure 4, we graph the degree of redistribution in 1997 on the horizontal axis and the same number for 1972 on the vertical axis. Points below the 45-degree line represent states that have become more redistributive over time. The bulk of the points lie below the 45-degree line.

The impact of state spending on the distribution of resources can also be illustrated in a simple table. Previous work has established that the amount districts raise locally to pay for K-12 education is correlated with observed characteristics of the population. Districts with higher average incomes, a better educated population, and fewer minorities raise more funds locally on a per student basis than other districts (Rubinfeld, Shapiro and Roberts, 1987; Rubinfeld and Shapiro, 1989; Hoxby, 1998; Poterba, 1997; and Harris, Evans and Schwab, 2001). These results are illustrated in Table 4 where we report average per pupil revenues by quartiles of the fraction of children in poverty within the school district and the fraction of minority students within the school district. The percent of children in poverty is taken from the Census' *Small Area Income and Poverty Estimates, School District Estimates* for 1997. The fraction of minority students is provided by the *Common Core of Data, Public Elementary/Secondary School Universe Survey Data 1999-2000*. The data were then merged into the 2000 *F33* data set that reports revenues by source at the school district level.

In the first column of the table, we report average local revenues per pupil weighted by school district enrollment for each quartile of the distribution. Notice that as we move from the districts with the lowest to highest quartile of children in poverty, there is a monotonic decline in per pupil revenues from $5,045 to $2,700. In the second column, we add local and state per pupil revenues together and as a result, a large fraction of this difference is erased. Now, the poverty/spending relationship is not monotonic, but there is still a $1,000 difference in per pupil revenues between districts with the lowest and highest quartile of percent poverty.

The degree to which states and the Federal government redistribute resources can be demonstrated more formally in a regression context. Specifically, if we regress local spending on district demographic characteristics, we should find that wealthier, more educated, and higher income districts spend more on education. Given the

redistributive nature of state and local education finance, we should see the opposite relationship when we turn to state revenue.

To implement this simple analysis, we need a detailed data set with both district-level education finance and demographic characteristics. Harris, Evans, and Schwab (2001) used just such a data set and we utilize that sample here. The data set from that paper is a national panel of public school districts for 1972, 1982, and 1992. The panel was created by merging six national school districts data sets: the *1970 Census of Population and Housing Special Fifth-Count Tallies*, the *1980 Census of Population and Housing Summary Tape File 3F*, the *1990 Census School District Special Tabulation, School District Data Book*, and the *1972, 1982,* and *1992 Census of Governments: School Districts.* The merging process was complicated by identification codes and district names that changed across the six data sets, in addition to the district consolidations and divisions during the 22-year period.[16] The merging procedure is described in detail in Harris (2000). Our sample is similar in spirit to the one used by Hoxby (1996), the first to construct a panel of school districts from these data.

The balanced panel consists of about 9,000 of the roughly 16,000 unified, elementary and secondary school districts in the 48 continental states and the District of Columbia. We lose district observations from the panel for three reasons. First, the 1972 demographic data provide individual school district records only for districts with populations greater than one thousand. We estimate that there are roughly 3,800 districts in 1972 that are eliminated because of this sample restriction. The inability to match districts to financial data or across all three decades resulted in the loss of approximately 780 districts. Finally, the removal of districts with exceedingly

[16] For a complete discussion of the construction of the data used in this research please refer to Amy Rehder Harris, "Data Chapter: The Construction of a National Public School District Panel," University of Maryland, October 1999, www.bsos.umd.edu/econ/evans/wkpap.htm.

high or low data for financial or demographic variables eliminated approximately 670 districts. Despite having only two-thirds of all districts in our balanced panel, we have data for the vast majority of students. In each year the school districts in our sample represent roughly 90 percent of all students in the nation. Consequently, it is no surprise that the means of key variables by year for the full sample of districts and for our balanced panel, when weighted by enrollment, are quite similar. The school finance data in this district-level data set were constructed according to the procedures in Murray, Evans, and Schwab (1998).

With this data set, we estimate a model that examines the correlates of local, state, and total revenues per pupil at the district level. The dependent variable is district level per pupil revenues in a particular year (1972, 1982 or 1992) for each revenue source. The demographic covariates in the model include characteristics about the population who live within school district boundaries such as the fraction nonwhite, the fraction Hispanic, the fraction of adults with less 12 years of education, the fraction of adults with 12-15 years of education, the fraction in poverty, the fraction who own homes, and median household income. In each model, we include district fixed effects to account for any unobserved, permanent differences in preferences for education services or costs between school districts that alters per pupil revenues. We include state-specific year effects to account for changes in school finances that are correlated at the state level over time (such as the finance reform movement we discuss later).

The results from these regressions are listed in Table 5. In the first column, we report results for local revenues per pupil. Because most of the variation in per pupil local revenues is between districts, our use of district fixed effects generates a high R^2. We replicate most of the stylized facts from previous work; per pupil local revenues are lower in districts with a higher fractions of blacks, Hispanics, poorly educated adults, renters, and poor people. All of these coefficients are precisely estimated and the

estimated magnitudes are qualitatively important. Using the distribution of the covariates across districts in 1992, a two standard deviation increase in the fraction black, Hispanic, in poverty, and owner occupied homes is estimated to reduce per pupil local revenues by $408, $624, $199, and $369, respectively.[17] The change in local revenues generated by income changes is even more dramatic. The standard deviation in household income across districts in 1992 is $11,000. A one standard deviation increase in median household income is expected to raise local spending by about $650.

In the second column of Table 5, we use the same specification but change the dependent variable to per pupil state and Federal revenues. In all cases, the signs on the demographic characteristics in this model are the opposite of what they are in the local revenues regression. Thus, the states redistribute resources to local districts that, a priori, we would expect to raise less funds locally. For many of the variables, the coefficient on the demographic variable in the state revenue model is roughly the negative of the coefficient in the local revenue model. It is no surprise then that when we re-estimate the model using total revenues per pupil (the third column of Table 5), we find that in five of the seven cases the coefficients on the demographic variables are statistically insignificant and quantitatively unimportant. Although the coefficient on median household income is statistically significant, the coefficient is small. In 1992, there is a $35,000 difference in the district with the 5th to the 95th percentile in median household income, but this movement would only generate a change in total per pupil revenues of about $280.

The degree to which states redistribute resources is so large that there is very little difference in the raw means in school spending across districts with very different students. Using our district-level data set, we weight district observations by the

[17] In 1992, the standard deviation of the fraction black, Hispanic, in poverty, and owner occupied homes across districts in our sample were 0.12, 0.11, 0.08 and 0.10, respectively.

number of enrolled students in a certain demographic group and then calculate the means. This procedure generates a mean for an average student picked randomly in the population. So, for example, in the first row of Table 6, we report the mean expenditures per student for the white and nonwhite students. Notice that in 1972, the average white student was in a district that only spent $56 more per student than the average nonwhite. By 1992, average spending was actually lower for whites than for nonwhites. These results suggest that expenditures on the average white student are roughly the same as those for the average black student.

In the next two panels of Table 6, we report similar calculations but use district characteristics to define groups. In the second panel, we divide districts by quartiles of within-district median household using the national distribution to define the quartiles. Notice that in 1972, districts in the highest quartile of median household income spent about 40 percent more than districts in the lowest quartile -- a difference of almost $900 per pupil. Between 1972 and 1992, spending in both groups increased rapidly, but the increase was much faster in poorer districts. In 1992, the districts in the highest quartile were still spending over $800 per pupil more than in lowest quartile, but the relative difference fell to 20 percent.

Although there is a difference in spending across higher and lower income districts, there is little if any difference in the average pupil-teacher ratio. In the right-side of the table, we generate estimates of the pupil-teacher ratio by merging information from the employment section of the *Census of Governments* with our balanced panel of districts for 1972, 1982, and 1992. Notice that when we weight the data by the number of white and nonwhite students in the district, there is virtually no difference in the pupil-teacher ratios between these groups in any year. By 1992, the average white student was in a district with higher pupil-teacher ratios than the average nonwhite student. We should provide the caveat that these estimates use district-level

measures of teachers and students and abstract from any within-district and within-school variation in class assignment.

The convergence of pupil-teacher ratios between white and black students was first noted by Boozer, Krueger, and Wolkon (1992). They use a number of new data sources to track the changing level of education resources in black schools since the Brown vs. Board of Education decision. Boozer, Krueger, and Wolkon report pupil-teacher ratios from 1915 through 1989 for 17 states and the District of Columbia that had legally segregated schools before the Brown decision. In 1953-54, just prior to the Brown decision, the pupil-teacher ratio for white students was 27.6 but 31.6 for blacks, a difference of 4.0 students. By 1966, the authors note the average difference in pupil-teacher ratios for blacks and whites had fallen to just 2.1. Using data from the *Common Core of Data* in 1989, the authors report average pupil-teacher ratios of 18.1 for blacks and 18.3 for whites.

In contrast to the variation in expenditures that exists between wealthier and poorer school districts in all years, there are actually more students per teacher in wealthier districts than in poorer districts. In 1972, this difference was one half of a student but rose to six tenths of a student in 1992.

IV. Education Finance Reform

The property tax is a cornerstone of the U.S. education system, accounting for more than 96 percent of total tax revenue in independent school districts.[18] This share is below 90 percent in only three states (Kentucky, Louisiana, and Pennsylvania). The emphasis on the property tax lies at the heart of a long string of court cases that have challenged the constitutionality of local funding of public schools. Critics have often argued that the property tax is inherently unfair because

[18] Independent districts are not part of a municipality or county government.

large disparities in tax bases across school districts lead inevitably to large differences in spending. In the landmark 1971 case *Serrano v. Priest*, the California State Supreme Court declared the state's public school finance system unconstitutional. In the *Serrano* case, the plaintiffs' attorneys showed that Beverly Hills spent more than twice as much per student as Baldwin Park, a low-income community 25 miles east of Los Angeles. Because of Beverly Hills' larger tax base, however, its school property tax rate was less than half of Baldwin Park's (Fischel 1996). The court ordered the state to develop a system where school support did not depend on district wealth, i.e., a system of fiscal neutrality.

Litigation in other states soon followed. California is one of 43 states where opponents of local funding for primary and secondary schools have challenged the constitutionality of the public school finance system. By 1999, the courts overturned systems in 19 states. In response to court orders, state legislatures implemented or revised equalization formulas and increased their state's share of educational spending. In this section, we review the history of education finance reform litigation and summarize some of the empirical work that describes the impact of finance reform.

A. A Short History of Education Finance Litigation[19]

In the 1960's, a number of critics began to formulate an attack on the system of local funding for public schools. There was broad agreement on the source of the problem: local control of key education decisions had led to significant differences in education spending. The best legal strategy, however, was open to debate. One strategy portrayed education as a "fundamental interest" for equal-protection purposes and thus could not be distributed unequally within a state in the absence of a

[19] This section draws heavily from Minorini and Sugarman (1999).

compelling state interest for doing so. This legal strategy drew an analogy with reapportionment cases, arguing that if courts were willing to insist on a one-man, one-vote standard, perhaps they could be persuaded to see the logic of a one-scholar, one-dollar standard for education. Thus this strategy argued for an end to unequal spending based on the equal-protection clause.

A second strategy argued that because some children may have different educational needs, equal protection might require the state to spend more on the education of low-achieving, low-income students than on students from affluent, well-educated families. The courts were not sympathetic to this line of argument (Minorini and Sugarman 1999, p37). Federal courts in a 1968 Illinois case *McInnis v. Shapiro* and a 1969 Virginia case *Burris v. Wilkerson* concluded that a needs-based theory left too many questions unanswered. As the *Burris* decision put it, the "courts have neither the knowledge, nor the means, nor the power to tailor the public moneys to fit the varying needs of these students throughout the State." As we will see below, the courts in the last decade have been much more receptive to this interpretation of equal protection. Both *McInnis* and *Burris* were appealed to the U.S. Supreme Court where the lower court rulings were affirmed without comment.

A third strategy did prove to be successful. John Coons, William Clune, and Stephen Sugarman (C-C-S) argued that unequal spending itself was not the key issue. Instead, in their view, the basic problem was that poor school districts had little property wealth that they could tax (Minorini and Sugarman 1999, p37). Poor districts were trying; they often set higher tax rates than did wealthy districts. But despite their efforts, these districts spent far less per student. C-C-S argued that it was this link between wealth and school spending that was the fundamental constitutional issue. They put forth what became known as their principle of fiscal neutrality: the quality of public education, most commonly measured as dollar inputs, may not be a function of wealth other than the wealth of the state itself.

Fiscal neutrality has a number of interesting implications. It allows, for example, for the possibility that some communities will wish to spend more on education than other communities, as long as those differences were unrelated to differences in wealth. Thus, a community would be free to set a higher tax rate than another if the two communities would raise the same tax revenue if they chose the same rate. Fiscal neutrality had little to offer high property wealth, low-income districts. Low wealth is often associated with poverty, but the two are far from synonymous. For example, the elderly often have lower than average incomes but higher than average wealth. Similarly, large cities with a significant non-residential tax base might have a large stock of taxable commercial property but a high fraction of low-income students. Money would not be redistributed to these areas since their property tax base is large. C-C-S were willing to accept these anomalies because they believed that fiscal neutrality was a viable legal strategy in the battle over school finance.

It is probably best to view fiscal neutrality as a legal strategy that might be successful in court rather than as a description of an optimal way to fund education. C-S-S knew from the *McInnis* and *Burris* decisions that the courts were unwilling to become embroiled in difficult problems such as defining the needs of individual students. The test here was straightforward: was school spending independent of wealth? Clearly, this is an easier question for the courts to answer than the questions the public interest lawyers were asking the courts to broach.

Federal courts, however, were unreceptive to the C-S-S argument. A lower federal court ruled in *Rodriguez v. San Antonio Independent School District* in favor of the plaintiffs based on the principle of fiscal neutrality (Minorini and Sugarman 1999, p39). The decision was appealed to the Supreme Court. In a 1973 decision, by a 5-4 majority, the U.S. Supreme Court overturned the lower court's decision and ruled against the plaintiffs. The Court saw this as a federalism issue: "... it would be difficult to imagine a case having a greater potential impact on the federal system than

the one now before us, in which we are urged to abrogate systems of financing public education presently in existence in virtually every state." As a result of *Rodriguez*, the Federal courts were no longer an option for anyone seeking legal reform of education finance.

Reformers were far more successful in state courts. Table 7 lists the 19 states identified by Minorini and Sugarman (1999) in which plaintiffs have successfully challenged a state's system of school finance. In another 12 states the plaintiffs lost and the cases are over. Finally, there is ongoing litigation in 12 states (either a case that has been decided at the lower level but not yet at a higher level, or no lower court ruling as yet). There has been no litigation in only seven states.

These cases have been decided on a range of legal grounds. Interestingly, the 1971 *Serrano* decision relied primarily on the U.S. Constitution's equal protection clause, a line of argument that made little sense following *Rodriguez*. Later, in the 1976 *Serrano II* decision, the California Supreme Court emphasized the state constitution's equal protection provisions. Other cases relied in whole or in part on state constitutional provisions specific to education. These provisions are often ambiguous and ambitious. The New Jersey constitution, for example, calls for a 'thorough and efficient system of free public schools' (New Jersey Constitution, Article 8, Section 4).

Plaintiffs in a traditional school-finance equity case often argued that a state's method for funding public school was inequitable because it violated the principle of fiscal neutrality. Alternatively, they might argue that differences in spending, regardless of their source, violated the state constitution. In either event, plaintiffs would present evidence on disparities in inputs and resources across the state.

A number of more recent cases have taken a very different approach. These cases focus on ensuring that all students in a state have equitable access to adequate educational opportunities (Minorini and Sugarman 1999, p47). The argument here is that at least some districts do not provide students with an adequate education and

that it is the state's responsibility to see that they receive the funding to allow them to do so. The remedy might require some districts to spend more (perhaps significantly more) than other districts; if districts with many students from low-income families and families where English is not the first language need to spend more to provide an adequate education, so be it. Clearly, these new adequacy cases are a rebirth of the "needs-based" claims of the late 1960s.

An adequacy claim would place more emphasis on outcomes than would a wealth-neutrality or spending-equalization claim. But there is a second important strand to this adequacy stance. Adequacy typically emphasizes absolute rather than relative standards. In the past, debates over equity focused on comparisons among children and districts and how well they fared relative to each other. Adequacy demands the setting of absolute standards rather than defining equity in terms of the relative performance of school-finance systems.

Adequacy began to emerge in the 1976 New Jersey decision in *Robinson v. Cahill*, the 1978 Washington decision in *Seattle v. State of Washington*, and 1979 West Virginia decision *Pauly v. Kelly*. But the key adequacy decision came in the 1989 Kentucky case, *Rose v. Council for Better Education*. In *Rose* the Kentucky court ruled that not only was the disparity in resources between rich and poor districts unconstitutional, but the entire state education system-- financing, governance, and curriculum-- was unconstitutional as well. The court stopped short of demanding specific changes, but it did provide specific guidelines for the legislature to follow. Those guidelines defined an adequate education as one that provides students with the opportunity to develop at least the following seven capabilities:

- sufficient oral and written communication skills to enable students to function in a complex and rapidly changing civilization
- sufficient knowledge of economic, social, and political systems to enable the student to make informed choices

- sufficient understanding of governmental processes to enable the student to understand the issues that affect his or her community, state, and nation
- sufficient self-knowledge and knowledge of his or her mental and physical wellness
- sufficient grounding in the arts to enable each student to appreciate his or her cultural and historic heritage,
- sufficient training or preparation for advanced training in either academic or vocational fields so as to enable each child to choose and pursue life work intelligently, and
- sufficient levels of academic or vocational skills to enable public school students to compete favorably with their counterparts in surrounding states, in academics, or in the job market

The state responded to the ruling on the finance system by raising the state's foundation grant, adjusting equalization grants and property assessments so that poorer districts received a larger share of state aid, and changing the aid formula so that state funding was now calculated on a per pupil basis. The state also changed governance and curriculum. It reorganized the Department of Education, introduced site-based management councils that make decisions previously made by principals, and established a reward system tied to a performance-based assessment system.

Rose has turned out to be a very influential case. Since 1989, courts in New Hampshire, Alabama, and Massachusetts have declared their education systems to be constitutionally inadequate, relying specifically on the Kentucky Court's definition of an adequate education. We return to some of these issues in a later section of the paper.

B. *The Impact of Finance Reform*

We now turn to a more systematic review of the evidence concerning the impact of finance reform. Since California is the largest state and the first to experience court-

ordered finance reform, it is no surprise that much of the work in this area has focused on this state. We therefore begin with a summary of the California experience in the wake of *Serrano*. We then turn to broader empirical studies that use more nationally-representative data sets.

The general consensus from the California work has been that the shift toward state financing of education has led to a significant decrease in spending on education. Silva and Sonstelie (1995) try to estimate what proportion of this decline should be attributed to *Serrano* and ensuing policy changes such as Proposition 13, and how much should be attributed to other factors such as changes in income and number of students.[20] They begin by estimating the determinants of education spending using data from all states other than California. Using this equation, they show that prior to *Serrano* spending in California was similar to other states during the same period after adjusting for differences in family income and the tax price of an additional dollar of education. They found a very different story in 1989-1990. Spending was significantly lower in California than we they would have predicted. They conclude that roughly one half of the decline in spending in California can be attributed to the *Serrano* decision.

It is difficult to separate the impact of *Serrano* from the impact of Proposition 13. Proposition 13 was passed in 1978. It severely limited the ability of local governments to fund education by establishing a maximum local property tax rate of one percent[21], rolling assessments back to 1975 levels, and limiting reassessments to two percent per year except when properties are sold (Fischel 1998). Perhaps Proposition 13 led to the decline in education spending and *Serrano* has been accused unjustly.

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[20] Proposition 13 was an amendment to the California State Constitution that limited property tax rates and property valuations, thereby limiting local governments' access to the main source of funding for education.

[21] Fischel (1989, 1996) offers an interesting perspective on this issue. He argues that Proposition 13 was not an independent event but instead a consequence of *Serrano*.

Broader empirical work attempts to go beyond the California experience by looking at data from many states. Manwaring and Sheffrin (1997) use a panel data set from 1970 through 1990 to examine the role of equalization litigation and reform in determining the level of education funding in a dynamic model. They found that on average, successful litigation or legislative education reform raises education spending significantly. In a similar paper, Downes and Shah (1995) show that the stringency of constraints on local discretion determines the effects of reforms on the level and growth of spending. Further, for any particular type of reform, the characteristics of a state's schools determine the direction and magnitude of the post-reform changes in spending.

As we noted above, we have looked at this question in several papers. In Murray, Evans, and Schwab (1998) we estimated a series of econometric models to explain state-level inequality between 1972 and 1992. We used two different variables to mark the timing of reform.[22] Initially, we included a simple indicator variable *Court Reform* that equals 1 in all years after court-ordered education-finance reform, and zero otherwise. Because we suspect reform will take some time to alter inequality, we also used a second variable, *Years after Court Reform*, which equals the number of years since the state supreme court overturned a finance system. Thus, for example, this variable always equals 0 in those states without successful litigation.

We came to three main conclusions. First, court-mandated education-finance reform reduced within-state inequality significantly. Depending on the way we measure inequality, our results imply that reform in the wake of a court decision

[22] Reform states in our econometric work include: Arkansas, California, Connecticut, Kansas, Kentucky, Texas, Wisconsin, Washington, West Virginia, and Wyoming. This list differs from Minorini and Sugarman (1999) because we do not consider the reforms after 1989 that would not have affected spending in the 1991-92 school year, the last year in which we have complete data; we include Kansas and Wisconsin (see below); and we exclude Montana because that state has no unified K-12 districts.

reduced spending inequality within a state by anywhere from 16 to 38 percent. Second, as a result of court-ordered reform, we found that spending rose by an estimated 11 percent in the lowest spending school districts, by 7 percent in the median district, and remained roughly constant in the highest spending districts. Therefore, court-ordered reform reduced inequality by raising spending at the bottom of the distribution while leaving spending at the top unchanged. Third, finance reform caused states to increase spending for education and leave spending in other areas unchanged, and thus by implication states fund the additional spending on education through higher taxes. As a consequence, the state's share of total spending rises as a result of court-ordered reform.

For this project, we have extended the basic econometric models from our previous work to include newly released data from the 1997 *Census of Governments*. Extending this data is important for two reasons. First, as Table 7 documents, there have been a number of states whose finance systems were overturned by the courts in the early 1990s that were not a part of our earlier work. It is therefore of interest to see how the results hold up to these new court rulings. Second, many states that faced finance reform in the late 1980s and early 1990s have been able to fully implement their reforms by 1997.

Initially, we examine the impact of finance reform on the within-state distribution of resources in a state. As in our previous work, we utilize state-level observations from the six *Census of Governments* from 1972 through 1997 for our 46 state sample. Our basic econometric model is a fixed-effects specification, where we regress a measure of within-state inequality for a state in a particular year on state and year effects plus some measure of finance reform. The fixed state effects capture the permanent differences between states in spending inequality, whereas the fixed year effects capture those factors that impact all states equally (such as recessions) but vary across time. As in our earlier work, we include two indicators to capture the

effects of finance reform. The first equals 1 in the first five years after finance reform. The second variable is also an indicator that equals 1 six years or more after court-ordered reform. These two indicators allow us to capture any growth in the effect of the finance reform over time. In essence, this fixed-effects specification is a "difference in difference" model where we compare the outcome of interest before and after a state is ordered to reform education finance with the same differences in states that were not subject to reform. This second group of states identifies the secular change in the outcome of interest that would have occurred in the absence of reform.

In Table 8, we report basic results using various measure of within-state inequality as an outcome. These measures of inequality are based on variation across districts in a state in per pupil current expenditures. Expenditures are weighted by enrollment so the dispersion measure represents the amount of inequality across students. We use three inequality measures: the Gini coefficient, the Theil index, and the log of the ratio of per pupil expenditures at the 95th and 5th percentile of spending in the state. All regressions use data from (46 states x 6 years) 276 observations.

The results indicate that six years after court-ordered finance reform, there is a statistically significant drop in all measures of inequality. The Gini is estimated have dropped by -0.012, the Theil by 0.0027, and the ln(95/5) by 0.049. These values represent 20, 24, and 11 percent of their sample means, which are very large changes in within-state inequality. Much of the decline in inequality was generated by changes in spending in the upper half of the expenditure distribution. Six years after court-ordered reform, we find that spending in the bottom half of the distribution has increased by a statistically precise 8 to 9 percentage points, whereas there is no statistically significant change in spending at the 95th percentile.

In Evans, Murray, and Schwab (1997) we tried to separate the responses of state and local governments to court mandates. In that work, we found that state revenues increased as a result of reform and the state share of education spending increased

dramatically. In Table 9, we update this work by including data through 1997, maintaining the same specification that was used in the previous table.

In Table 9, we find that six years after reform, total per pupil revenues from all sources increased an average of $726, which is 17 percent of the sample mean value. Nearly all of this money, $702, can be attributed to higher state spending. As a result of the higher state spending on K-12 education, the state share of funding has increased considerably. Six years after court-ordered reform, the state share of revenues has increased by 7.5 percentage points. Overall, our results suggest that court-ordered reform has encouraged a much larger role for states in K-12 education finance.

In addition to the impact on inequality, school finance formulas can also have income and price effects that influence the level of spending over time and the productivity of schools. This point is emphasized in Hoxby (2001). In that paper, the impact of school finance equalization formulas that redistribute revenues from local property taxes are compared to flat or matching grants programs that would redistribute revenues from statewide income or sales taxes aid based on district enrollment. The aid programs could potentially be targeted for educating children from poor families or with special needs, but this is not a feature of the flat-grant programs that states historically used.

Since flat-grant aid programs are lump sum payments to districts, they only produce an income effect (district residents feel richer or poorer and may want to buy more or fewer school inputs). Under a flat grant, a district need only raise a dollar to spend an additional dollar; that is, the tax price is one and thus, flat grants do not affect the relative price of education inputs. Matching grant aid programs, however, affect the tax price of education spending so that it is positively related to household income. Foundation grants and district power equalization programs also affect the tax prices a district faces and, because they are typically tied to property taxes, are

positively related to property values. Because the relative price of schooling inputs is affected, the latter three programs can introduce substitution effects that may distort household behavior.

The impact of changes in the tax prices on the level of spending may depend on the type of finance formula in place. Under a flat or matching grant programs the effects are ambiguous. For wealthy districts facing tax prices greater than one, education spending could fall because it is relatively more expensive. For poorer districts that experience tax prices less than one, education spending would increase. However, Hoxby suggests that even with subsidized prices for education spending, low-income households (districts) can choose to spend less on education than high-income households with a much greater taste for education. If this were the case, matching grant programs would have a leveling-down effect, greater spending equality accompanied by lower average spending in the district.

Depending on the level of funding specified in the minimum level of funding for a foundation grant, average total spending in a state may increase or fall. As Hoxby suggests, spending equality can be achieved with leveling up. However, if the funding level is set according to the preferences of a district with unusually low tastes for school spending and spending is equalized, average spending falls. If funding levels were set according to the preferences of districts with high tastes for school inputs then average spending would increase. In a power equalization scheme, it is also the case that if tax rates were set according to the preference of districts with low demand for education, school spending would decrease under the equalization plan.

Hoxby empirically investigates the influence of the type of school finance formula on the growth in district spending between 1972 and 1992. Her models include four variables to describe the school finance equalization scheme: foundation tax rate, income and sales tax rate, inverted tax price, and flat grant. Only the coefficients on

the foundation tax rate and inverted tax price are statistically significant. These estimates suggest that school spending falls as tax rates and tax prices increase.

In order to show the effect of the schemes on mean state spending, Hoxby compares the predicted average spending under her model to what mean spending would have been if no equalization program were in place. Under this scenario, her results suggest a weak, but positive relationship between the degree of equalization (as measured by a reduction in the change in within-state variation in per pupil spending due to equalization) and whether mean spending fell in the state relative to what spending would have been in the absence of a redistribution formula. In a few states such as California, highly equalizing finance formulas are associated with leveling down; however, in most states equalization is less dramatic than California and per pupil spending actually increased. Hoxby finds mixed evidence of the impact of strong equalization schemes on dropout rates but that private school attendance increases in property rich districts as tax prices increase.

V Distribution of School Environments

School finance is one metric by which we can measure the distribution of education resources. It is, however, an admittedly limited measure. In this section, we describe the distribution of some non-pecuniary resources are available to students across schools serving high and low poverty or minority student populations.

The cost of educating students is a function of the environmental factors present in the school. Two schools with the same per student resources may have vastly different costs structures. Costs can vary because the price of inputs to education (labor, land, electricity, transportation, etc.) differ across geographic areas. The cost of educating students may also differ because of factors that alter the production function for education. For example, it costs more to educate a disabled child, so even though two districts may spend the same dollars per child, these dollars may

purchase very different quantities of education in two different contexts. We showed above that adjusting for regional variation in prices does not change the basic conclusion all that much -- the overall variation of spending cannot simply be explained by persistent variation in the prices of inputs. In this section, we will focus on describing factors that may alter the productivity of spending. Specifically, we have collected five different measures of the school environment: school safety, quality of physical capital, teacher quality, advanced placement courses, and computer use. We report data from several nationally representative surveys. In many cases we have information over time, but in some cases we only have information at a point in time.

A. Violence in U.S. Schools, 1996/97 School Year

Tragic events such as the Columbine shootings have brought to the forefront the problem of violence in schools. School violence can affect the ability of a school to educate students. High quality teachers may be less likely to teach in schools with a reputation for violence and violent incidents can disrupt the education process. Violence in schools is more prevalent in communities with particular characteristics, such as higher fractions of poor and minority students. In Table 10, we report the fraction of schools reporting serious violent incidents[23] and the number of these violent incidents per 1000 students by the fraction of minority students (defined as the percentage of students that are non-white) and the fraction of poor students (defined as the percentage of students participating in the free or reduced-price lunch program). The data are from the National Center for Education Statistics' (NCES) survey *Principal/School Disciplinarian Survey on School Violence* and the table reports data from the 1996/97 school year. Schools with the largest fraction of minority students are two and a half times more likely to report a violent incident and have five

[23] Violent incidents are defined as murder, rape or other type of sexual battery, suicide, physical attack or fight with a weapon, or robbery.

times the incidence rate as schools with the lowest fraction minority. The differences based on the fraction of students with free or reduced-price lunch show similar patterns, though the differences are smaller. Schools with more than 75 percent of their students participating in the free or reduced-price lunch program are 25 percent more likely to have a violent incident during the school year compared to schools with less than a 20 percent poverty rate among students. The incidence rate in the schools with the most poor students is two and a half times that in schools with the lowest poverty rates.

B. Quality of Physical Capital in U.S. Schools, 1998/99 School Year

In Table 11, we report some statistics on the quality of the capital stock of schools across schools with varying degrees of poverty status, defined as the number of students eligible for reduced-lunch programs. These numbers are taken from the 1999 NCES survey on the *Conditions of America's Public School Facilities*.

The numbers in the table tell a consistent story – the physical capital of schools tends to be substantially poorer quality in schools with a higher fraction of poor students. For example, schools with highest fraction of poor students (>70%) are twice as likely to be 25 percent of more overcapacity than schools with less than 20% poor. These same schools are also about twice as likely to be greater than 35 years of age than schools in the lowest poverty group. Looking at specific structural problems of schools, those in the poorest neighborhoods are 78 percent more likely to have less than adequate roofs on schools than those in the lower poverty group. The differences in plumbing and heating problems are less pronounced, but there is still a noticeable difference across the groups.

C. Quality of Teachers in U.S. Schools, 1993/94 School Year

Table 12 looks at a cross-section of schools from the 1993-94 *Schools and Staffing Survey* (SASS) to see how the characteristics of newly hired teachers differ across

schools of varying race and income compositions during the 1993-94 school year.[24] SASS is a periodic survey conducted by the NCES that collects data from a nationally representative sample of public and private schools on characteristics and views of school personnel.

Many of the same survey questions have been used in each cross-sectional cycle of the survey, allowing researchers to investigate trends over time. The questionnaires for each round of SASS are available online and can be downloaded from the Questionnaires and Items page. In this case, we only use data from the 1993/94 survey. When data from the 2000 survey are released, we will be able to update these tables.

In this analysis, we focus on new teachers, who are defined as those with two or fewer years of experience. Table 12 shows that while average base year salaries vary little over schools with different concentrations of minority (top panel) or poor (bottom panel) students, the qualifications and job satisfaction of new teachers across these schools varies greatly.[25] For example, in 1993-94, new teachers in schools where 90 percent or more students were minority were less likely to be certified in their primary teaching field than new teachers in schools that had 10 percent or fewer minority students. When asked whether they would teach again if given the chance to return to college, only 60.7 percent answered in the affirmative among new teachers in primarily minority schools, compared with 81.3 percent in primarily white schools. Similarly, teachers in primarily minority schools were more than five times more likely to state that they "definitely plan to leave teaching as soon as possible" when asked how long they expected to teach.

[24] The Schools and Staffing Survey provided sample weights to account for differences in teachers' sampling probabilities and survey non-response. We used the SASS final teacher weights in computing all statistics in Table 12.

[25] Base year salaries are not adjusted for cost of living differences across school districts.

Differences in the qualifications of new teachers are even more striking when comparing across schools with different proportions of students in poverty. New teachers in highest-poverty schools (defined as over 90 percent of students qualify for the free or reduced-price lunch program) were 15 percent less likely to be certified and 36 percent less likely to hold advanced degrees than new teachers in low-poverty schools. The fraction of students in poverty in a school does not appear, however, to have as large of an impact on the job satisfaction of new teachers as does the fraction minority in the school. While new teachers in highest-poverty schools were more likely to state that they plan to exit teaching as soon as possible, or that they would not teach again, the differences when compared to lowest-poverty schools (defined as less that 10 percent of student participate in the free or reduced-prince lunch program) were small and statistically insignificant.

D. Advanced Placement Courses

Table 13 uses three large longitudinal surveys conducted by the NCES to see how offerings of advanced placement (AP) courses differed across public schools with varying fractions of minority or poor students in three different academic years, 1972, 1982, and 1990.[26] The data sets we use are the *National Longitudinal Survey of 1972*, *High School and Beyond Senior Cass of 1982* and the *National Educational Longitudinal Survey*.

The proportions in Table 13 indicate the fraction of schools (by percent black, or percent disadvantaged) that offer one or more advanced placement courses.[27] [28] While

[26] Two surveys—the National Longitudinal Study of the High School Class of 1972 (NLS-72) and High School and Beyond (HSB) indicate the poverty status of schools using the percent of students qualifying for free lunch, while the other survey—the National Educational Longitudinal Survey (NELS)—uses percent "disadvantaged."

[27] Our calculations from these surveys of the overall fraction of schools offering AP courses are much larger (in all years) than those reported by the College Board, the organization which administers AP exams. While these surveys specifically asked whether the school offered "College Board Advanced Placement Courses," the responses may reflect some confusion among survey respondents as to what an 'advanced placement' course meant. To the extent that

significant gains were made among all schools in AP offerings, schools with majority black and majority disadvantaged student populations were almost always much less likely to offer these courses than largely non-black or non-poor schools. For example, in 1972 students in 90 percent or higher black schools were 30 percent less likely to have the opportunity to take AP courses than students in schools where less than 10 percent of students were black. By 1990, however, these schools had made large strides in course offerings, and mostly black schools were about as likely to have AP courses as mostly non-black schools. Stark differences remained between mostly disadvantaged and non-disadvantaged schools in 1990, however. As Table 13 indicates, in 1990 only 38.5 percent of mostly disadvantaged schools offered AP courses while over 76 percent of non-disadvantaged schools made these courses available.

E. Distribution of Internet Access and Computer Use, 1984-2000

One of the fastest changing characteristics of K-12 education is the use of advanced technologies in the classroom. The drop in computer prices and the rise of the Internet have led schools to re-evaluate computer use in the classroom. Almost all education groups recognize the importance that technology will play in the future economy yet most groups are still struggling with how best to integrate computers in the classroom. Even with these uncertainties, schools and the Federal government

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survey respondents' definitions of advanced placement courses were consistent across schools and across time, our calculations should be representative of differences in AP offerings across schools. However, these numbers should be interpreted with appropriate caution.

[28]NLS72 and HSB asked whether or not the school offered college board AP courses; NELS asked what fraction of the student body receives AP courses, and the number of 12th graders in AP courses. For the NELS, we assumed the school offered AP if either of these numbers was nonzero. The NLS72 sample consists of public high schools participating in base year (1972) administrator survey. The HSB sample consists of public high schools participating in first follow up (1982). The NELS sample consists of public high schools participating in first follow up (1990).

have invested considerable resources to buy computers and wire classrooms for Internet access.

Not surprisingly, computers appeared first in wealthier districts. This disparity in computer access in all segments of society is known as the digital divide and this divide is of particular concern in education. In these next few pages and tables, we provide some indication of the difference in computer resources across schools with different characteristics. Over the past eight years, NCES has conducted annual surveys of computer equipment and Internet access in U.S. public schools. In Tables 14-16, we report some results from these surveys.

In Table 14, we report the fraction of schools with Internet access by specific school characteristics. In the first row of the table, we report estimates of the fraction of schools with Internet access. Note that although only one-third of schools had some Internet in 1994, that number was 98 percent by 2000. Given the high fraction of schools with access to the Internet, it should come as no surprise that there is little variation in access to the Internet across schools with different characteristics. For example, schools with a high fraction minority or a high fraction of students receiving free or reduced price lunch still had Internet access rates in excess of 94 percent.

Students do not, however, have equal access to the Internet. In Table 15 we report the fraction of *classrooms* wired for the Internet by the same school characteristics as in the previous table. There is good news and bad news in this table. First, the good news -- the fraction of classrooms with Internet access has increased dramatically in all schools. In schools with more than 75 percent of their students receiving free or reduced lunch, the fraction of classrooms wired for the Internet has increased to 60 percent in 2000. Now the bad news; this number is 22 percentage points below the rate for students with a smaller fraction of students receiving reduced cost lunches. The NCES document that reported these statistics indicates a number of other quality

differences between schools of differing socio-economic status including differences in the speed of the connection, training of the teachers, and the number of computers.

The rapid pace by which schools and classrooms have become wired has been aided in part by the Federal E-rate program. This program was created as part of the Telecommunications Act of 1996 and it provides subsidies for low-income schools and certain libraries to pay for Internet access. The program is funded by a tax on long distance service and schools may use the proceeds to pay for investments in Internet and communications technology. The E-rate program spends up to $2.25 billion per year; to put this in perspective, note that other school expenditures on hardware, software, and training average roughly $4 billion annually.

The E-rate program subsidizes school spending by 20 to 90 percent, depending on school characteristics. For example, schools with 75 to 100 percent students receiving reduced or free lunch were subsidized at a 90 percent rate, whereas urban schools with less than a 1 percent free or reduced lunch population received the 20 percent subsidy. Using data for California schools, Goolsbee and Guryan (2002) examine the impact of the E-rate program on the speed with which schools obtained Internet access. They estimate that by 2000, there were 6 percent more schools with Internet access than there would have been without the E-rate program. They argue that is is equivalent to accelerating Internet access by about 4 years.

There are also differences in the number of computers available for use by students in schools across predictable lines. In Table 16 we report the average number of computers in schools used for instruction across all schools and for schools with differing fractions of students receiving free or reduced-price lunches. Unfortunately, the publication from which these data come does not break these numbers down by racial composition of the school. Note that by 2000, schools had an average of 110 computers dedicated for instructional use. As with many of the previous tables, there is a disparity in computer resources across schools. The resources available in the

poorest schools has increased considerably since 1995; the mean number of computers per school increasing by almost 50 percent in the poorest schools (defined as schools with more that 75 percent of their students eligible for the free and reduced-price lunch program). However, there has been little change in the gap between computers per school for low and higher poverty schools. In 2000, schools in the lowest poverty group had 20 percent more computers than schools in the higher poverty group, which is close to the 16 percent difference that existed in 1995.

These data sets only identify whether computers are available in schools and they do not indicate whether students are using them. Fortunately, data on computer use has been collected in the *October School Enrollment supplement of the Current Population Survey* (CPS). The CPS is a monthly survey of approximately 50,000 households conducted by the Census Bureau. Its primary purpose is to collect information on the size and characteristics of the labor force. Each October, the CPS administers the school enrollment supplement that collects educational attainment and enrollment information for both adults and children in the household. In 1984, 1987, 1993, and 1997, this supplement also includes questions about computer use at home, school, and work.

For this paper, we use the data about computer use at school. Our sample includes children age 5 through 18 who attend 1st through 12th grade. Computer use at school is based on the following question asked of the adult respondent for each child in the household: "Does ... directly use a computer at school?" One limitation of the survey is that parents are responding for children and there may be substantial measurement error in the outcome of interest. We construct means of computer use at school for all students and subgroups of students based on race, income, and parents' education. The race classifications are based on the student's characteristics; however, household income, educational attainment of most educated member of the household, and community categories are based on household level data. The income

classifications are constructed for each year by dividing all households in the sample into three income groups. Each group contains roughly a third of the households. Each child within a household was assigned that income group. Table 17 provides the fraction of students in each category that directly use a computer in school, among students for whom the computer use information was not missing.

As with the three previous tables, the numbers in Table 17 indicate that although computer use in school has increased considerably for all groups, significant differences remain. In 1984, usage of computers by white, non-Hispanic students were 18 percentage points higher than for blacks and almost 20 percentage points higher than for Hispanics. Over the next 13 years, computer use in school by these minority groups has more than tripled with the difference in use rates being cut in half for blacks, but showing little progress for Hispanics. Looking at children by household income, we see again sharp increases in use in all points of the income distribution. The raw difference in use between children from high- and low-income households was cut in half over the 1984 to 1997 period.

VI Conclusion

In this paper, we have documented the changing level and distribution of education spending and revenues over the past 30 years. Over time, the level of spending on K-12 education has increased considerably and overall inequality in spending has declined dramatically. Much of the decline in spending inequality can be traced to various state policies. States have historically redistributed education resources from richer to poorer communities, but these redistributive policies have been more aggressive in recent years. In some cases, these redistributive policies were only put into place after states were instructed by courts to reform education finance rules. Much of the remaining variation in school spending is between states and not within states over time. In recent years, some states that have historically spent relatively

little on K-12 education have redirected more resources to schools, helping to reduce between-state inequalities.

We also investigated changes in the distribution of non-pecuniary resources in schools such as safety, quality of physical capital, teacher quality, curriculum and computer use. Although dollars have become much more equal across districts over time, many non-monetary inputs into the education process are not distributed as equally. Schools serving larger percentages of poor or minority students were more likely to report a violent incident, lower quality physical structures, less experienced teachers, fewer AP course offerings and fewer Internet connections. However, for the two measures of school environment in which we have consistent data over time, curriculum and Internet access, we find that the differences by poverty and minority status of schools have also declined.

Many of the changes that have encouraged higher state support for K-12 education were instituted during the 1990s – a period of rapid economic growth and flush state budgets. In recent years, the economic slowdown has been particularly hard on state budgets. A recent report by the National Governors' Association notes that since state 2002 budgets were enacted, 40 states have had to fight budgets shortfalls totaling $40 billion, about 4 percent of aggregate state budgets. Because state budget growth tends to lag recessions, the Association is predicting more lean years ahead. It will be important to see whether these budget problems will alter the states' role in education finance.

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Figure 1: Federal, State, and Local Revenues per Pupil

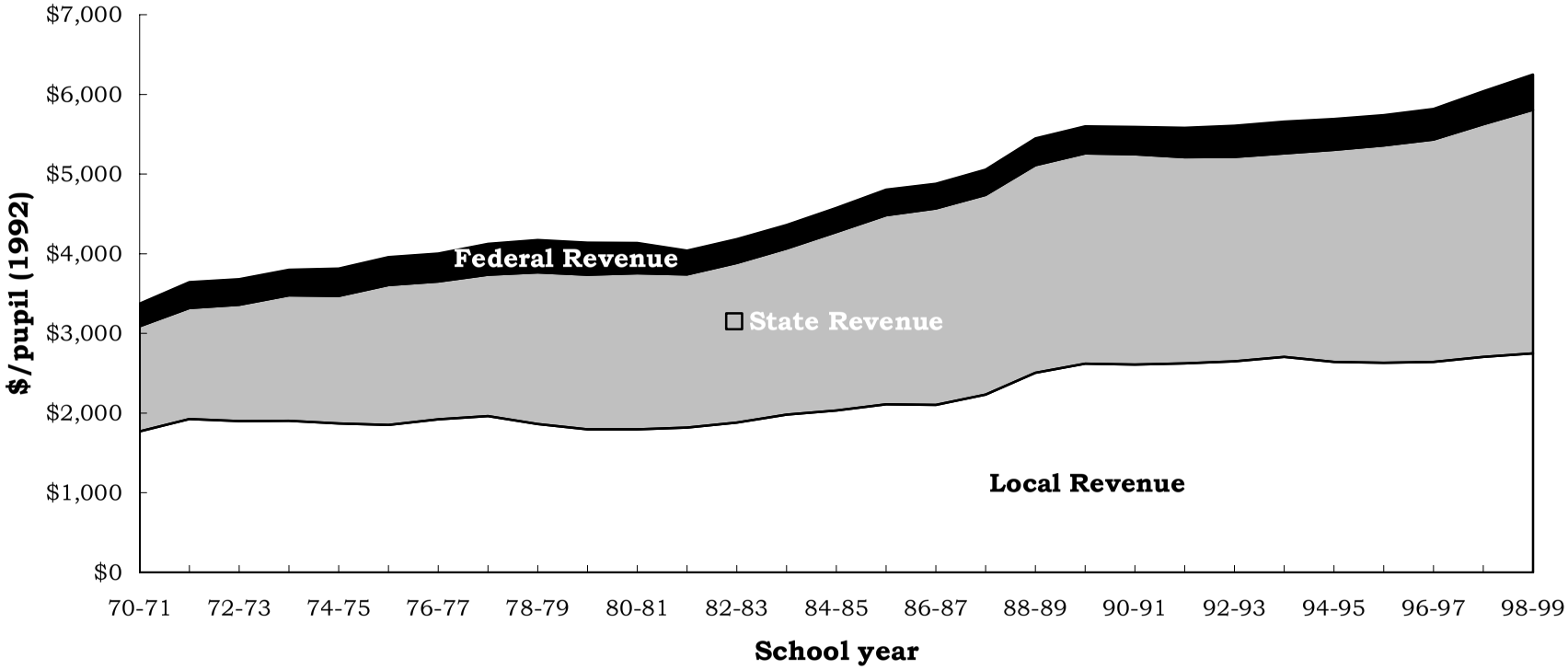

Figure 2: Comparison of Actual and Synthetic State Gini Coefficients for Total Revenue per Pupil in 1972

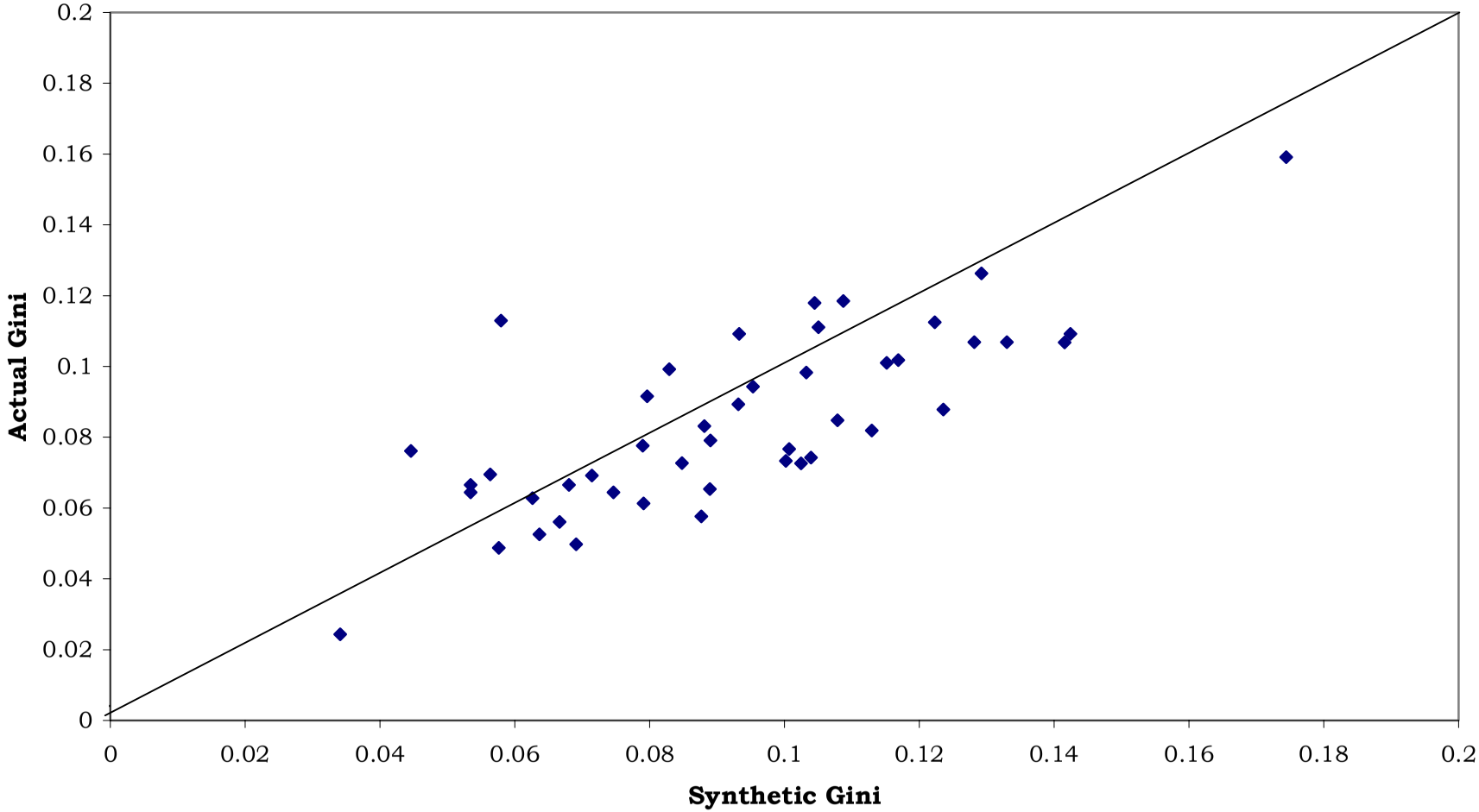

Figure 3: Comparison of Actual and Synthetic State Gini Coefficients for Total Revenue per Pupil in 1997

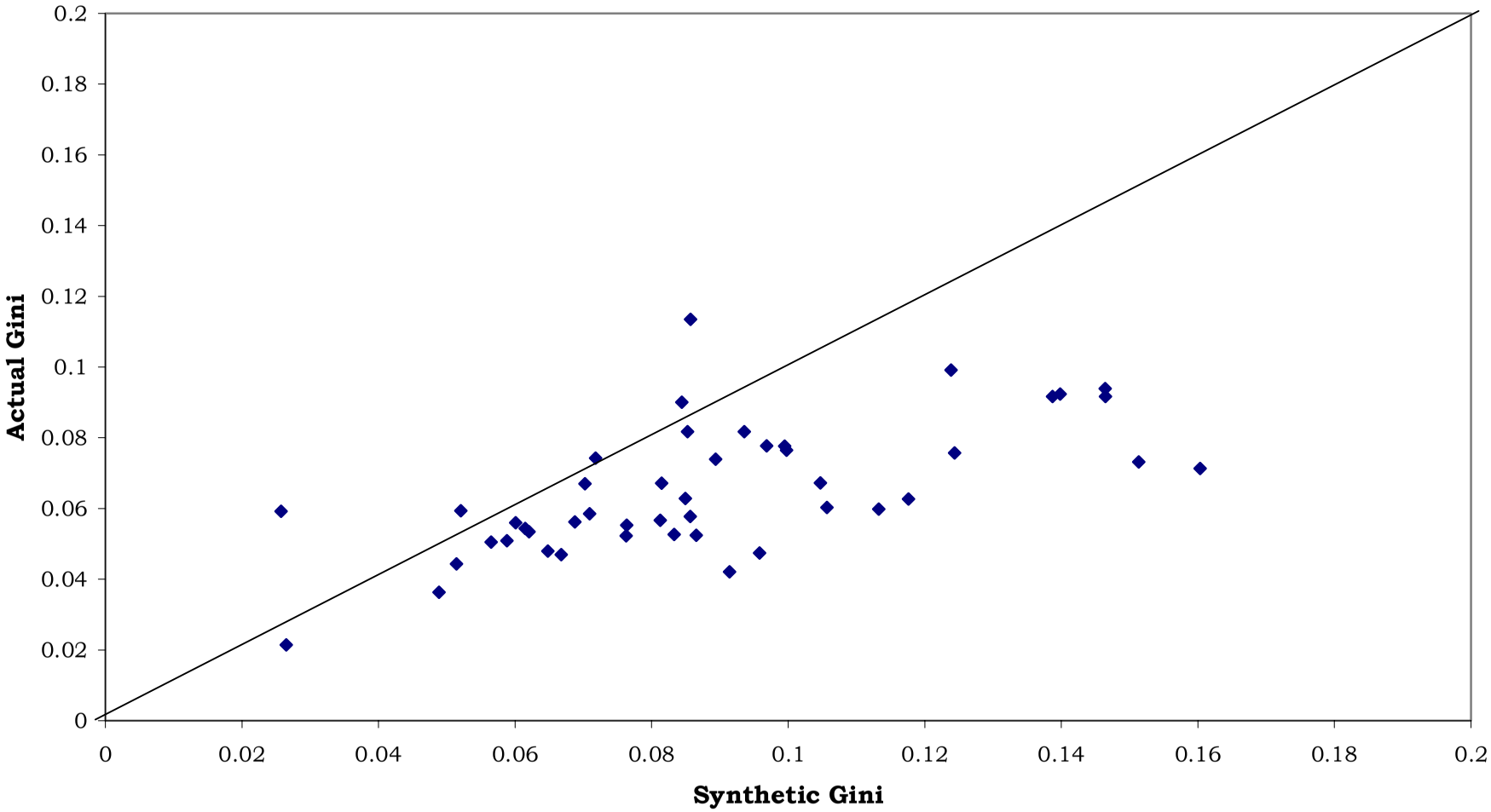

Figure 4: Comparison of the Degree of Redistribution in 1972 versus 1997

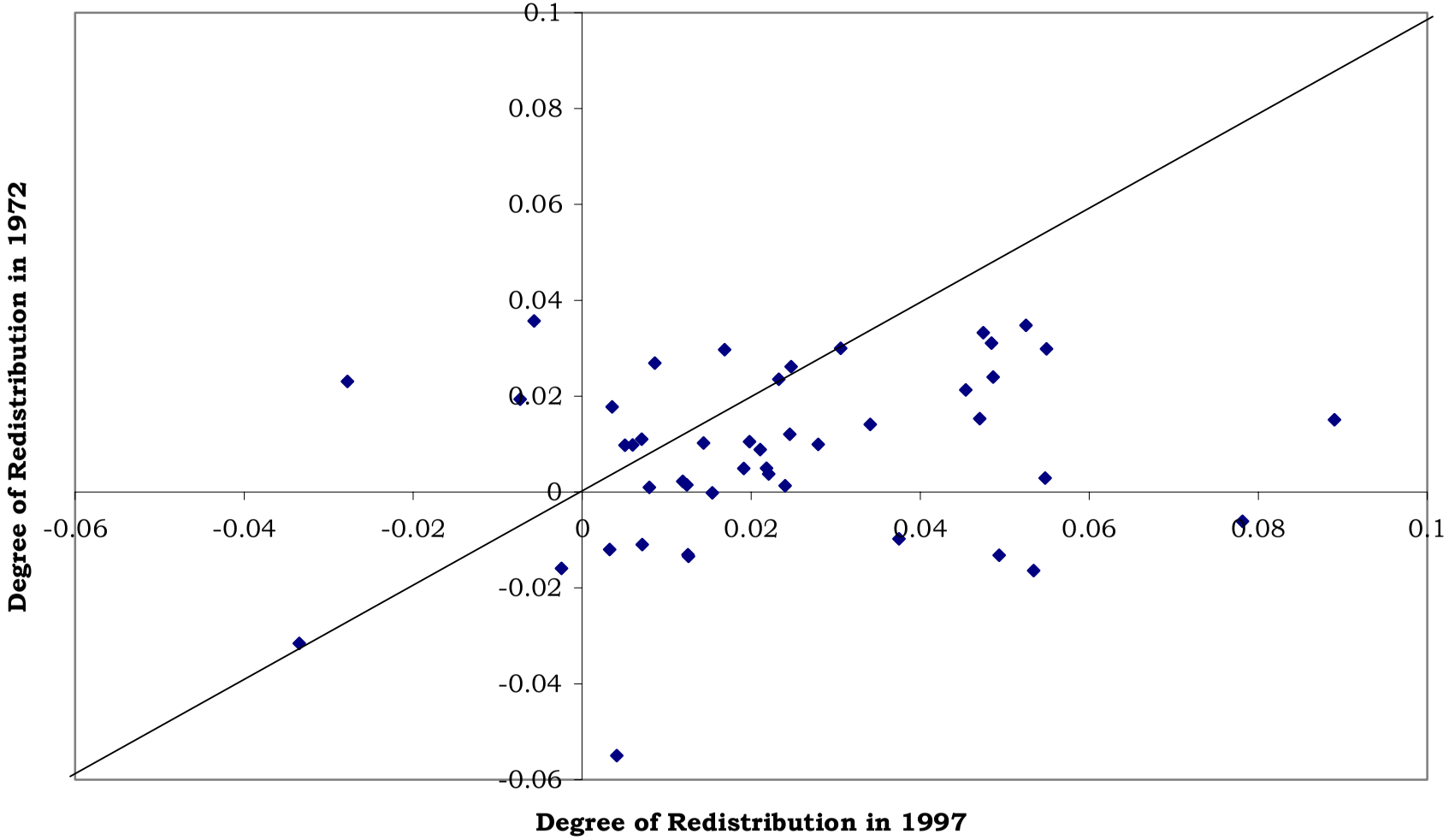

Table 1: Summary of Current Education Expenditures, 1972-1997

	1972	1977	1982	1987	1992	1997
Funding per Student ($1992)						
Local	1,857	1,915	1,867	2,268	2,540	2,595
State and Federal	1,469	1,841	2,061	2,598	2,767	3,221
Total	3,327	3,756	3,928	4,866	5,307	5,816
Measures of Inequality						
Gini coefficient (x100)	16.3	15.0	13.8	15.8	15.5	13.0
95/5 ratio	2.72	2.37	2.22	2.53	2.40	2.10
Coefficient of variation	30.8	28.1	25.6	29.6	29.9	26.0
Theil index (x1000)	43.7	37.1	31.0	40.7	40.5	30.6
Theil Index Decomposition						
Within states	13.7	14.4	14.0	12.6	13.4	9.9
Between states	30.0	22.8	17.0	28.2	27.1	20.7
National	43.7	37.1	31.0	40.7	40.5	30.6
Household Income						
Median ($1992)	32,548	31,422	29,326	32,186	30,636	32,348
Gini coefficient (x100)	40.1	40.2	41.2	42.6	43.4	45.9

Table 2: Growth Rate in Education Spending per Student Selected States
1992 - 1997

State	Per pupil spending, 1992	Rank in per pupil spending, 1992	Rank in per pupil spending growth rate, 1992 to 1997
Utah	2,972	46	10
Alabama*	3,008	45	1
Mississippi	3,070	44	7
Tennessee*	3,157	43	2
Idaho	3,170	42	3
Arizona*	3,201	41	4
Arkansas*	3,479	40	8
Oklahoma	3,530	39	16
Kentucky*	3,655	38	5
New Mexico	3,743	37	18

* Successful school finance litigation

Table 3: Summary of Resources Adjusted for Cost of Living Differences, 1992

		Cost of Living Adjustment		
	Unadjusted	Barro Cost Index	Chambers TCI	McMahon-Chang COL
Measures of Inequality				
95 to 5 ratio	2.47	2.07	2.08	2.19
Theil index	37.9	26.4	29.2	32.4
Coefficient of variation	30.1	24.4	25.7	27.1
Theil Index Decomposition				
Within states	12.9	12.2	12.2	12.9
Between states	25.0	14.2	17.0	19.5
National	37.9	26.4	29.2	32.4

Table 4: Per Pupil Revenues by Source and District Characteristics, 1999-2000

	Average per pupil revenues ($2000)		
	Local	Local + state	Local+state+ Federal
By quartile of % children in poverty:			
1st (lowest)	$5,045	$8,264	$8,492
2nd	$3,360	$7,149	$7,534
3rd	$2,779	$6,770	$7,344
4th	$2,700	$7,252	$8,256
By quartile of % minority students:			
1st (lowest)	$3,720	$7,645	$7,970
2nd	$3,925	$7,530	$7,906
3rd	$3,399	$7,139	$7,672
4th	$2,930	$7,427	$8,284

Table 5: Cofactors of Local, State, and Total Per Pupil Revenues on K-12 Education 1972, 1982, and 1992

Balanced Panel of Districts

	Spending per pupil ($1992)		
Covariate	Local	State+ Federal	Total
Fraction black	-1,701	1,829	-79
	(147)	(111)	(158)
Fraction Hispanic	-2,837	3,885	278
	(169)	(128)	(182)
Fraction of adults that are high school dropouts	-852	450	328
	(224)	(169)	(241)
Fraction of adults with 12-15 years of education	-6,124	3,809	-1904
	(178)	(135)	(192)
Fraction in poverty	-744	1,105	213
	(206)	(156)	(221)
Fraction owner occupied homes	-1,847	2,216	14
	(133)	(101)	(143)
Median household income	0.059	-0.044	0.008
	(0.002)	(0001)	(0.002)
Sample mean	2,067	2,015	4,126
R^2	0.892	0.888	0.899

All models include district fixed effects and state-specific year effects. Standard errors are given in parentheses.

Table 6: Schooling Inputs by Demographic Characteristics
1972-1992

Category	Expenditures/Pupil (1992$)			Pupils/Teacher		
	1972	1982	1992	1972	1982	1992
By average white and non-white student in the district:						
(1) White	2,856	3,414	4,661	19.32	15.13	13.09
(2) Nonwhite	2,800	3,460	4,796	19.58	14.58	12.52
Ratio (1)/(2)	1.02	0.99	0.97	0.99	1.04	1.05
By median household income in the district:						
1st quartile	2,212	3,040	4,214	19.22	14.24	11.93
2nd quartile	2,388	3,381	4,324	19.24	14.56	12.56
3rd quartile	2,970	3,359	4,686	18.82	15.25	13.20
4th quartile	3,095	3,667	5,047	19.82	15.70	13.53
Ratio (4th)/(1st)	1.40	1.21	1.20	1.03	1.10	1.13
By poverty status:						
(1) Out of poverty	2,881	3,432	4,700	19.34	15.11	13.06
(2) In poverty	2,660	3,331	4,531	19.42	14.81	12.81
Ratio (1)/(2)	1.08	1.03	1.04	1.00	1.02	1.02

Table 7: Successful Education Finance Cases

State	Decision	Year(s)
Alabama	*Harper v. Hunt*	1993, 1997
Arizona	*Roosevelt Elem. Sch. Dist. 66 v. Bishop*	1994, 1997
Arkansas	*Dupree v. Alma Sch. Dist.*	1983
	Lake View v. Arkansas	Filed 1994
California	*Serrano v. Priest*	1971, 1977
Connecticut	*Horton v. Meskill*	1977
	Sheff v. O'Neill	1996
Kentucky	*Rose v. The Council*	1989
Massachusetts	*McDuffy v. Secretary of Educ.*	1993
Missouri	*The Committee v. Missouri and Lee's Summit P.S.U. v. Missouri*	1996
Montana	*Helena Sch. Dist. v. Montana*	1989
	Montana Rural Educ. Assoc. v. Montana	Filed 1993
New Hampshire	*Claremont v. Gregg*	1997
New Jersey	*Robinson v. Cahill*	1973, 1976
	Abbott v. Burke	1990, 1994, 1997, 1998
North Carolina	*Leandro v. North Carolina*	1997
Ohio	*DeRolph v. Ohio*	1997
Tennessee	*Tennessee Small Sch. Systems v. McWherter*	1993, 1995
Texas	*Edgewood v. Kirby*	1989, 1991, 1992, 1995
Vermont	*Lamoile Co. v. Vermont*	1997
	Brigham v. Vermont	1997
Washington	*Seattle v. Washington*	1978
	Tronson v. Washington	1991
West Virginia	*Pauley v. Kelly*	1979, 1984
	Pauley v. Bailey	File 1994
Wyoming	*Washakie v. Herschler*	1980
	Campbell v. Wyoming	1995

Source: Minorini and Sugarman (1999)

Table 8: Impact of Education Finance Reform on
The Level and Distribution of Education Spending
1972-1997

	Coefficient (standard error)		
Dependent Variable	1-5 years after reform	6 or more years after reform	R^2
Gini coefficient	-0.0069	-0.0119	0.792
	(0.0033)	(0.0036)	
Theil index	-0.0025	-0.00027	0.745
	(0.00097)	(0.00011)	
ln(95th/5th percentile)	-0.047	-0.049	0.701
	(0.024)	(0.026)	
ln(95th percentile)	0.003	0.041	0.923
	(0.028)	(0.030)	
ln(50th percentile)	0.047	0.084	0.929
	(0.025)	(0.027)	
ln(5th percentile)	0.054	0.090	0.921
	(0.029)	(0.032)	

The data covers 46 states in 6 time periods.
All models include state and year effects.

Table 9: Impact of Court-Mandated Finance Reform on State, Local, and Total Revenue, 1972-1997($1992)

Dependent Variable	Mean of Dependent Variable	Coefficient (standard error) 1-5 years after reform	Coefficient (standard error) 6 or more years after reform	R^2
Per pupil total revenues	4117	340	726	0.896
		(167)	(168)	
Per pupil revenues from state sources	2071	258	702	0.894
		(100)	(110)	
Per pupil revenues from local sources	2045	81	24	0.890
		(141)	(142)	
State share of total revenues	0.51	0.020	0.075	0.922
		(0.019)	(0.019)	

All models include state and year effects.

Table 10: Reported Incidents of Serious Violent Criminal Incidents in Public Schools, 1996-97

	% of schools reporting serious violent incidents	Incidents per 1000 students
By minority enrollment of school:		
< 5%	5.8%	0.2
5-19%	10.9%	0.4
20-49%	11.1%	0.5
>50%	14.7%	1.0
By percentage of students participating in the free or reduced-price lunch program:		
<20%	8.6%	0.3
21-34%	11.7%	0.6
35-49%	11.6%	0.5
50-75%	8.9%	0.7
>75%	10.2%	0.8

Serious violent crimes include murder, rape or other type of sexual battery, suicide, physical attack or fight with a weapon, or robbery.

Source: U.S. Department of Education, National Center for Education Statistics, "Principal/School Disciplinarian Survey on School Violence," FRS 63, 1997.

Table 11: Characteristics of Capital Quality of Public Schools, 1999

Percentage of schools that are:	Percentage of students eligible for the free or reduced-price lunch program			
	<20%	20-39%	40-69%	>70%
6-25% over capacity	16	13	16	12
> 25% over capacity	6	8	7	12
> 35 years old	11	15	11	21
Have less than adequate				
Roofs	18	21	22	32
Plumbing	23	23	23	32
Heating, ventilation/AC	28	26	29	35

Source: U.S. Department of Education, National Center for Education Statistics, "Conditions of America's Public School Facilities: 1999."

Table 12: Characteristics of Newly Hired Teachers by Race and Income Composition of School Schools and Staffing Survey 1993-94

Percent of School Enrollment that is Black:	All	0-10%	10-50%	50-90%	90+%
N	3,643	2,656	696	181	110
Mean Years of Experience	1.48	1.48	1.49	1.49	1.51
Fraction Certified in Primary Teaching Field	91.4	93.8	88.8	87.3	86.8
Fraction with Bachelors Degree or Higher	99.5	99.4	99.7	99.8	99.7
Fraction with Masters Degree or Higher	16.7	15.6	15.1	26.2	28.4
Fraction Teaching Full-Time	86.0	83.6	88.1	94.7	94.2
Fraction Who Say They Would Teach Again	77.3	81.3	73.1	66.3	60.7
Fraction Who Plan to Exit Teaching as Soon as Possible	2.5	1.6	2.2	8.2	9.1
Fraction Who Plan to Exit Teaching at First Opportunity	14.3	13.1	12.9	27.2	21.7
Mean Academic Base Year Salary	23,083	22,741	23,509	23,943	24,209
Percent of School Enrollment Qualified for Free or Reduced-Price Lunch:	All	0-10%	10-50%	50-90%	90+%
N	3,643	834	1,878	729	202
Mean Years of Experience	-	1.47	1.47	1.49	1.58
Fraction Certified in Primary Teaching Field	-	95.6	93.1	86.7	80.9
Fraction with Bachelors Degree or Higher	-	99.3	99.6	99.5	99.6
Fraction with Masters Degree or Higher	-	22.9	14.3	16.3	14.7
Fraction Teaching Full-Time	-	82.6	84.4	91.1	90.5
Fraction Who Say They Would Teach Again	-	79.9	78.1	74.5	72.5
Fraction Who Plan to Exit Teaching as Soon as Possible	-	1.6	1.5	5.0	3.9
Fraction Who Plan to Exit Teaching at First Opportunity	-	13.1	13.5	17.8	11.2
Mean Academic Base Year Salary	-	24,282	22,331	23,232	24,268

Based on authors' calculations from the 1993-94 NCES Schools and Staffing Survey. SASS teacher weights were used in all cases. We define "newly hired teachers" as teachers with two or fewer years of experience.

Table 13: Fraction of Schools Offering Advanced Placement (AP) Courses by Race and Income Composition of School

Category	High School Class of		
	1972	1982	1992
All schools	31.0	48.3	76.4
By percentage black:			
0 – 10 %	30.0	45.6	72.8
10 – 50%	36.0	57.6	84.0
50 – 90%	23.9	50.0	77.9
90 – 100%	21.4	41.9	76.7
By percentage qualified for free or reduced-price lunch:			
0 – 10 %	38.9	52.0	84.2
10 – 50%	20.6	46.0	74.2
50 – 90%	8.3	34.4	69.0
90 – 100%	0.0	26.7	38.5

Based on authors' calculations from the National Longitudinal Study (1972), High School and Beyond (1982), and NELS (1992). Calculations apply only to public high schools participating in these three surveys. Schools were counted as having an AP program if they offered one or more advanced placement courses.

Table 14: Percentage of Schools with Internet Access, 1994-2000

		1994	1995	1996	1997	1998	1999	2000
All Schools		35	50	65	78	89	95	98
By percentage minority enrollment:								
(1)	< 6%	38	52	65	84	91	95	98
(2)	6-20%	38	58	72	87	93	97	100
(3)	21-49%	38	55	65	73	91	96	98
(4)	> 50%	27	39	56	63	82	92	96
	Difference (1) - (4)	11	13	9	21	9	3	2
By percentage students eligible for free or reduced lunch:								
(1)	< 35%	39	60	74	86	92	95	99
(2)	35-49%	36	48	59	81	93	98	99
(3)	50-74%	31	41	53	71	88	96	97
(4)	> 75%	20	31	53	62	79	89	94
	Difference (1) - (4)	19	29	21	24	13	6	5

Source: National Center for Education Statistics, *Internet Access in U.S. Public Schools and Classrooms, 1994-2000*, (2001).

Table 15: Percentage of Classrooms with Internet Access, 1994-2000

		1994	1995	1996	1997	1998	1999	2000
All Schools		3	8	14	27	51	64	77
By percentage minority enrollment:								
(1)	< 6%	4	9	18	37	57	74	85
(2)	6-20%	4	10	18	35	59	78	83
(3)	21-49%	4	9	12	22	52	64	79
(4)	> 50%	2	3	5	13	37	43	64
	Difference (1) - (4)	2	6	13	24	20	31	21
By percentage students eligible for free or reduced lunch:								
(1)	< 35%	3	9	17	33	57	73	82
(2)	35-49%	2	6	12	33	60	69	81
(3)	50-74%	4	6	11	20	60	69	81
(4)	> 75%	2	3	5	14	38	38	60
	Difference (1) - (4)	1	6	12	19	19	35	22

Source: National Center for Education Statistics, *Internet Access in U.S. Public Schools and Classrooms, 1994-2000*, (2001).

Table 16: Mean Number of Instructional Computers Per School

		1995	1997	1998	1999	2000
All Schools		72	75	90	100	110
By percentage of students eligible for free or reduced-price lunch:						
(1)	< 35%	78	84	95	109	120
(2)	35-49%	59	72	91	90	111
(3)	50-74%	74	62	81	89	94
(4)	> 75%	67	69	85	98	99
	Difference (1) - (4)	1.164	1.217	1.118	1.112	1.212

Source: National Center for Education Statistics, *Internet Access in U.S. Public Schools and Classrooms, 1994-2000*, (2001).

Table 17: Fraction of Students (K-12) that Use a Computer in School
School Enrollment Supplements to the October CPS

Category	1984	1987	1993	1997
By race:				
(1) White, non-Hispanic	36.20	56.27	70.58	80.91
(2) Black, non-Hispanic	18.18	39.03	56.29	71.52
(3) Other race, non-Hispanic	31.67	51.97	66.17	73.75
(4) Hispanic	19.73	41.66	56.72	66.59
Difference (1) - (2)	18.02	17.24	14.29	9.39
Difference (1) - (4)	16.47	14.61	13.86	14.32
By incomes of households with children:				
(1) Top third	39.51	58.62	71.10	81.02
(2) Middle third	33.31	54.89	67.90	79.38
(3) Bottom third	24.14	45.73	62.27	72.49
Difference (1) - (3)	15.37	12.89	8.83	8.53
By highest education within household:				
(1) College degree	42.04	59.90	72.87	81.54
(2) High school degree	31.35	51.90	66.11	77.64
(3) < High school degree	20.01	38.53	56.57	63.86
Difference (1) - (3)	22.03	21.37	16.30	17.68