SCHOOL FINANCE, EQUIVALENT EDUCATIONAL EXPENDITURE, AND THE INCOME DISTRIBUTION: EQUAL DOLLARS OR EQUAL CHANCES FOR SUCCESS?

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Abstract

This article breaks new ground in the debate on school finance and equality of per pupil school expenditures. We are able to merge school district data with the individual and family data of the Panel Study of Income Dynamics (PSID). This allows us to examine both student and school district characteristics and to assess several measures of equality of expenditure across the income distribution of parents and by funding sources. Unlike studies that use district-level data, our study finds a surprising degree of equality in the actual amounts expended per child in low- versus high-income families. But after adjusting expenditures for student body composition to reach equivalent education expenditures, we find a greater inequality in per pupil spending across the income distribution. In addition, there are substantial racial inequalities in expenditures across the income spectrum. In closing we discuss policy implications for school finance and increased equality of educational opportunity.

1. INTRODUCTION

Debates about school finance and its effect on children's educational performance have a long and distinguished history in both economics and education policy. The 1983 National Commission on Excellence in Education report "A Nation at Risk," which called for renewed attention to the nation's efforts to improve both schools and learning, and Jonathan Kozol's 1991 account of vast school inequities were among the first to attract popular attention to this cause. In fact, this attention was warranted. Following legal and public action, a substantial equalization of school finances across school districts within states was achieved in the 1990s according to many analysts who examined differences in school district expenditures per student using average district characteristics (e.g., Corcoran et al. 2004; Murray, Evans, and Schwab 1998; Evans, Murray, and Schwab 1997). Still, large differences across school districts persisted.

The "public benefit" case for equal funding per unit of need—what we later call "equivalent expenditures"—has been forcefully made using recent evidence on educational attainment and its relation to civic engagement, subsequent voter participation, support for free speech, and a host of other "civic capital" and "public benefit" measures (Dee 2002; Milligan, Moretti, and Oreopoulos 2003; Lochner and Moretti 2001). Thus, on both equity and efficiency grounds, it behooves us to see if in fact expenditures per pupil are equally distributed across students in public schools.

Of course, it is not clear that equal expenditures per student within or across school districts translate into equal opportunity for students. If the issue that concerns us is equality of inputs per expected unit of output, then the measure of monetary input should be not just equal fiscal effort (money expenditures per pupil), but equal effort relative to the measurable heterogeneous needs of students (differences in what it takes to provide more equal productivity of those expenditures across all children).

The active debate about whether and how "input"-based polices such as school expenditures, class size, neighborhood influences, teacher quality, and parental inputs have affected educational outcomes has not been resolved. Classic papers (e.g., Hanushek 1986; Card and Krueger 1992; Hanushek, Rivkin, and Taylor 1996) mix with newer findings and arguments (e.g., Hanushek 2003; Houtenville and Conway 2003; Raudenbush 2005; Yinger 2004) to make the case that equal spending does not produce equal outcomes. A multitude of evidence on both sides of the debate over school inputs can be marshaled to argue that finances do or do not matter (e.g., see Duncombe and Yinger 1997; Duncombe, Lukemeyer, and Yinger 2003, compared to Hanushek 2003). But we still do not know how school finances interact with parental resources at the individual student level. Do the children of poor adults attend underfunded schools, while the children of the upper class in

suburban districts attend schools with extraordinarily high expenditures per pupil? What does and what doesn't money buy in schooling once we control for student needs? And how do local, state, and federal funds intermingle to produce these outlays? This article begins to fill these gaps.

In this article, we begin *not* with the distribution of expenditures across school districts based on measures of income for the entire district, but rather with the distribution of district expenditures per pupil based on individual family economic and social circumstances for actual students in the district. We accomplish this by matching school expenditures per pupil with children and their families using the Panel Study of Income Dynamics Geo-coded file and the Department of Education's Common Core of Data (CCD) school database. This allows us to look at school finance and its pattern by economic status of parents and demographics of the household. In addition, we are able to look at the way that education expenditures compare to family finances and the distribution of economic and social resources across households. Studies at the school district level almost always use crude measures of income, such as the percentage of children in poverty or receiving free or reduced-price lunch. By using the nationally representative data set of the PSID (Panel Study of Income Dynamics), we are able to examine the inequality of school spending across the entire economic spectrum of individual pupils as well as examining inequality for racial and other groupings across the entire income spectrum.[1]

The article provides three important contributions. First, it examines equivalent expenditures that control for supply and demand factors affecting the productivity of school spending. Second, it examines economic inequality and expenditure inequality across individuals using an individual-level data set that allows for comparisons across all income levels and from specific locational and other perspectives. Finally, it measures the effects of various funding streams on equalization of spending—local revenue, state revenue, and federal revenue.

The article begins with a brief literature review on school finance, focusing on past approaches to the issue of heterogeneous student needs. Next, in section 3, we explain the data and methodology for merging data sets as well as for adjusting for cost differences and student need differences to arrive at a measure of "equivalent education expenditures." Our results are presented in the following sections. The article ends with a brief set of conclusions and policy implications.

1. However, while this allows us to address issues that district-only data would not, we still are unable to isolate expenditures on individual students and thus cannot measure differences in expenditures *within* school districts. For more on this topic see Corcoran et al. 2004.

2. THE RELEVANT LITERATURE

The literature on school finance and its distribution has been recently surveyed by Corcoran et al. (2004). They find that despite a period of increased or constant inequality from 1982 to 1992, overall inequality in educational spending fell by 20–35 percent measured nationally across school districts, from 1972 to 1997. Much of this recent reduction was the result of legal actions by which court decisions mandated greater equality of expenditures and more equalizing school revenue formulas (Lukemeyer 1999; Evans, Murray, and Schwab 1997; Ladd, Chalk, and Hansen 1999). As Corcoran et al. (2004) and Yinger (2004) note, important differences still persist, but greater equality of public effort per pupil has been achieved at the school district level.

Of course, other influences on fiscal effort are also important, including those of the federal government and local parent groups. The first of these efforts is made by the federal government by means of special Title I outlays, which are designed to help school districts who have larger-than-average shares of low-income students. These funds are already reflected in our Common Core data. But their broad distribution and relatively small value (2 percent of total spending nationwide) suggest that Title I dollars may not be enough to compensate for the unequal needs of students and that measures of unmet need ought to be accounted for as well.

A second type of effort takes the form of school-specific "foundations" by which parents add to school resources by donating tax-deductible funds to be used to complement what they see as inadequate school expenditures. Until recently, very little was known about these funds and their distribution across schools or pupils (Hoxby 1998). However, two recent articles conclude that the extent of voluntary fiscal federalism via foundation spending in California is both small and limited to a few school districts that are relatively smaller in size and therefore does not greatly reduce expenditure equality (Brunner and Sonstelie 2003; Brunner and Imazeki 2003). Rather, differences in outputs of California schools can be traced to other factors such as teacher qualifications, neighborhood effects, and other education inputs (Phillips and Chen 2004).

The idea of adjusting expenditures or incomes for the needs of the recipients in order to arrive at a measure of "equivalent income" or "effective spending" is not new in the public finance literature. In fact, money measures of income and economic well-being are often adjusted by measures of need. Examples of measures of need include the number of persons who are to have their needs met by income, age, region, or cost-of-living indexes (e.g., see Atkinson, Rainwater, and Smeeding 1995). These measures are called "equivalent income" because they employ "equivalence scales" that adjust money measures for economies of scale and scope in household living arrangements to arrive at a better measure of well-being than can be conveyed by unadjusted

income alone. Further, the value of public expenditures for health care is often delineated by the age of the recipient, because the health care needs of persons vary systematically by their age. For instance, health expenditures for elderly persons may vary by a factor of four or more times compared to those for a young adult population due to the greater health care needs of the aged (Garfinkel, Rainwater, and Smeeding 2004).

It follows that education expenditures also need to be adjusted for the student need and for school heterogeneity if we are to assess the productivity of these expenditures (see Jencks 1988). The literature we follow takes two approaches to the issue of heterogeneous student "needs." First, one must account for environmental or "ecological" differences in spending as they reflect differences in school characteristics such as size of school (economies of scale) and prevailing patterns of schoolteacher wages and related costs. Both national and international evidence suggests that adequate financing for good teachers can improve both school performance and equality of productive inputs (Fertig and Schmidt 2002; Darling-Hammond and Sykes 2003; Jencks 1988). Following Chambers and Fowler (1996) and others (Rubenstein 2002), one needs to adjust school outlays for these differences in order to reflect differential economic costs of providing education. Even then, like others, we are unable to adjust for such elements as school safety, quality of school capital, and other environmental factors that are liable to affect school performance (Phillips and Chen 2004). Moreover, the actual differences in parental resources per child (such as money, time, and parenting skill) are also not reflected in these expenditures.

A second, more important issue is related to the individual needs of students of different types. These include the special needs of disabled students, limited-English-proficiency (LEP) students, and students from low-income families. Studies of this type often ask the following question: Is education funding adequate to achieve equal opportunities for advancement for all students? The finding in Rubenstein 2002, and in many similar studies, is that urban school districts need greater expenditure per pupil to make up for the compound disadvantages that their students face (U.S. General Accounting Office 2002; Duncombe 2002). The adjustors from these and many other studies that preceded them (e.g., Duncombe and Yinger 1997; Yinger 2004; Downes and Pogue 1994; Reschovsky and Imazeki 1998) are used later in the article to adjust school spending for the needs of students.

3. DATA AND METHODS

Studies examining the equality of school expenditures generally use district-level data (e.g., Murray, Evans, and Schwab 1998). This is driven by the

fact that there is no nationally representative individual-level data set that includes adequate information about school characteristics. However, we merge data from two separate sources, the PSID and the Common Core of Data, to build a rich data set of individual, family, and school district measures.

The Merge

The PSID is a nationally representative longitudinal data set that began interviewing families annually in 1967. For this article, we use data from the 1998 wave of the PSID. Our measure of family income is income/needs ratio, which is family income divided by the poverty line for the family. The PSID has a supplemental Geo-code file that allows census data to be merged with the family information. While we do not use the census data explicitly, the location indicators in the Geo-code file (zip code, FIPS county code, and census place) are used to merge the data with the Common Core of Data. The sample includes all individuals ages six to eighteen, resulting in a sample size of 4,831.

The Common Core of Data, published by the National Center for Education Statistics, contains information on every school and school district in the United States. The financial information on school districts contained therein includes the source of all revenues and expenditures, and demographic data includes poverty rates, the percentage of LEP students, and the percentage of students with disabilities. The data are from the 1998–99 survey.

Because the Common Core of Data includes all schools in the United States, it is possible to merge the school data with the PSID using the location information in the Geo-code file. There are three possible ways for a match to be made. If there is only one school in the individual's zip code, then the district associated with that school is used.[2] If there is no school in the individual's zip code, but there is only one school district in the individual's county, then that school district is used.[3] If the student does not have a match based on these first two criteria, the National Center for Education Statistics Web site was used to make a match. This Web site allows searching for schools based on zip code and provides a list of the schools in or near that zip code, the city the school is located in, and the number of miles the school is located from the zip code. Using census place (city name) in the PSID Geo-code file, we were able to use this information to identify the school district for the individual. Given

2. School districts were identified based on whether they are only elementary, only secondary, or joint elementary and secondary. Students of elementary school age are matched only to elementary or joint districts; students of secondary age are matched only to secondary or joint districts.
3. For a number of states, school district boundaries are drawn to completely correspond to county borders.

that all school data in this study is at the district level, it is not important that we accurately identify the actual school attended but only the school district. In a minority of individuals in the sample (1.5 percent), it was not possible to identify a single school district. For these individuals, the school data is the average of the potential districts.

The sample that results from the merge is school-age individuals where each observation has data on student and family characteristics from the PSID and school district characteristics from the CCD. Because the PSID oversamples racial minority groups and low-income whites, all descriptive statistics are weighted by the PSID individual weight to provide a nationally representative sample of school-age children.[4]

Adjusting for Needs to Reach "Equivalent Education Expenditures"

The methodology to be used involves adjusting district expenditures for factors that impact the effectiveness of school spending, in essence creating an equivalence scale for spending across districts in terms of cost differences and student need differences. Within the context of an education production function, a district's education production is a function of student characteristics and teaching inputs. A district with a high proportion of students who have special learning needs would have to expend more teaching inputs to accomplish the same average level of education. In addition, school districts maximize this production function relative to some budget constraints. If there are differences in the costs of teaching inputs across districts, then a district in a high-cost

4. A recent study of attrition by Fitzgerald, Gottschalk, and Moffitt (1998) draws the following conclusion: "Despite the large amount of attrition, we find no strong evidence that attrition has seriously distorted the representativeness of the PSID through 1989, and considerable evidence that its cross sectional representativeness has remained roughly intact" (p. 251). They do find, though, that immigration accounts for some of the differences between the CPS and the PSID, therefore the PSID may not include as many recent immigrants who, according to their study, are disproportionately nonwhite and have lower labor force activities and lower earnings. There are additional sampling issues that must be addressed for the purposes of this article. Using the individual as the unit of analysis means there may be multiple observations from the same household. However, if the household is used as the unit of observation, the results would not be representative of the population of school-age children; specifically, it would give too much weight to families with only one child and too little weight to families with multiple children. An additional complication is the PSID sample design involves geographic clustering, which could result in districts being overrepresented in the sample. To address how representative the sample is and ensure that sampling and the cluster design are not affecting the results, we calculate district expenditures by district poverty rates (a parallel analysis to table 2, panel B) and compared the results using our sample to results using all school districts in the United States. There are small differences. The average unadjusted spending in our sample is 0.72 percent higher than for all school districts; the largest difference is for unadjusted expenditures of the lower-middle poverty quintile, which is 3.25 percent higher. However, the patterns and relative magnitudes of the results were the same for all districts as for our sample; this holds not only for unadjusted expenditures but also when cost and needs are adjusted for. These results are available from the authors upon request.

area would not produce as much education, for the same dollar amount of expenditures, as a district in a low-cost area would. Ideally we would be able to measure the amount of education provided to each student when considering the equality of educational opportunities. Unfortunately, we are limited to examining the average expenditures per student in a district as a proxy for this source of heterogeneity. Given the differences in student composition and costs across schools, it is important to adjust expenditures per student to more accurately capture what we will call "equivalent education expenditures (EEE)." These adjustments can be interpreted as measuring how much would be spent per student (on average) if schools all faced the same costs and had the same student body composition.

Our purpose is to examine the equality of EEEs on individual students as ranked by their parental income. Differences in regional costs of providing education and differences in the characteristics of the student body will result in the same level of resources in different districts purchasing different amounts of educational input—or having differential productivity per dollar spent. What we are measuring is the average expenditure per student adjusting for these different costs and needs factors. For example, we adjust for the percent of high-need students in the district by using estimates from the literature on how much extra actually is spent to educate high-need students. Therefore, the EEE numbers presented can be interpreted as how much is spent on the average student in a school district once the amount of extra resources the district must spend on high-need students is accounted for given its student body composition. However, EEEs should not be interpreted as "sufficient" expenditures, as our adjustments are based on how much extra *is actually* spent on high-need students, rather than how much *would have to be spent* in order to give a high-need student the same opportunity to succeed as the average student.

In order to adjust for cost differences of various school inputs in different school districts, we first adjust school spending using Chambers's 1993–94 geographic cost-of-education index (GCEI) developed for the National Center on Educational Statistics (see Chambers and Fowler 1996; Chambers 1997). The purpose of the GCEI is to adjust for cost-of-living differences among different school districts and variations in the desirability of different regions and school districts as places to work and live. Chambers's index is based on a hedonic wage model that captures the effect of cost factors that local school district officials can control as well as those they cannot. The advantage of Chambers's index is that it is the only comprehensive, national index of its kind. However, the index is not without problems. Specifically, criticisms include that: (1) the data that this index is based on are out of date; (2) the regression does not directly control for private wages, hence it produces biased

results;[5] and (3) since the regression only includes two variables that attempt to measure a district's classroom environment, most cross-district variation in classroom environment is omitted from the model (Yinger 2001).

We next adjust district spending based on three measures of student need—percentage of special education students, percentage of students with limited English proficiency, and percentage of low-income children in the district—using the following equation for adjusted expenditures:

$$\frac{\$e}{w \times p + 1 \times (1 - p)}$$

where $\$e$ is the district's per pupil expenditure, w is the weight assigned to each special needs student, and p is the fraction of students who are in a special needs category. For each adjustment we present results using two sets of weights, a low weight and a high weight.[6] Each weight represents estimates of the actual percentage increase in spending used to educate children with these extra needs. For example, a weight of 1.8 would indicate that the school spends 80 percent more to educate the high-need student than the average student. If one district has 50 percent high-need students and a second district has 25 percent high-need students and both districts spend $10,000 per student on average and the weight is 1.8, the EEE for the first district would be $\$10{,}000 \div (1.8 \times .50 + 1 \times .5) = \$7{,}143$, and the EEE for the second would be $\$10{,}000 \div (1.8 \times .25 + 1 \times .75) = \$8{,}333$. Because the district spends 1.8 times as much on high-need students, the $10,000 average expenditure per student overstates what is actually spent on the average student; the average student in the first district is actually receiving only $7,143, while the average student in the second district is actually receiving $8,333 in comparative terms.

The adjustment for the percentage of special education students recognizes the additional expenditure demands, such as smaller class size, teacher aides, transportation, assessment, special vocational services, and adaptive physical education. Chaikind, Danielson, and Brauen (1993) find that average total per pupil special education expenditures were 2.3 times the cost of regular education. A recent study by Chambers, Parrish, and Harr (2004) finds a ratio

5. Schools must attract teachers away from alternative employment, so teacher wages will have to be higher when the wages in alternative employment are higher. Chambers controls for this factor indirectly by including variables such as population density, distance of the district office from the central city, and housing costs. However, he does not directly control for wages in alternative employment opportunities. He does not, for example, include a variable to measure average wages of college graduates in the region.

6. A variety of government studies use this same weighting scheme to adjust for student needs and either use the same weights as our study or weights that fall within the range of our low and high rates. Examples include U.S. General Accounting Office 1996, 1997, 1998, 2002 and Parrish, Matsumoto, and Fowler 1995.

of 1.9. Two older studies (Kakalik et al. 1981; Rossmiller, Hale, and Frohreich 1970) find ratios of 2.17 and 1.92, both within the range of the newer studies. Guided by this range, we use 1.9 and 2.3 for the low and high weight for the district's percent of special education students where a student is designated as special education if they are on an IEP (Individual Education Plans) program.

We also do needs adjustments for students with limited English proficiency and low-income students. LEP students may be given tutoring, be placed in self-contained classrooms with smaller class size and more teacher aides, be given additional materials and supplies, and use special textbooks, all of which require additional expenditures. Using a selective, limited sample of school districts in California, Parrish (1994) finds that expenditures on LEP students are 10 percent higher. But because this is considered a lower bound on expenditures, we use 1.1 as our low weight. The high weight, following the range of weights used by the U.S. General Accounting Office (2002) and based on government and academic studies (for example, Downes and Pogue 1994; Duncombe 2002), is 1.9. The adjustment for low-income students recognizes that additional educational services are often necessary because low-income students are at greater risk of failure. Examples of these services include supplemental instruction, before- and after-school programs, and professional development for teachers. The low weight for low-income students is 1.2, based on Federal Title I provisions of additional resources, and the high weight is 2.0, based on the adjustment factor found by William Duncombe (2002) in his estimate of the cost function of education in New York. Downes and Pogue (1994) and Reschovsky and Imazeki (1998) find poverty weights near the upper end of this range in estimates of education cost functions for Arizona and Wisconsin, respectively.[7]

The mean percentage of students in the school district with these needs adjustment characteristics for each income/needs category can be found as appendix 1 on the *Education Finance and Policy* Web site (http://mitpressjournals.org/efp). Not surprisingly, individuals who are in low-income families live in districts where a higher percentage of children are in poverty. However, even among individuals with income/needs ratios greater

7. While the original intent of Title I was to compensate for cost differences in educating low-income students, the money provided for Title I may represent not only the cost differences but also a redistribution to low-income districts for other reasons. Using it as a lower bound assumes that it is only capturing cost differences. The studies that estimate cost functions for Arizona and New York use fixed effects or instrumental variables to isolate the cost factor from other district characteristics, such as ability to raise revenue or inefficiency. In justifying the use of weights of 1.2 to 2.0, the U.S. General Accounting Office (1998) study *State and Federal Efforts to Target Poor Students* states, "Depending on the type of services provided, the experts have estimated that the additional cost for educating poor students ranges from 20 to 100 percent of the average per pupil cost. Such estimates are equivalent to poor student weights ranging from 1.2 to 2.0" (p. 35).

Table 1. Measures of Educational Expenditure per Pupil by Income/Needs Raito

Expenditure Measure[a] (District per Pupil Expenditures)	Sample Mean	Income/Needs Ratio				
		In Poverty	1 to 2	2 to 3	3 to 5	> = 5
Unadjusted	$7,206	$6,953	$6,969	$7,093	$7,187	$7,636
Cost-adjusted	$7,132	$6,966	$6,994	$7,178	$7,119	$7,308
Low needs, cost-adjusted (EEE)	$6,197	$5,882	$5,992	$6,196	$6,234	$6,489
High needs, cost-adjusted (EEE)	$5,111	$4,432	$4,173	$5,056	$5,280	$5,654
Expenditure as % of Expenditures for Those in Poverty	**Total**	**Income/Needs Ratio**				
		In Poverty	1 to 2	2 to 3	3 to 5	> = 5
Unadjusted	103.6%	100.0%	100.2%	102.0%	103.4%	109.8%
Cost-adjusted	102.4%	100.0%	100.4%	103.0%	102.2%	104.9%
Low needs, cost-adjusted (EEE)	105.4%	100.0%	101.9%	105.3%	106.0%	110.3%
High needs, cost-adjusted (EEE)	115.3%	100.0%	106.3%	114.1%	119.1%	127.4%

Source: Authors' calculations for the Panel Study of Income Dynamics.

[a]See text for definition of expenditures.

than five, 11.6 percentage of children in their district were living in poverty in 1998. Thus, equivalent expenditures will be lower for all income quintiles when high-need students are taken into consideration, but the effect will be greatest for individuals in the lower income quintiles. The percentage of children with special needs in the district (indicating they are on an IEP program) is fairly constant across income quintiles. Finally, the percentage of LEP students is much higher in school districts attended by the lowest income quintile (14.1 percent) compared to those in the highest income quintile (5.8 percent). The difference in student body characteristics of poverty and limited English proficiency suggest that adjusting for student needs is important in getting an accurate picture of inequality in education spending.

4. BASIC RESULTS: UNADJUSTED EXPENDITURES AND EEE BY STUDENT AND PARENTAL CHARACTERISTICS

School Expenditures by Family Income Level

Table 1 contains weighted mean school district spending in 1998 by income/needs level for the student's family for each of the expenditure measures. The actual dollars spent per student, or unadjusted expenditures, across all income groups was $7,206. Although spending increases monotonically across the income/needs ratio, the differences across income levels are within 10 percent. Those with income more than five times the poverty line have the highest school spending ($7,636), and those with income below the poverty line have the lowest expenditures ($6,953). Unadjusted expenditures are

virtually identical for those near poverty (income/needs ratio of one to two) as those in poverty, and 2 to 3 percent higher for those with income/needs ratios of two to five. This equality is truly surprising for those whose priors suggest that inequalities manifest themselves in substantially higher per pupil spending for "rich" children as compared to those not so well off. The unadjusted numbers suggest that these differences are not very large.

But the expenditure figures reflected in the unadjusted numbers of row 1 (table 1) do not take into consideration the fact that cost-of-living differences result in simple expenditures not being comparable across locations. Row 2 presents school expenditures adjusting for Chambers's geographic cost-of-education index. These cost adjustments result in education expenditures being even *more* equally distributed, implying that students in higher-income families live in higher cost-of-education areas. For example, those with income/needs ratios greater than five have expenditures that are only 4.9 percent higher than those in poverty, compared to almost 10 percent unadjusted.

The final set of adjustments to school expenditures take into consideration the fact that some students have higher needs and thus require more expenditures to provide an equivalent level of education input in terms of the measured productivity of those expenses. As was discussed earlier in the article, prior studies have shown that low-income students, students with disabilities, and LEP students require more inputs. Rows 3 and 4 of table 1 show expenditures that are adjusted for the percentage of the school district that is in poverty, the percentage with special needs (on an IEP program), and the percentage with limited English proficiency to produce our measure of EEE.

Inequality is much larger once student needs are taken into account. Using the low range of student need weights, students from the highest income/needs range attended schools with expenditures that are 10.3 percent higher than students living in poverty. Using the high range adjustment, the numbers rise to 27.4 percent, or $1,213 more per student. The difference is not just between the highest income and the lowest income; those with income to needs of two to three and three to five spend 14 percent to 19 percent more than those in poverty, respectively. Calculating EEE for the lowest income group shows that those in poverty receive 5.4 to 15.3 percent less than the average student, rather than the 3.6 percent implied by the unadjusted expenditures.

We find that the effects for poverty and limited English proficiency are much larger than the effects for disability. These results are consistent with recent findings that disability ratings are largely relative measures and therefore that all school districts seem to have a quota of "disabled" students. For instance, Cullen (2003) finds that fiscal incentives for state and federal funds for disabled students can explain nearly 40 percent of the growth in student disability rates in the state of Texas alone. In fact, there has been a recent

increase in national school-related disability rates due to chronic limitations, despite a continued decline in disability rates by any other measure in recent years (Federal Interagency Forum on Child and Family Statistics 2003).

Comparison of Individual-Level Data to District Data

One contribution of this article is the ability to examine individual-level income data rather than relying on aggregate proxies of income for the school district. To contrast the results using individual data to results using district-level data, we use the Common Core of Data information for all school districts in the United States to examine how district expenditures vary by the income level for the district using the percentage of children in the district in poverty as a proxy for district income.[8] To make the analysis more comparable, we use quintiles of income/need for the PSID data set and quintiles of percentage of children in poverty for the CCD data (where the bottom quintile has the highest percentage of children in poverty).

Table 2 presents per pupil expenditures by family income/need quintile for the PSID in panel A and by district percent of children in poverty quintile from the CCD in panel B. Because family incomes vary greatly within a school district, the aggregate district poverty data suggest greater inequality in spending than what is seen using the individual-level data. For example, the range across quintiles of unadjusted expenditures using individual data varies between $6,932 and $7,650, while using district data it ranges from $6,575 to $8,057. When adjustments are made for cost and student needs, the difference is even more striking. With the high needs adjustment, school districts from the top poverty quintile with district data on average spend 147 percent more than those from the bottom quintile. But school districts from the top income/needs quintile on average only spend 127 percent more than those from the bottom quintile. The results suggest that studies that use income measures for the school district to proxy for family income will overstate the inequality in school spending relative to actual family income.

School Expenditures by Race and Income Level

Table 3 disaggregates school expenditures from table 1 by race: The third panel compares expenditures for whites to those for nonwhites of the same income level. While the unadjusted mean expenditures for whites are very similar to nonwhites, both in aggregate ($7,235 compared to $7,150) and across the income levels, the EEE measures are much higher for whites: Districts attended by white children spend 8 percent more per student than districts attended

8. The district data are weighted by the number of students in the district to make the results representative of all students in school.

Table 2. Contrast of Individual-Level Analysis and District Analysis: Measures of Educational Expenditure per Pupil by Family Income/Needs Ratio and % of District Children in Poverty

Panel A: Individual–Level Analysis Using Family Income/Needs Ratio Quintile						
Expenditure Measure[a] (District per Pupil Expenditures)	**Sample Mean**	**Income/Needs Ratio Quintile**				
		Lowest	**Mid-Low**	**Middle**	**Mid-Upper**	**Top**
Unadjusted	$7,206	$6,982	$6,932	$7,298	$7,167	$7,650
Cost-adjusted	$7,132	$6,979	$6,998	$7,297	$7,076	$7,309
Low needs, cost-adjusted (EEE)	$6,197	$5,907	$6,020	$6,335	$6,223	$6,502
High needs, cost-adjusted (EEE)	$5,111	$4,468	$4,833	$5,269	$5,315	$5,671
Expenditure as % of Expenditures for Those in Poverty		**Income/Needs Ratio Quintile**				
	Total	**Lowest**	**Mid-Low**	**Middle**	**Mid-Upper**	**Top**
Unadjusted	103.2%	100.0%	99.3%	104.5%	102.6%	109.6%
Cost-adjusted	102.2%	100.0%	100.3%	104.6%	101.4%	104.7%
Low needs, cost-adjusted (EEE)	104.9%	100.0%	101.9%	107.2%	105.3%	110.1%
High needs, cost-adjusted (EEE)	114.4%	100.0%	108.2%	117.9%	119.0%	126.9%
Panel B: School District–Level Analysis Using District % of Children in Poverty Quintile						
Expenditure Measure[a] (District per Pupil Expenditures)	**Sample Mean**	**% of Children in Poverty Quintile**				
		Lowest	**Mid-Low**	**Middle**	**Mid-Upper**	**Top**
Unadjusted	$7,164	$7,362	$6,575	$6,750	$7,078	$8,057
Cost-adjusted	$7,135	$7,163	$6,869	$6,990	$7,060	$7,591
Low needs, cost-adjusted (EEE)	$6,200	$5,950	$5,861	$6,076	$6,253	$6,861
High needs, cost-adjusted (EEE)	$5,170	$4,273	$4,681	$5,114	$5,496	$6,293
Expenditure as % of Expenditures for Those in Poverty		**% of Children in Poverty Quintile**				
	Total	**Lowest**	**Mid-Low**	**Middle**	**Mid-Upper**	**Top**
Unadjusted	97.3%	100.0%	89.3%	91.7%	96.1%	109.4%
Cost-adjusted	99.6%	100.0%	95.9%	97.6%	98.6%	106.0%
Low needs, cost-adjusted (EEE)	104.2%	100.0%	98.5%	102.1%	105.1%	115.3%
High needs, cost-adjusted (EEE)	121.0%	100.0%	109.5%	119.7%	128.6%	147.3%

Source: Authors' calculations for the Panel Study of Income Dynamics.

[a]See text for definition of expenditures.

by nonwhite children when the low student need adjustments are made and 22 percent more when the high need adjustments are made. The unadjusted expenditure numbers do not capture the true difference in average expenditure by race.

The differences in race are seen across the income spectrum, but nonwhite children in low-income families attend schools that are particularly less well funded. For those children in poverty, schools attended by white children

Table 3. Measures of Educational Expenditure per Pupil by Race

Expenditure Measure[a] (District per Pupil Expenditures)	Sample Mean	Income/Needs Ratio				
		In Poverty	1 to 2	2 to 3	3 to 5	> = 5
Panel A: Child Is Not White						
Unadjusted	$7,150	$6,895	$7,115	$7,336	$7,285	$7,619
Cost-adjusted	$6,932	$6,807	$6,888	$7,085	$7,034	$7,049
Low needs, cost-adjusted (EEE)	$5,890	$5,714	$5,804	$5,999	$6,104	$6,229
High needs, cost-adjusted (EEE)	$4,468	$4,186	$4,273	$4,513	$4,972	$5,148
Panel B: Child Is White						
Unadjusted	$7,235	$7,151	$6,786	$6,993	$7,160	$7,638
Cost-adjusted	$7,235	$7,511	$7,129	$7,216	$7,143	$7,337
Low needs, cost-adjusted (EEE)	$6,355	$6,459	$6,228	$6,277	$6,272	$6,518
High needs, cost-adjusted (EEE)	$5,441	$5,274	$5,268	$5,280	$5,368	$5,700
Panel C: White as Percent of Those Nonwhite of Same Income Level						
Expenditures for White as % of Expenditures for Nonwhite	**Total**	**Income/Needs Ratio**				
		In Poverty	1 to 2	2 to 3	3 to 5	> = 5
Unadjusted	101.2%	103.7%	95.4%	95.3%	98.3%	100.2%
Cost-adjusted	104.4%	110.3%	103.5%	101.9%	101.6%	104.1%
Low needs, cost-adjusted (EEE)	107.9%	113.0%	107.3%	104.6%	102.8%	104.6%
High needs, cost-adjusted (EEE)	121.8%	126.0%	123.3%	117.0%	108.0%	110.7%

spend 13 percent to 26 percent ($745 to $1,088) more per student than schools attended by nonwhite children. In contrast, nonwhite children with the greatest family income resources are able to attend school districts with expenditures closer, but still not equal to, their white counterparts. White children living in families with income greater than five times the poverty line spend 5 percent to 11 percent ($289 to $552) more than nonwhite children in the same income category. The equivalent expenditures show that spending is not equal across racial groups, even when income is controlled for. Thus, the effects of race compound the effects noted by income differences alone (table 1).

School Expenditures by Urbanization and Income Level

Students living in an urban area may attend schools with different cost of living and different student body composition than students in the suburbs or rural areas. Expenditures in cities or suburbs may be higher (or lower) for a number of cost- and labor-market-related factors (Darling-Hammond and Sykes 2003). Table 4 presents school expenditures by income needs and by

Table 4. Measures of Educational Expenditure per Pupil by Location

Panel A: Lives in City

Expenditure Measure[a] (District per Pupil Expenditures)	Sample Mean	Income/Needs Ratio				
		In Poverty	1 to 2	2 to 3	3 to 5	> = 5
Unadjusted	$7,224	$7,175	$7,316	$7,438	$7,058	$7,235
Cost-adjusted	$7,047	$6,969	$7,079	$7,178	$6,999	$6,997
Low needs, cost-adjusted (EEE)	$5,988	$5,824	$5,985	$6,115	$5,965	$6,085
High needs, cost-adjusted (EEE)	$4,628	$4,251	$4,504	$4,754	$4,757	$4,986

Panel B: Lives in Suburb

Expenditure Measure[a] (District per Pupil Expenditures)	Sample Mean	Income/Needs Ratio				
		In Poverty	1 to 2	2 to 3	3 to 5	> = 5
Unadjusted	$7,519	$6,691	$6,816	$7,015	$7,608	$8,048
Cost-adjusted	$7,126	$6,572	$6,652	$6,805	$7,191	$7,472
Low needs, cost-adjusted (EEE)	$6,338	$5,658	$5,811	$6,011	$6,434	$6,702
High needs, cost-adjusted (EEE)	$5,481	$4,278	$4,688	$5,195	$5,657	$5,964

Panel C: Lives in Rural Area

Expenditure Measure[a] (District per Pupil Expenditures)	Sample Mean	Income/Needs Ratio				
		In Poverty	1 to 2	2 to 3	3 to 5	> = 5
Unadjusted	$6,564	$6,501	$6,377	$6,682	$6,496	$6,721
Cost-adjusted	$7,294	$7,407	$7,285	$7,507	$7,137	$7,167
Low needs, cost-adjusted (EEE)	$6,314	$6,336	$6,267	$6,472	$6,197	$6,302
High needs, cost-adjusted (EEE)	$5,301	$5,221	$5,237	$5,352	$5,228	$5,449

Panel D: Suburb as Percent of Those in City of Same Income Level

Expenditures in Suburb as % of Expenditures in City	Total	Income/Needs Ratio				
		In Poverty	1 to 2	2 to 3	3 to 5	> = 5
Unadjusted	103.8%	93.3%	93.2%	94.3%	107.8%	111.2%
Cost-adjusted	101.1%	94.3%	94.0%	94.8%	102.7%	106.8%
Low needs, cost-adjusted (EEE)	105.8%	97.2%	97.1%	98.3%	107.9%	110.1%
High needs, cost-adjusted (EEE)	118.4%	100.6%	104.1%	109.3%	118.9%	119.6%

Panel E: Town/Rural as Percent of Those in City of Same Income Level

Expenditures in Town/Rural as % of Expenditures in City	Total	Income/Needs Ratio				
		In Poverty	1 to 2	2 to 3	3 to 5	> = 5
Unadjusted	90.6%	90.6%	87.2%	89.8%	92.0%	92.9%
Cost-adjusted	103.5%	106.3%	102.9%	104.6%	102.0%	102.4%
Low needs, cost-adjusted (EEE)	105.4%	108.8%	104.7%	105.8%	103.9%	103.6%
High needs, cost-adjusted (EEE)	114.5%	122.8%	116.3%	112.6%	109.9%	109.3%

[a]See text for definition of expenditures.

urban location. There is a large difference between the equity of expenditures across urban areas using both unadjusted numbers and EEEs.

Using unadjusted expenditures, it appears that wealthier individuals in the suburbs attend schools with expenditures about 8 to 11 percent higher than those in the city, while lower-income suburban children attend schools with expenditures about 6 percent lower than those in the city. The cost adjustments have a rather small effect on the distribution, but the needs adjustments have a quite large effect. EEEs with the high student need adjustment are 18 percent more on average for students in the suburbs than for those in the city (the number is 6 percent using the low need adjustment). These increased expenditures are experienced for individuals with higher family income; by contrast, schools attended by suburban children in poverty have expenditures roughly equal to those attended by their city counterparts.

The pattern is different still for individuals living in a small town or rural area. Unadjusted expenditures there are about 10 percent lower than those for individuals in the city, and this holds across the income distribution. However, much of this funding difference reflects the lower cost of living in these rural areas. If we control for cost of living, spending is actually slightly higher in the rural areas. When cost adjustments are combined with the needs adjustments, reflecting the fact that urban schools are more likely to have high-need students, the equivalent expenditure premium experienced by rural children is 5 to 15 percent for low and high needs adjustment, respectively. While suburban children in poverty had comparable expenditures to their urban counterparts, low-income rural children fare much better than poor city children, with expenditures that are 9 to 23 percent higher.

In summary, while unadjusted education spending per student varies little by income level, adjustments for costs, for student needs, and for race and location each produce larger differences when viewed alone. These differences both compound (e.g., race and income) and counteract (e.g., needs and rural area) one another to produce patterns of "equivalent" educational expenditure that differ by selected student and school district characteristics.

Sensitivity Analysis

As with many empirical articles, a variety of assumptions and data adjustments have been made. The sensitivity analysis presented here examines the definition of income and adjustment factors used. There are two primary issues regarding our definition of income. First, we choose to use income/needs ratio rather than the actual (unadjusted) income level because this captures the relative standard of living that we feel is most appropriate. In contrast, many other studies use actual income. Second, while the education expenditure is

adjusted for cost-of-education differences, no similar cost-of-living adjustment has been made to income. Appendix 2, located on the *EFP* Web site, presents the results using family income not adjusting for family needs (panel B) and with a regional adjustment to income/needs for cost of living (panel C).[9] A comparison to household income/needs quintiles (panel A) indicates the results are consistent across income specifications and adjustments.

We have presented a case for why expenditures should be adjusted for cost and need factors. We have also discussed difficulties with Chambers's cost of education index and recognize that differences exist in currently available needs adjustments. Appendix 3, located on the *EFP* Web site, examines how the results would change if no adjustment were made for a particular factor. The first panel uses the low adjustment factors; the second panel uses the high adjustment factors. For the low adjustment factor, the adjustment for disability has the largest effect: If no adjustment were made for disability, expenditures would be 10 percent higher. However, this adjustment is made equally across all income categories and thus has little effect on distribution of expenditures. The adjustment for cost of education has the greatest effect on distribution of expenditures. If no cost-of-education adjustment were made, expenditures would be much less equally distributed. For the high adjustment factor, the adjustment for poverty has the largest effect on overall level of expenditure and on distribution. Expenditures would be more equally distributed if no adjustment were made for poverty.

5. MULTIVARIATE ANALYSIS OF EXPENDITURE

The descriptive statistics presented indicate that school expenditures vary based on income, race, and urbanization. The regression analysis presented in table 5 allows all of these factors to be examined jointly. The purpose is to isolate how the equality of school spending varies by these major demographic characteristics.[10] One of the contributions of the article is to be able to examine the entire income spectrum. Therefore, we first present the basic regression results (panel A) and then present a set of regressions that include interaction variables that allow the coefficient estimates to vary by parental incomes (panel B). The dependent variable is the log of district per pupil spending.

9. The cost-of-living adjustment is a regional adjustment based on metropolitan and nonmetropolitan cost of living by state (U.S. Census Bureau 2001).
10. This research contrasts studies that are estimating the demand for education expenditures. While demand studies are interested in what factors affect a community's demand for the public good, this study is interested in the distributional effects of these education choices made by the local, state, and federal governments. While the regression analysis isolates the partial correlations, as long as households are mobile, causation cannot be attributed.

Table 5. Multivariate Estimates of Various Measure of School Expenditures Using Dependent Variable: Log of District per Pupil Expenditure with Listed Adjustments

Panel A: Base Expenditure Regression Results[a]

	Unadjusted		Cost Adjusted		Cost and Low Needs		Cost and High Needs	
	Coef. Est	**St. Err.**	**Coef. Est**	**St. Err.**	**Coef. Est**	**St. Err.**	**Coef. Est**	**St. Err.**
Intercept	**1.959**	0.008	**1.955**	0.007	**1.800**	0.007	**1.570**	0.008
Ln of income/needs	**0.014**	0.004	0.003	0.003	**0.009**	0.003	**0.022**	0.004
Dummy for whether child is black	*−0.013*	0.008	−0.008	0.007	**−0.021**	0.007	**−0.066**	0.008
Dummy for whether child is Latino	**−0.113**	0.013	**−0.157**	0.012	**−0.188**	0.012	**−0.340**	0.013
Dummy for whether child is other race/ethnicity	0.015	0.016	−0.022	0.014	**−0.034**	0.014	**−0.108**	0.016
Dummy for whether child lives in suburb	0.001	0.008	**−0.015**	0.007	**0.019**	0.007	**0.107**	0.008
Dummy for whether child lives in town/rural	**−0.132**	0.008	0.002	0.007	0.009	0.007	**0.059**	0.008

Table 5. Continued

Panel B: Interaction Expenditure Regression Results[a]								
	Unadjusted		Cost Adjusted		Cost and Low Needs		Cost and High Needs	
	Coef. Est	**St. Err.**	**Coef. Est**	**St. Err.**	**Coef. Est**	**St. Err.**	**Coef. Est**	**St. Err.**
Intercept	**1.971**	0.011	**1.970**	0.010	**1.816**	0.010	**1.594**	0.011
Ln of income/needs	−0.010	0.008	**−0.019**	0.007	**−0.015**	0.007	−0.007	0.008
Dummy for whether child is black	−0.003	0.011	−0.011	0.010	**−0.023**	0.010	**−0.071**	0.011
Dummy for whether child is Latino	**−0.105**	0.015	**−0.153**	0.014	**−0.186**	0.014	**−0.379**	0.015
Dummy for whether child is other race/ethnicity	−0.033	0.024	**−0.068**	0.021	**−0.094**	0.022	**−0.214**	0.024
Dummy for whether child lives in suburb	**−0.056**	0.011	**−0.059**	0.010	**−0.026**	0.010	**0.056**	0.011
Dummy for whether child lives in town/rural	**−0.163**	0.011	*−0.017*	0.010	−0.013	0.010	**0.031**	0.011
Income × dummy for whether child is black	−0.012	0.009	0.002	0.008	0.001	0.008	0.000	0.009
Income × dummy for whether child is Latino	0.006	0.017	−0.005	0.016	0.002	0.016	*0.031*	0.017
Income × dummy for whether child is other race/ethnicity	**0.052**	0.019	**0.038**	0.017	**0.064**	0.017	**0.115**	0.019
Income × dummy for whether child lives in suburb	**0.060**	0.009	**0.045**	0.008	**0.047**	0.008	**0.052**	0.009
Income × dummy for whether child lives in town/rural	**0.045**	0.010	**0.027**	0.009	**0.031**	0.009	**0.035**	0.010

Note: Bold values are significant at 5 percent level; italicized values are significant at 10 percent level
[a]Variables are as explained in text.

Basic Regression Results

Income is a statistically significant predictor of school expenditures across all the specifications except the cost adjustment but is rather small in magnitude. The income elasticity of education is .009 using the low needs adjustment and .022 using the high needs adjustment. This means that a 10 percent change in income is associated with a .09 to .22 percent change in expenditures per pupil (or EEE).

For the regression analysis, race/ethnicity is broken down into black, Hispanic/Latino, and other, with white as the reference category. Because of the growing fraction of all students from minority households, these differences are very important predictors of not just current school needs but all near-future school needs (Tienda 2005). The racial differences for Hispanic/Latino individuals are striking in the regression results. Controlling for income and urbanization of location, the coefficient estimate for the Hispanic/Latino indicates equivalency spending of 19 percent less than whites using the low estimate of student needs and 34 percent less using the high estimate.[11] Blacks also are in districts with lower EEE, even controlling for income, with a coefficient estimate indicating spending of 6.6 percent (2.1 percent) less for the high (low) need adjustments.

Finally, the basic regression results indicate that there are differences in expenditures even when one controls for cost-of-education differences, student needs, and income based on the location of the school district. With no adjustments, those living in the suburbs have virtually the same spending as those in the city (the omitted category). However, once equivalent cost and needs adjustments have been made, between 1.9 percent and 10.7 percent more is spent per student depending on whether the low or high weights for student needs are used. Conversely, those in a town or rural area have a coefficient estimate of −0.132 when no adjustments are made, but once cost and needs are adjusted for using the high-need standard, have equivalent expenditures that are 5.9 percent more than those of city schools. In other words, when cost and needs are not adjusted for, the expenditures of city schools are overstated compared to those of rural schools and small towns.

11. A majority of the Hispanic/Latino individuals in the sample live in California, so the regressions were also run with a dummy variable for California. The coefficient estimate on the Hispanic/Latino variable remains statistically significant but is smaller in magnitude (17.9 percent and 4.7 percent for the high and low needs adjustment, respectively). From a policy perspective, it is not clear whether the regression with the California variable is preferred. If we are trying to examine inequality as a nation, the fact that a large percent of a minority group live in a low-spending state does not reduce the amount of inequality. This would be similar to saying there hasn't been a historic difference in expenditures for blacks because blacks were more likely to live in the South, where spending is lower. In both specifications, Latino students receive considerably less effective expenditures than whites or blacks.

Interaction Effects

In order to determine how the effects of race and urbanization vary across the income distribution, several interaction variables are added to the basic regression. The coefficient estimates on black and Latino students remain very similar to the base regression, and the interaction term is not significant. While children in these racial groups face lower equivalent expenditures per student, the effect is the same for all income levels. The interaction term for other race/ethnicity indicates that there is a greater gap in spending between low-income children of "other" races and low-income whites than between high-income children of "other" races and high-income whites.

The positive and significant coefficient estimate on the urbanization/income interaction terms indicate that higher-income individuals in the suburbs and rural areas have a greater level of expenditures than do higher-income individuals in the city. In other words, the expenditure difference between low-income city children and low-income suburban/rural children is not as great as the expenditure difference between high-income city children and high-income suburban/rural children. While the differences in expenditures between low-income city and suburban/rural children are not as dramatic as one might expect, the coefficient estimate on the urbanization variables still indicate that the city children have lower expenditures per student than those children in the suburbs/rural area; it is just that the reduction in expenditures is larger for higher-income city children than for lower-income city kids.

6. SOURCES OF EQUALIZATION

Our analyses suggest that unadjusted spending is fairly equal across income levels and racial groups, but EEEs are not so equally distributed. In this section, we examine the sources of revenue, whether local, state, or federal, to try to better understand what roles both level and type of government revenue have on the degree of inequality evident across the income distribution.

Table 6 presents the revenue per student from the various revenue sources. For ease in exposition, the table is constructed using the average of the low and high needs adjustments for each district. Thus, the base revenue values in the top row of panel A are comparable to the average of the third and fourth rows of EEE from table 1. The pattern for total revenue follows very closely that found for total expenditures in table 1, both in terms of revenue per student by family income and by race.

Local tax bases are the primary source of variation in revenue. The average local revenue per student is 47 percent higher than the revenue for students living in poverty, and students in families with income more than five times the needs standard receive almost 88 percent more local revenue per student

Table 6. Measure of Revenue per Pupil by Source of Revenue, Income Level, and Race

Panel A: By Income/Needs Ratio

Amount of Revenue by Source	Sample Mean	Income/Needs Ratio				
		In Poverty	1 to 2	2 to 3	3 to 5	> = 5
Total revenue	$5,549	$5,061	$5,269	$5,492	$5,711	$5,893
Local revenue	$2,576	$1,752	$2,060	$2,447	$2,783	$3,292
State revenue	$2,635	$2,838	$2,799	$2,671	$2,628	$2,374
Federal revenue	$339	$471	$410	$374	$300	$227
% Change from Those in Poverty	**Total**	**Income/Needs Ratio**				
		In Poverty	1 to 2	2 to 3	3 to 5	> = 5
Total revenue	109.6%	100.0%	104.1%	108.5%	112.8%	116.4%
Local revenue	147.0%	100.0%	117.6%	139.7%	158.8%	187.9%
State revenue	92.8%	100.0%	98.6%	94.1%	92.6%	83.7%
Federal revenue	72.0%	100.0%	87.0%	79.4%	63.7%	48.2%

Panel B: By Race

Child Is Not White

Amount of Revenue by Source	Sample Mean	Income/Needs Ratio				
		In Poverty	1 to 2	2 to 3	3 to 5	> = 5
Total revenue	$5,069	$4,863	$4,924	$5,148	$5,430	$5,491
Local revenue	$1,966	$1,633	$1,651	$2,121	$2,604	$2,791
State revenue	$2,648	$2,744	$2,795	$2,508	$2,454	$2,403
Federal revenue	$456	$487	$477	$519	$371	$297

Child Is White

Amount of Revenue by Source	Sample Mean	Income/Needs Ratio				
		In Poverty	1 to 2	2 to 3	3 to 5	> = 5
Total revenue	$5,795	$5,739	$5,705	$5,634	$5,791	$5,938
Local revenue	$2,889	$2,162	$2,575	$2,582	$2,834	$3,348
State revenue	$2,628	$3,162	$2,804	$2,738	$2,678	$2,371
Federal revenue	$278	$415	$326	$314	$279	$219

White as % of Nonwhite of Same Income

	Total	Income/Needs Ratio				
		In Poverty	1 to 2	2 to 3	3 to 5	> = 5
Total revenue	114.3%	118.0%	115.9%	109.4%	106.6%	108.1%
Local revenue	146.9%	132.4%	156.0%	121.7%	108.8%	120.0%
State revenue	99.2%	115.2%	100.3%	109.2%	109.1%	98.7%
Federal revenue	61.0%	85.2%	68.3%	60.5%	75.2%	73.7%

than those in poverty. State funding is comparable in size to local revenue but does very little to redistribute educational effort. The average state revenue is only 7.2 percent less than revenue for those in poverty, and those with income more than five times the poverty line receive only 16 percent less state revenue than do children in poverty. As expected, state revenue produces more equal overall revenue per student, as a result of providing a virtual lump-sum transfer to all students, making local revenue differences relatively smaller than if all funding were based on local revenues alone. In contrast, federal revenue is actually progressive, with individuals in poverty receiving 28 percent more federal revenue than the average. But since federal revenue is so small relative to total revenue (only 9 percent of revenue is from federal sources), it does little to affect the distribution of revenue.

Panel B of table 6 breaks the revenue data down by race. Whites receive more local revenue than nonwhite children across the income spectrum. The difference is most dramatically pronounced between those with low income: Whites with incomes below the poverty line (or incomes between one to two times the poverty line) have public schools that receive 32.4 percent (and 56 percent) more local revenue, respectively, than do low-income nonwhites. In contrast, federal revenue is greater for nonwhites than for whites, both for the sample as a whole and across the income spectrum. However, again, the dollar amounts for federal revenue are so much smaller that it is not enough to offset local revenue differences. These findings are consistent with those of Yinger (2004). The lesson here is that while school finance equalization has had some effect on expenditure patterns by student income level, these effects have not been strong enough to offset the inequities inherent in local educational finance patterns.

7. CONCLUSIONS, RESEARCH ISSUES, AND POLICY ISSUES

Many studies have examined the degree of inequality in school expenditures by school district. This study is unique because it adjusts those expenditures for differences in costs of education and student needs and is done using a data set for individuals and families rather than comparing school districts. We find that studies using district-level data overstate the level of inequality in per student expenditures that is found using individual-student-level data.

Still, unadjusted school spending patterns clearly understates the degree of inequality in school spending effort, and the understatement comes more from student need factors than from district cost factors. It is because of the differential composition of students at schools attended by families of different incomes that equivalent expenditures vary significantly by family income. In addition, large racial and ethnic inequalities in school spending persist across

the entire income spectrum. Both low-income and high-income blacks and Hispanic/Latino individuals have lower EEEs in their school districts than do whites of comparable income, although the differences are much higher for Hispanic/Latino students. While state and federal revenues offset huge local revenue disparities and reduce the amount of inequality, state funds are not distributed progressively enough, and federal funds are not large enough to fully compensate for the local inequalities in which they face.

Our findings suggest that it is not enough to just equalize nominal dollars spent if one wants to have equal impacts from public spending. In attempting to equalize spending, policy makers must also consider cost differences and student need differences across districts. In other words, the extraordinary needs of children less prepared for school or more difficult to educate need to be taken into greater account by school funding formulas. For instance, policies that incur higher costs to attract better teachers to schools with high needs (e.g., pay incentives, loan forgiveness) and programs to better prepare students (e.g., early childhood education and preschool programs) may be needed to reach equality of academic opportunity for those who would otherwise struggle at current expenditure levels. Policies that change the composition of school districts to avoid concentration of high-needs students should also be evaluated in this regard.

In closing we argue that analysts need to place school spending data—equivalent expenditures and unadjusted expenditures—into perspective. American children living in the lowest quintile belong to families that had median resources in cash and near cash (e.g., food stamps) of about $9,800 per child in 1997. In contrast, the median parent of children living in the highest quintile had on average $50,100 per child to spend after taxes and government benefits (Smeeding 2002). In the face of such daunting differences as these, the modest amounts we spend on school finance (roughly $7,000 per pupil in 1997) cannot be expected to bring about equality of opportunity in educational attainment for American children. Stronger measures are needed if educational equality of opportunity is the goal.

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Appendix I: School Mean District Characteristics by Income/Needs Ratio

	Sample	Income to Needs Ratio				
District Characteristic	Mean	in poverty	1 to 2	2 to 3	3 to 5	>=5
% of Students in Poverty	19.2	31.7	24.5	19.9	15.9	11.6
% of Students in Special Education	11.7	11.8	11.7	12.2	11.7	11.2
% of Students Limited English Proficiency	9.4	15.3	13.9	9.7	6.4	5.8

Appendix II: Sensitivity to Alternative Income Measures

Panel A: Income to Needs Quintiles

	Income to Needs Ratio Quintile				
District Per Pupil Expenditure Measure[A]	Bottom	Low Mid	Middle	Upper Mid	Top
Unadjusted	$6,982	$6,932	$7,298	$7,167	$7,650
Cost-adjusted	$6,979	$6,998	$7,297	$7,076	$7,309
Low needs, cost adjusted (EEE)	$5,907	$6,020	$6,335	$6,223	$6,502
High needs, cost adjusted (EEE)	$4,468	$4,833	$5,269	$5,315	$5,671

Expenditures as % of Expenditures	Income to Needs Ratio Quintile				
for Those in the Bottom Quintile	Bottom	Low Mid	Middle	Upper Mid	Top
Unadjusted	100.0%	99.3%	104.5%	102.6%	109.6%
Cost-adjusted	100.0%	100.3%	104.6%	101.4%	104.7%
Low needs, cost adjusted (EEE)	100.0%	101.9%	107.2%	105.3%	110.1%
High needs, cost adjusted (EEE)	100.0%	108.2%	117.9%	119.0%	126.9%

Panel B: Household Income Quintiles

	Household Income Quintile				
District Per Pupil Expenditure Measure[A]	Bottom	Low Mid	Middle	Upper Mid	Top
Unadjusted	$6,976	$6,862	$7,003	$7,092	$7,615
Cost-adjusted	$7,014	$7,033	$7,137	$7,105	$7,305
Low needs, cost adjusted (EEE)	$5,957	$6,027	$6,183	$6,215	$6,477
High needs, cost adjusted (EEE)	$4,603	$4,783	$5,118	$5,266	$5,607

Appendix II: Sensitivity to Alternative Income Measures (continued)

Expenditures as % of Expenditures for Those in the Bottom Quintile	Household Income Quintile				
	Bottom	Low Mid	Middle	Upper Mid	Top
Unadjusted	100.0%	98.4%	100.4%	101.7%	109.2%
Cost-adjusted	100.0%	100.3%	101.8%	101.3%	104.1%
Low needs, cost adjusted (EEE)	100.0%	101.2%	103.8%	104.3%	108.7%
High needs, cost adjusted (EEE)	100.0%	103.9%	111.2%	114.4%	121.8%

Panel C: Income to Needs Quintiles Adjusted for Regional Cost of Living

District Per Pupil Expenditure Measure[A]	Income to Needs Ratio Quintile				
	Bottom	Low Mid	Middle	Upper Mid	Top
Unadjusted	$7,089	$6,985	$7,260	$7,132	$7,565
Cost-adjusted	$6,992	$7,042	$7,246	$7,088	$7,291
Low needs, cost adjusted (EEE)	$5,919	$6,057	$6,312	$6,217	$6,482
High needs, cost adjusted (EEE)	$4,451	$4,873	$5,277	$5,316	$5,638

Expenditures as % of Expenditures for Those in the Bottom Quintile	Income to Needs Ratio Quintile				
	Bottom	Low Mid	Middle	Upper Mid	Top
Unadjusted	100.0%	98.5%	102.4%	100.6%	106.7%
Cost-adjusted	100.0%	100.7%	103.6%	101.4%	104.3%
Low needs, cost adjusted (EEE)	100.0%	102.3%	106.6%	105.0%	109.5%
High needs, cost adjusted (EEE)	100.0%	109.5%	118.6%	119.4%	126.7%

Appendix III: Sensitivity to Alternative Cost and Needs Factors

Panel A: Low Needs Factor Adjustments

Expenditure Measure[A]	Sample	Income to Needs Ratio				
(district per pupil expenditures)	Mean	in poverty	1 to 2	2 to 3	3 to 5	>=5
All needs and cost adjustments	$6,197	$5,882	$5,992	$6,196	$6,234	$6,489
No adjustment for cost	$6,265	$5,868	$5,967	$6,121	$6,301	$6,784
No adjustment for poverty	$6,404	$6,212	$6,250	$6,414	$6,407	$6,618
No adjustment for disabilities	$6,819	$6,475	$6,594	$6,245	$6,864	$7,110
No adjustment for limited English	$6,244	$5,950	$6,056	$6,864	$6,267	$6,522

Expenditures as % of All Needs		Income to Needs Ratio				
and Cost Adjusted	Total	in poverty	1 to 2	2 to 3	3 to 5	>=5
No adjustment for cost	101.1%	99.8%	99.6%	98.8%	101.1%	104.6%
No adjustment for poverty	103.3%	105.6%	104.3%	103.5%	102.8%	102.0%
No adjustment for disabilities	110.0%	110.1%	110.0%	110.5%	110.1%	109.6%
No adjustment for limited English	100.8%	101.2%	101.1%	100.8%	100.5%	100.5%

Expenditures as % of Expenditures		Income to Needs Ratio				
for Those in Poverty	Total	in poverty	1 to 2	2 to 3	3 to 5	>=5
All needs and cost adjustments	105.4%	100.0%	101.9%	105.3%	106.0%	110.3%
No adjustment for cost	106.8%	100.0%	101.7%	104.3%	107.4%	115.6%
No adjustment for poverty	103.1%	100.0%	100.6%	103.3%	103.1%	106.5%
No adjustment for disabilities	105.3%	100.0%	101.8%	105.7%	106.0%	109.8%
No adjustment for limited English	104.9%	100.0%	101.8%	105.0%	105.3%	109.6%

Appendix III: Sensitivity to Alternative Cost and Needs Factors (continued)

Panel B: High Needs Factor Adjustments

Expenditure Measure[A]	Sample	Income to Needs Ratio				
(district per pupil expenditures)	Mean	in poverty	1 to 2	2 to 3	3 to 5	>=5
All needs and cost adjustments	$5,111	$4,432	$4,713	$5,056	$5,280	$5,645
No adjustment for cost	$5,164	$4,402	$4,673	$4,982	$5,339	$5,905
No adjustment for poverty	$5,829	$5,492	$5,565	$5,813	$5,916	$6,134
No adjustment for disabilities	$5,740	$4,941	$5,273	$5,701	$5,944	$6,339
No adjustment for limited English	$5,371	$4,764	$5,043	$5,326	$5,485	$5,863

Expenditures as % of All Needs		Income to Needs Ratio				
and Cost Adjusted	Total	in poverty	1 to 2	2 to 3	3 to 5	>=5
No adjustment for cost	101.0%	99.3%	99.2%	98.5%	101.1%	104.6%
No adjustment for poverty	114.0%	123.9%	118.1%	115.0%	112.0%	108.7%
No adjustment for disabilities	112.3%	111.5%	111.9%	112.8%	112.6%	112.3%
No adjustment for limited English	105.1%	107.5%	107.0%	105.3%	103.9%	103.9%

Expenditures as % of Expenditures		Income to Needs Ratio				
for Those in Poverty	Total	in poverty	1 to 2	2 to 3	3 to 5	>=5
All needs and cost adjustments	115.3%	100.0%	106.3%	114.1%	119.1%	127.4%
No adjustment for cost	117.3%	100.0%	106.2%	113.2%	121.3%	134.1%
No adjustment for poverty	106.1%	100.0%	101.3%	105.8%	107.7%	111.7%
No adjustment for disabilities	116.2%	100.0%	106.7%	115.4%	120.3%	128.3%
No adjustment for limited English	112.7%	100.0%	105.9%	111.8%	115.1%	123.1%