

APPENDIX D

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Data Sources

Financial information for school districts was based on the 1990 Survey of Local Government Finances, commonly known as the F-33. This data collection effort was jointly conducted by NCES and the U.S. Bureau of the Census (Governments Division) for all public school districts in the country. These data permit the assessment of revenue and expenditure equity for school districts within states, as well as across the Nation. For district and community information, district and school-level data files of the 1989-1990 Common Core of Data (CCD), and the 1990 Census School District Special Tabulation, commonly known as the census mapping file, were used. All three of these data files were intended to include the universe of public school districts, but the census mapping file has a number of missing districts in certain states. Information for missing districts was imputed (see Imputation Procedures in this appendix).

Selection of Observations

After merging the F-33, CCD District, CCD school summed to district, and census mapping files, school districts were dropped from the data set if they provided specialized or solely administrative services, were missing data, or were outliers. Observations were deleted if any of the characteristics listed below were present. (There were a total of 17,418 observations. The number of observations remaining after each deletion is shown in brackets.)

- Were designated as vocational, special education, college grades, nonoperating, or education services agencies (school-level code from F-33) [16,194];
- Had zero or missing enrollment (fall enrollment for October 1989 from F-33) [15,008];
- Had zero or missing total revenue and total expenditure (total revenue and total expenditure from F-33) [15,007];
- Had the strings “VOC,” “TECH,” “VOC TECH,” “SPEC ED,” “SPECIAL ED,” or “AGRIC” in the name of the district (LEA name from CCD District and F-33) [14,960]
- Had over 50 percent special education students (special education students from CCD District and fall enrollment from F-33) [14,918];
- Were supervisory union administrative centers, regional education services agencies, state-operated agencies, federally operated agencies, or other agencies that cannot be appropriately classified using another CCD designation (type code from CCD District) [14,811];

- Had per student expenditures that were less than the 0.5 percentile or greater than the 99.5 percentile, with the exception of districts with expenditure levels known to be accurate (total expenditures and enrollment from F-33) [14,661].¹

Procedures for Calculating State Payments Made on Behalf of School Districts

Based on information received from the Governments Division Branch Chief at the Census Bureau and NCES, the following procedures were performed to allocate state on-behalf-of-LEA revenues to districts. These procedures include allocation to the separate on-behalf-of-LEA expenditure categories of C-J13 (Expenditures on-behalf-of-LEA – Instruction), C-J15 (Expenditures on-behalf-of-LEA – Support Services), and C-J10 (Expenditures on-behalf-of-LEA – Other current).

For states with district totals of zero in on-behalf-of-LEA revenues *and* expenditures fields, district current expenditures in the three categories of instruction, support, and other current expenditures were used as a percentage of total state current expenditures of each of these three to determine three separate on-behalf-of-LEA expenditure estimates of “Expenditures – on-behalf-of-LEA – Instruction,” “Expenditure – on-behalf-of-LEA – Support,” and “Expenditures – on-behalf-of-LEA – Other current” for each district. For districts that reported less on-behalf-of-LEA revenues than the state reported it gave, the additional revenues were allocated to districts in that state which did not report on-behalf-of-LEA revenues and expenditures. In cases in which districts reported less on-behalf-of-LEA revenues than the state reported it gave *and* all districts in that state reported on-behalf-of-LEA revenues or expenditures, the difference was added to existing values in on-behalf-of-LEA revenues and expenditures categories for each district, using the procedures below (and in these cases the C-J10, C-J13, and C-J15 are relevant).

Although districts in Montana reported on-behalf-of-LEA revenues, state reports indicated zero revenues were allocated for this fund. Following the Census Bureau’s suggestion, districts that reported on-behalf-of-LEA revenues were changed to zero.

¹ The data were modified in this way to exclude extreme values that seemed implausible. Even after deleting high cost special and vocational education districts, expenditures per student were still as high as \$53,588 and as low as \$1499. Thus, the 0.5 and 99.5 percentiles were chosen as cut-off points with the observations thought to be erroneous deleted from the analysis. The average expenditures per student at these points are \$2,462 and \$17,742, respectively. Twenty-four of the 75 observations that were greater than the 99.5 percentile were added back to the data set because they were districts in Alaska and New York, and these extremely high expenditures per student were known to be accurate in these states.

The three current expenditure variables were constructed as shown below.

Instruction includes:

Instruction Expenditures

and if applicable:

Elementary/Secondary Retirement Fund Transfer – Own System

Expenditures on-behalf-of-LEA – Instruction

Support includes:

Instructional Staff Expenditures

General Administration Support Services Expenditures

School Administration Support Services Expenditures

Support Services, Unspecified Pupil Expenditures

Support Services, Pupil Expenditures

All Other Support Services Expenditures

and if applicable:

Elementary/Secondary Retirement Fund Transfer – Support Services

Elementary/Secondary Expenditures on-behalf-of-LEA – Support Services

Other current includes:

Food Service

Expenditures on-behalf-of-LEA – other current

The following procedures were used to assign district values:

District on-behalf-of-LEA instruction expenditure =

$$\frac{\text{Instruction expenditure of district}}{\text{Instruction expenditure of state}} \times \text{On-behalf-of-LEA instruction expenditure of state}$$

District on-behalf-of-LEA support services expenditure =

$$\frac{\text{Instruction expenditure of state}}{\text{Instruction expenditure of district}} \times \text{On-behalf-of-LEA support services expenditure of state}$$

District on-behalf-of-LEA noninstruction =

$$\frac{\text{Current other expenditure of district}}{\text{Current other expenditure of state}} \times \text{On-behalf-of-LEA current other expenditure of state}$$

District on-behalf-of-LEA total expenditure =

District on-behalf-of-LEA instruction expenditure +
District on-behalf-of-LEA support services expenditure +
District on-behalf-of-LEA other current expenditure

District on-behalf-of-LEA total revenue =

District on-behalf-of-LEA total expenditure.

Imputation Procedures

The number of students in a district who were classified into various ethnicity categories and as special education students was missing for some school districts. In those cases, it was imputed either from other years' percentages of student in these categories, or, in a few cases in which information from other years was unavailable, from percentages in similar school districts.

The numbers were imputed using AIR's hot deck procedure, PROC IMPUTE. PROC IMPUTE selects the best method of differentiating school districts for the purpose of imputing ethnicity and special education category counts and selects a value from the distribution of values for similar districts. For example, for the 1989-1990 special education percentage, determination of similar districts was based primarily on a weighted average of the percentages for 1988-89 and 1990-91. (Log number of ungraded students, the highest grade in the district, and metro status also entered into the similarity measure with small weights.)

For special education counts, there was one state in which a large percentage of cases had neither 1988-89 data nor 1990-91 data. However, in that state there were data for most districts in 1991-92, and 1991-92 data were used in the imputation of both 1988-89 percentages and 1990-91 percentages. Therefore, there was no state in which the majority of 1989-90 special education percentages were imputed without benefit of data on the percentages from some other year.

Overall, 1989-90 special education percentages were imputed for 1,789 districts, 12 percent of all districts. The mean percentage of special education students in districts that reported data was 9.8 percent, and the mean for imputed values was 7.8 percent. The standard deviation of imputed values was 6.8 percent, compared to 9.2 percent for reported values, once reported values greater than 100 percent were trimmed. The slightly smaller means and standard deviations reflect the fact that districts similar to those with missing special education data reported lower and less varying special education counts than other districts.

Three measures of children in poverty, children with limited English proficiency, and children at risk; and four household measures of income, value of owner-occupied

housing, poverty, and education attainment were used in this report. These measures were computed from several dozen variables contained in the Census Mapping (CM) database. All of the measures actually used in the report were averages, medians, or percentages.

The Census Mapping data were missing for approximately 350 of the Nation's 16,000 school districts, including approximately 250 in northern California. Although no tables in the report refer to state-by-state breakdowns, it was preferable to include those 350 districts in the aggregate figures tabulated. To do this, it was necessary to impute averages, percentages, and medians of the seven children and household measures derived from Census Mapping variables for those 350 districts. AIR did this with a simple hot deck imputation procedure, described below.²

A merged CCD/F-33/CM file was created for the expenditure report analyses. This file was sorted in a manner that places districts likely to be similar to one another on the CM variables, and for each record with missing CM data, the values of variables from the preceding case with data were inserted.

The imputed variables relate to language background, ethnicity, and wealth. Therefore, the merged CCD/F-33/CM file was sorted on CCD wealth and ethnicity measures. In particular, the percentage of students who are free lunch eligible, the percentage of students who are Hispanic, and the percentage of students who are minority were used as sort variables. Each of these percentages were blocked in 5-percent intervals. Within these blocks, districts were sorted on the three-level CCD locale code. Finally, districts were sorted by total enrollment within each combination of sort variables.

To avoid odd imputations that might result from the lexicographic ordering of the cases, if the first case of several within a combination of the four sort variables is missing data, it received data from the following case, rather than from the preceding case. If the only case within a combination was missing data, it received data from either the preceding or following case, depending on which was more similar on the sort variables.

² Where county-level information was available, imputation was not necessary when county and district lines were coterminous. Beyond this, county-level data were not used in the imputation process to preserve variability among districts in a county.

Construction of Key Revenue and Expenditure Categories

The revenue and expenditure categories used in tables were constructed from F-33 variables as shown below:

Total Expenditures included:

- E13 Instruction expenditures
- E17 Support services, pupil expenditures
- E07 Support services, instructional staff expenditures
- E08 Support services, general administrative expenditures
- E09 Support services, school administrative expenditures
- E27 Support services, all other expenditures
- E11 Gross school lunch expenditures
- E10 All other (enterprise operations, community service operations, adult education)
- E15 Support services, unspecified
- F12 Capital outlay, construction
- G15 Capital outlay, land and existing structures
- K12 Capital outlay, new and replacement equipment
- J10 Expenditures, on-behalf-of-LEA, other current
- J11 School retirement fund transfer
- J12 School retirement fund transfer, own system
- J13 Expenditures, on-behalf-of-LEA, instruction
- J15 Expenditures, on-behalf-of-LEA, support services
- L12 Payments to state governments
- M12 Payments to local governments
- I86 Interest on debt
- Q11 Interschool transfer

Current Expenditures included:

- E13 Instruction expenditures
- E17 Support services, pupil expenditures
- E07 Support services, instructional staff expenditures
- E08 Support services, general administration expenditures
- E09 Support services, school administration expenditures
- E15 Support services, unspecified
- E27 Support services, all other expenditures
- E11 Gross school lunch expenditures
- J10 Expenditures, on-behalf-of-LEA, other current
- J11 School retirement fund transfer
- J12 School retirement fund transfer, own system
- J13 Expenditures, on-behalf-of-LEA, instruction
- J15 Expenditures, on-behalf-of-LEA, support services

Core Expenditures included:

- E13 Instruction expenditures
- E17 Support services, pupil expenditures
- E07 Support services, instructional staff expenditures
- E15 Support services, unspecified
- E27 Support services, all other expenditures
- J10 Expenditures, on-behalf-of-LEA, other current
- J11 School retirement fund transfer
- J12 School retirement fund transfer, own system
- J13 Expenditures, on-behalf-of-LEA, instruction
- J15 Expenditures, on-behalf-of-LEA, support services

Total Revenue included:

- T06 Property tax
- T09 General sales or gross receipts tax
- T15 Public utility taxes
- T40 Individual and corporate net income taxes
- T99 All other taxes
- T02 Parent government contributions
- D11 Revenue from other school systems
- D23 Revenue for other school systems
- A10 Tuition and transportation feeds from pupil and parents
- U22 Interest earnings
- A09 Gross receipts from school lunch sales
- A12 Other sales and service revenue (student activities, revenue from community services, textbook sales and rentals)
- U97 Miscellaneous other local revenue (rentals, contributions and donations from private sources, gains or losses on sale of fixed assets, miscellaneous)
- C23 Revenue from state sources
- C24 Census considered state revenue/NCES considered local revenue
- C25 Federal Child Nutrition Act revenues
- C26 All other federal aid through state
- C27 Total state payments on behalf of school district
- B23 Federal government revenue for elementary and secondary education
- B26 Other Federal government revenue received

Total Revenue from Local Sources included:

- T06 Property tax
- T09 General sales or gross receipts tax
- T15 Public utility taxes
- T40 Individual and corporate net income taxes
- T99 All other taxes
- T02 Parent government contributions
- D11 Revenue from other school systems
- D23 Revenue for other school systems
- A10 Tuition and transportation feeds from pupil and parents
- U22 Interest earnings
- A09 Gross receipts from school lunch sales
- A12 Other sales and service revenue (student activities, revenue from community services, textbook sales and rentals)
- U97 Miscellaneous other local revenue (rentals, contributions and donations from private sources, gains or losses on sale of fixed assets, miscellaneous)
- C24 Census considered state revenue/NCES considered local revenue

Total Revenue from State Sources included:

- C23 Revenue from state sources
- C27 Total state payments on behalf of school district

Total Revenue from Federal Sources included:

- C25 Federal Child Nutrition Act revenues
- C26 All other federal aid through state
- B23 Federal government revenue for elementary and secondary education
- B26 Other Federal government revenue received

Resource-Cost Adjustments

To allow analyses of fiscal measures to be meaningful in a comparative sense, a set of indices for adjusting revenues and expenditures for resource-cost differences *across districts* was incorporated. Cost-adjusted data are especially important in making national comparisons because the nominal dollar amounts for districts are of much less interest than what they represent in the form of real purchasing power. When comparable expenditures for education services are reported, comparable power to purchase education goods and services is assumed. Because of locational cost differentials, however, identical expenditures may *not* have the same purchasing power in different districts. To allow meaningful comparisons of revenues and expenditures per student across districts, it is important to convert these nominal amounts (actual dollars) into amounts that reflect real purchasing power (cost-adjusted dollars).

Although the concept of adjusting for cost differentials in making comparisons in expenditures and revenues across regions is generally accepted, the most appropriate set of adjustments to be used for these purposes has yet to be fully agreed upon or developed. For this reason, and to allow the reader to ascertain the impact of the cost adjustments to the actual data, actual and cost-adjusted revenue and expenditure information are presented together throughout this report.

The resource-cost adjustments used in this report are based on a set of unique cost-of-living indices calculated by McMahan and Chang (1991) for large cities, metropolitan areas, and nonmetropolitan areas across all of the states. These indices were derived from a regression analysis of the relationship between the cost-of-living and per capita personal income, housing value, and percentage change in population. (The Cost of Living Index table that follows was reproduced from their 1991 report.) Thus, in the absence of cost-of-education measures, the McMahan and Chang measures were used to produce alternative sets of expenditure and revenue values to accompany the actual values.

These cost-of-living indices were attached to individual districts through the use of the MSA and metro status codes for school districts from the 1989-90 CCD district file. These geographic codes and categories are assigned by the Office of Management and Budget (OMB), for the purpose of linking school districts to their respective *area components* of metropolitan statistical areas. The metro status code indicates the extent to which a district primarily serves a central city, and the MSA code further identifies the specific city being served.

In assigning cost-of-living indices to specific cities, a district was assigned to the nonmetropolitan cost of living index for its state when the metro status code indicated that it did not serve an MSA. When the metro status code indicated that a district served an MSA, that district was assigned the generic MSA index for its state unless its MSA code associated it with one of the large cities listed in the table, in which case it was assigned the index for that particular large city.

An issue associated with the use of the McMahon and Chan indices included in this report is the relative lack of detail. For the majority of the states, only two indices were provided, metropolitan and nonmetropolitan areas. This level of aggregation masks a great deal of district-level variation and would seem to be of especially questionable use in analyses within individual states. However, more detail was provided for the most populous states. For example, seven indices were calculated for California with unique indices provided for each of the five large cities (population greater than 1.5 million). This level of detail is considered to be sufficient for use in this analysis of the full universe of districts across the Nation. It is also considered to be a placeholder for introducing the concept of resource-cost adjustments until more appropriate and detailed indices are made available for these purposes.

The most appropriate form of cost adjustment to be used with the F-33 fiscal data would be based on measures of variation in the cost of *education* resources in different locations throughout the country. Although work on the development of such cost-of-education differentials has been investigated by NCES, this type of cost-adjustment factor is not currently available for use in this report. Lacking cost adjustments based on differences in the cost of *education*, a second option is to base the cost factors to be used in this report on differences in cost of *living* within states and across the Nation. Although less preferable than cost-of-education measures, it has been shown that variations in the cost of living are highly correlated with differences in the cost of education (Chambers 1981; Chambers et al. 1993).

Cost of Living Index, 1989
For Large Cities, Metropolitan Areas, and Nonmetropolitan Areas

State	Large City (Pop > 1.5 m)	MSA's (1.5m – 50,000)	Nonmetropolitan (Pop < 50,000)
Alabama		96.02	94.90
Alaska		127.60	137.10
Arizona		101.15	100.43
Arkansas		96.30	93.10
California		118.75	99.25
Anaheim-Santa Ana	130.90b		
Los Angeles-Long Beach	129.20		
Riverside-San Bernardino	110.36		
San Francisco	151.84		
San Jose	129.90		
Colorado		99.63	93.45
Denver	102.10		
Connecticut		131.75	99.33
Delaware		112.85c	102.80
District of Columbia		125.50	
Florida		101.08	97.20
Miami-Hialeah	113.50		
Georgia		98.95c	98.30
Hawaii		132.50*	132.50
Idaho		96.10	92.75
Illinois		105.56	97.35
Chicago	120.10b		
Indiana		96.77	95.46c
Iowa		96.50	95.95
Kansas		98.85	89.80
Kentucky		95.97	91.20
Louisiana		98.80	93.45*
Maine		104.00*	99.30*
Maryland		108.30	101.80*
Massachusetts		120.25	99.30*
Michigan		106.93	103.50
Detroit	117.63b		
Minnesota		100.03	95.23*
Mississippi		96.02a	93.30
Missouri		94.45	88.95

Data is not available, so the index uses data from an adjacent state (or city).

a Data is not the same as Alabama, because there are no MSA's in Mississippi.

b COL predicted using regression equation based on BLS sample, as explained in McMahon (1991). It uses data on housing values, per capita personal income, and population change specific to each large city. The resulting prediction for each city indicated (b) is before normalization to a statewide base of 100. To accomplish this adjustment, a regression equation was computed in each case for a neighboring city that does not have ACCRA data, and the ratio of the BLS based prediction to the ACCRA estimate in the neighboring city is used to "normalize" the BLS-equation predictions to the same base.

c The data presented by ACCRA data is incomplete and is not representative, or is missing, so the regional index for the respective MSA's or nonmetropolitan areas is used.

d For Nevada MSA's and nonmetropolitan areas respectively, 1989 and 1990 ACCRA data is pooled.

Cost of Living Index, 1989 (Continued)
For Large Cities, Metropolitan Areas, and Nonmetropolitan Areas

State	Large City (Pop > 1.5 m)	MSA's (1.5m – 50,000)	Nonmetropolitan (Pop < 50,000)
Montana		95.61*	93.86*
Nebraska		92.45	89.33
Nevada		106.87d	104.40d
New Hampshire		122.30	99.30*
New Jersey		122.05c	122.05c
Newark	122.05c		
New Mexico		100.85	98.06
New York		105.82	99.50c
Nassau-Suffolk	137.73b		
New York	131.45b		
North Carolina		99.19	96.80
North Dakota		98.60	95.23
Ohio		98.29	96.07
Cleveland	111.94b		
Oklahoma		93.75	87.00
Oregon		99.00	94.90
Pennsylvania		104.60	99.50
Philadelphia	129.20		
Pittsburgh	106.10		
Rhode Island		103.96*	99.33*
South Carolina		96.34	92.70
South Dakota		96.90	94.95
Tennessee		95.30	92.93
Texas		95.89	94.05
Dallas	104.20		
Houston	99.10		
Utah		92.10	90.80
Vermont		103.96*	99.33*
Virginia		113.27	101.80
Washington		97.42	92.70
Seattle	113.20		
West Virginia		93.87	92.07*
Wisconsin		99.80	96.10
Wyoming		95.61c	93.86c

Data is not available, so the index uses data from an adjacent state (or city).

b COL predicted using regression equation based on BLS sample, as explained in McMahon (1991). It uses data on housing values, per capita personal income, and population change specific to each large city. The resulting prediction for each city indicated (b) is before normalization to a statewide base of 100. To accomplish this adjustment, a regression equation was computed in each case for a neighboring city that does not have ACCRA data, and the ratio of the BLS based prediction to the ACCRA estimate in the neighboring city is used to "normalize" the BLS-equation predictions to the same base.

c The data presented by ACCRA data is incomplete and is not representative, or is missing, so the regional index for the respective MSA's or nonmetropolitan areas is used.

d For Nevada MSA's and nonmetropolitan areas respectively, 1989 and 1990 ACCRA data is pooled.

Student-Need Adjustments

To account for variations in the education needs of students in districts and to ensure that data can be compared in meaningful ways, education resource values were adjusted by student need. The three most prevalent categorical funding sources in recognition of these student-need variations are special education, compensatory education, and limited English proficient (LEP) students. Because of these categorical funding sources and because of the clearly acknowledged higher cost of serving these categories of students, meaningful resource allocation distinctions cannot really be made across districts without somehow taking into account variations in these student populations. For example, equal revenues across districts that appear to be perfectly equitable, may, in fact, be quite inequitable if these districts enroll different populations of special need students. This issue is equally important, if not more so, than the resource-cost adjustments; and, due to the lack of relevant data, will be even more difficult to ascertain with precision. However, because of their importance to this analysis, we have made the best effort to account for the effects of these variations using results from a limited number of studies that have addressed this issue.

The weightings used for the student-need adjustments for special education were based on the best available information found regarding the average, marginal costs of providing additional services to meet the needs of these exceptional need populations. Of course, the use of a single cost factor masks the considerable variations in the cost of providing different types of interventions to different types of students within each special needs category. Lacking counts of service configuration by district, single average cost factors were applied to counts of special needs students by district.

A single multiplier for special education, produced by Moore et al. (1988), based on data from a nationally representative sample, is 2.3. This multiplier reflects the finding that the average cost of serving a special education student was 2.3 times the cost of serving regular education students for the 1985-86 school year. This special education weight is fairly well established over years of research on this issue, and it has not varied a great deal across alternative special education cost studies (Chaikind, Danielson, and Brauen 1993).

For children in poverty, the best estimate for a single multiplier may be based on the average federal Chapter 1 allocation for a school year. As many states have compensatory education supplemental allocations for students in poverty, this multiplier will actually understate the actual average adjustment received by students in poverty across the Nation. However, this readily available and well-understood indicator may be the best, currently available, basis for determining a weighting for students in poverty. Based on total average revenues per student for 1987 and the average Chapter 1 allocation per student, the resultant weighting for students in poverty is 1.2 (Levin 1989).

Cost estimates for LEP students are even more problematic. The most carefully derived cost estimate that we are aware of is based on a cost analysis of alternative programs for LEP students in California, which is summarized in a paper by Parrish (1994). Although based on a purposive sample of districts and restricted to California, these data may provide the best estimate available of the marginal cost of serving students with limited English proficiency. Based on these data, the estimated multiplier of the excess cost of serving LEP students is 1.08 (\$4,598 average expenditures per student in California as compared to the estimated supplemental cost of serving LEP students in this subset of California districts of \$361.) Because this study was based on a very limited sample and very little information on the cost of instructional services for LEP students is available, a multiplier of student weight of 1.2 was used for LEP students. This was selected for lack of a better number and because there is no reason that special services for LEP students would be less costly than for students in poverty.

The student weights used in this study are certainly open to challenge and could easily be replaced by alternatives. This is especially true of the students in poverty and LEP weights. For example, one alternative would be to increase the poverty weight from 1.2 to 1.4 to reflect the authorized, rather than the actual, Chapter 1 grant. The weights used in this study should be viewed as placeholders until better program cost estimates are derived.

Compensatory education student-need adjustments were applied to districts based on the percentages of children living in households where English is not the spoken language and who speak English “not well” or “not at all,” and the percentage of children in poverty which were derived from the Census Mapping database. The enrollment count of each district in the F-33 was multiplied by these percentages to determine the counts of compensatory education students. These students were given an enrollment weight of 1.2. The CCD database contained counts of special education students; these were given an enrollment weight of 2.3.

Dispersion Measures

Broad interest in comparing expenditures had led to several questions about how variation in expenditures per student should be measured. For example, should the degree of variation existing within a state simply be expressed as the size of the gap between the highest and lowest spending districts? Or should a measure of variation omit some of the more extreme values and look at the expenditure gap between districts at some specified percentiles (e.g., the degree of difference between districts at the 5th and 95th percentiles)?

Relative variation, or dispersion, in education expenditures per student can be measured in a variety of ways. Each of these alternatives focuses on a unique aspect of the distribution of expenditures across a state, and each presents a somewhat different picture regarding the relative equity of the state allocation system. For this reason, six alternative measures of dispersion are commonly used in conducting such equity analyses

(Berne and Stiefel 1984). Descriptions of each of these measures—range, restricted range, federal range ratio, McLoone Index, coefficient of variation, and the Gini coefficient—follow:

The range is the difference between the highest and lowest districts. Of all the measures, the range is perhaps the easiest to understand and most widely used, but it is subject to the influence of an exceptional case and does not accurately represent the variations in resources among all districts.

The restricted range is the difference between the values at the 95th and 5th percentiles. Thus, in a state with 500 districts, it would be the value for the 25th ranking district, minus the value for the 475th ranking district. This measure is much less likely to be sensitive to a few exceptional cases.

The federal range ratio, which is the restricted range divided by the value at the 5th percentile, indicates how many times greater the resources are at the high end of the distribution than at the low end.

The McLoone Index is used to assess equity in the distribution of resources among students in the lower half of the spending distribution. It compares the total amount spent for all students below the median with a calculation of what would have to be spent to bring them up to the median level of revenues. The closer this value is to 1, the less dispersion there is among students in low spending districts (Picus and Toenjes 1994).

The coefficient of variation is 100 times the standard deviation divided by the mean (i.e., the standard deviation as a percentage of the mean). In contrast to the three range measures, it takes into account all observations. It roughly indicates the percentage above and below the mean within which two-thirds of the observations lie. The coefficient of variation can take on any positive value, with zero indicating perfect equity.

The Gini coefficient is based on the Lorenz curve, which shows the cumulative proportion of the aggregated value of a variable plotted against the cumulative proportion of districts, when districts are ranked in ascending order by the variable. If the variable has the same value in every district, the Lorenz curve is a straight line, with a positive 45-degree slope. If the variable is not equally distributed across districts, the curve will “sag.” The Gini coefficient is the area between the Lorenz curve and the 45-degree line, expressed as a fraction of the total area below the 45-degree line. This coefficient ranges from 0 to 1, with 0 indicating perfect equity.

Equity and equality. Distinctions between equity and equality are central to the formation of public education fiscal policy. Equity issues focus on the fairness of the overall public education allocation system. Given our decentralized system of public education, more public dollars will inevitably be spent on the education of some school children as opposed to others. In fact, even if there were perfect equality in terms of the number of dollars received per student, because of the resource-cost and student-need differentials that are known to exist across districts, equal dollars for all students would

not result in equal education opportunities. Thus, major policy questions in relation to equity and equality standards pertain to when expenditure differentials are warranted and to what degree.

These issues are magnified by the fact that all public education funding formulas allocate different amount of revenue to districts to account for the differing education needs of some type of students (e.g., special education). This raises questions about the kinds of students who should be eligible for supplemental aid and the most appropriate size for these supplements. These types of vertical equity questions further complicate issues related to the relationship between equity and equality in the formation of fiscal policies governing public education.

The types of dispersion measures described above are fairly simplistic in their orientation, as they simply equate education equity with resource equality. For this reason, they are almost always used in a comparative context because it is difficult to know what meaning to attribute to the results when they stand alone. It is generally recognized that perfect equality in education expenditures may not be equitable in other terms (Toenjes 1994; Odden 1992; Wyckoff 1992; Riddle 1990; Berne and Stiefel 1983). For example, because it is known that resource costs vary across districts and it is recognized that some categories of students require additional resources (vertical equity), some degree of expenditure variation may be warranted.

This leaves us with questions of how near to equal expenditures must be in order to be equitable. Because resource-cost and student-need adjustments have been incorporated into the fully adjusted cost estimates for this study—to the extent that these adjustments are appropriate—some may argue that, for these data, perfect equality equals perfect equity. Unfortunately, the adjustments that have been used are not fully agreed upon across the education research and policy community, nor are they fully comprehensive. For example, no attempt has been made to adjust for diseconomies of scale. Very small schools are known to have higher costs for this reason, but most people would disagree with allocating more revenues to very small schools to cover these inefficiencies, unless the schools are necessarily small (i.e., located in remote regions). Thus, even with fully adjusted expenditures, the question remains as to what degree of equality in expenditures constitutes equity within the system.

For these reasons it is difficult to say what degree of expenditure variation within a state should be tolerated and considered equitable. Thus, dispersion data are almost always presented in comparison with something else. For example, dispersion measures in a given state can be compared over time to measure progress in achieving school finance equity. Or, states can be compared with one another using these types of measures. Berne and Stiefel (1992), for example, have ranked the states in relation to the relative equity of their public funding systems.

Utility of national dispersion data. The discussion above raises the question of the relative utility of dispersion measures for the Nation. How can these measures be interpreted? Similar to the state context, national dispersion measures could be used to ex-

amine the degree of variation in public education resource allocations in the United States as compared to other countries, if such data were available. A second parallel to the uses within states is that these data could be collected and measured over time to assess national progress in reducing variations in distributions of public education resources.

Although at present the ability to interpret these data is limited, the presentation of national expenditure data in this form serves several purposes. First, these data demonstrate a method for combining horizontal and vertical equity considerations in making comparisons of education resource measures. Horizontal equity assumes that all students are equal and consequently should receive equal resources. A vertical equity standard reflects the belief that students with varying levels of identifiable education needs require varying levels of education resources. The combination of student-need weights, or adjustments, and resource-cost adjustments may provide an equity standard that can be more clearly defined and understood. For example, it could be argued that if the adjustments were sufficiently detailed and correct, perfect equity would result from equality of expenditures in adjusted terms. Whereas the adjustments may never become that precise, their use begins to clarify some ultimate equity objectives. Thus, although the adjustments used in this report may need refinement, they are the types of adjustments that should be made in assessing disparities of revenue and expenditures.

Second, these data establish a baseline against which future national dispersion measures can be compared. An ongoing assessment of whether equity gains in the allocation of public education resources are being made across the nation can begin with these data.

Third, these data provide a national perspective on the role played by state and federal funding provisions in promoting school finance equalization. For example, a comparison of the degree of variation found in state and local revenue combined in relation to local revenues alone could be used to measure the relative equalizing influence of state revenue sources across the Nation.

Fourth, these data can be used to explore such national patterns as the degree of variation found in core instruction versus total resources. For example, it is sometimes argued that the observed variation in total public education expenditures overestimates any true differential in education opportunities. This argument contends that extra dollars often may be used to purchase nonessential items for schools and therefore that key instructional resources do not vary as much as total expenditures. These types of dispersion measures allow exploration of such questions using national data.

Last, the degree of dispersion observed in education resource allocations can be compared to measures of the dispersion of wealth across the Nation. This provides a comparative basis for interpreting the degree of variation observed in the allocation of education resources. Do public education resources appear to be more equally allocated across the country than income or wealth in the form of housing values? Do these data provide evidence that allocations of resources for public education services have a leveling effect in society?

Categorization Breakpoints

For this report, categorization breakpoints were based on previous Department of Education publications. Categories for which no prior examples were found were broken as evenly as possible while still making logical breaks (e.g., 0-<5%, 5%-<10%, 10%-<15%, 15% or more). These types of breaks were preferable to quartile breaks, which are subject to change on a yearly basis. We also attempted to choose more logical breaks for ease of reader understanding.

Standard Errors

School district averages based on the 1990 Census were used to define certain row variables in the tables. These were the percentages of school-age children in poverty, limited English proficient children, school-age at-risk children, and population in poverty, median household income (actual and cost-adjusted), median value owner-occupied housing, and education attainment of householders. Census estimates were based on information available from only a sample of decennial census respondents, and therefore, these values are subject to sampling error. For small districts, this sampling error can be quite large. Therefore, the entries in the tables in this report should be interpreted as applicable to the MEASURED row variable for the subpopulation of districts, not to an underlying construct.

Multivariate Analyses

Because the various factors on which school districts differ are correlated with each other, (some, like enrollment size and urbanicity, highly correlated), it is impossible to discern from marginal averages which of several correlated variables are most responsible for a difference. By simultaneously allowing all of the descriptive factors under study to account for variation in the dependent variable (e.g., in per student expenditures), it is possible to identify which are the “real” factors and which only appear to be factors because of their correlation with the “real” factors. Conceptually, this is accomplished by finding out which of the factors is correlated with the dependent variable when the analysis is restricted to districts that are equal on the other factors. If a factor is correlated with the dependent variable, when districts are equal on comparable levels in respect to the other variables, then it is more likely to be a “real” factor; whereas, if its correlation with the dependent variable evaporates when examining only districts that are equal on other factors, then that factor is only an apparent contributor to variance in the dependent variable.³

³ It should be noted that the accuracy and meaningful interpretation of results from any type of analysis are limited by (1) the ability to correctly and fully specify the model, and (2) the availability of all needed data.

The method used for this analysis was the SAS program for the General Linear Model, PROC GLM. The model used was:

dependent variable = METRO_C, GEORG_C, INCADJ_C, HOUSE_C,
HSGRAD_C, DSTENR_C, DSTTYP_C, POVCHD_C,
SPECED_C, LEP_C, MINENR_C, ATRSK_C

Where:

METRO_C = metropolitan status category
GEOREG_C = geographic region category
INCADJ_C = cost-adjusted median household income category
HOUSE_C = median value owner-occupied housing category
HSGRAD_C = education attainment of householders category
DSTENR_C = district enrollment category
DSTTYP_C = grade levels served category – elementary, secondary, or unified
POVCHD_C = school-age children in poverty category
SPECED_C = special education students category
LEP_C = limited English proficient children category
MINENR_C = minority enrollment category
ATRSK_C = school-age at-risk children category

In this model, each of the factors was treated as a categorical variable; that is, the model was essentially an analysis of variance model. Thus, unlike linear regression, no assumptions of linearity of relations were imposed. Based on the estimates produced by this analysis, it is possible to compute “least squares means” or “equated means,” which present what the dependent variable means in the marginal cells would have been if the model had been applied to a population in which the factors were uncorrelated.

The multivariate analysis procedures used in these analyses were based on the “LSMEANS” computation provided by SAS. However, this procedure normally invokes an additional normalization of the population by displaying what the dependent variable means in marginal cells would have been if the factors were uncorrelated and if the distributions on the factors were all uniform (all cells of equal frequency). Because forcing uniformity of distributions of factors in the case actually distorts the results (e.g., it is not the case that there are equal numbers of urban, suburban, and rural districts), the “least squares means” presented in this report are not based on this uniform distribution model. Rather, they were computed from the SAS program output by adding that constant to all least squares means which would enable the overall least squares mean to the overall raw mean. Thus, within each table and subtable, the average of the least squares means matches the average of the raw means, whenever the same cases were used in both analyses.

APPENDIX E

Definitions of Key Terms

Definitions of Key Terms

Capital outlay is direct expenditure for contract or force account construction of buildings, roads, and other improvement, and for purchases of equipment, land, and existing structures. This includes amounts for additions, replacements, and major alterations to fixed works and structures. However, expenditure for repairs to such works and structures is classified as current operation expenditure.

A **central city** is a city within a Metropolitan Statistical Area (MSA) with a minimum population of 50,000, and has a Census Urbanized Area Code.

The **coefficient of variation** is a statistical measure of dispersion. It is 100 times the standard deviation divided by the mean (i.e., the standard deviation as a percentage of the mean). It indicates the percentage above and below the mean within which two-thirds of the observations lie. The coefficient of variation can take on any positive value, with zero indicating perfect equity.

A **Consolidated Metropolitan Statistical Area (CMSA)** is an area of greater than 1,000,000 population. The totality of the PMSAs in a single geographical area.

Core instructional expenditures are current expenditures for instruction, student support services (health, attendance, guidance, and speech), and instructional staff support services (curricular development in-staff training and education media, including libraries). Excluded are school administration expenditures, general administration, business functions, operation and maintenance, student transportation, food service, enterprise, and community services operations. The use of the term “core” is designed to reflect the central purpose of the local education agency, which is to educate children. Some readers who philosophically differ with this interpretation may wish to add expenditures for student transportation, or food services, or school administration, if they believe these functions would be included in the central purpose of the local education agency.

Current operating expenditures are expenditures for the categories of instruction, support services, and noninstructional services for salaries, employee benefits, purchased services and supplies, and payments by the state made for or on behalf of school systems. This does not include expenditures for debt service and capital outlay, and property (i.e., equipment); or direct costs (e.g., Head Start, adult education, community colleges, etc.) and community services expenditures.

District Type is defined by the level of instruction provided. The categories and distinctions are:

- elementary – district provides instruction only below 8th grade.
- secondary – district provides instruction between 7th and 12th grades.
- unified – district provides instruction for any other combination of grades.

An **education agency** is a government agency administratively responsible for providing public elementary and/or secondary instruction or education support services.

Education attainment is defined as the highest level of education attained. In this study it is measured by the percentage of householders with high school diplomas (or its equivalent) or higher education. Persons who reported completing the 12th grade but not receiving a diploma are not included.

Elementary is a general level of instruction classified by state and local practice as elementary, composed of any span of grades not above grade 8. Preschool or kindergarten is included only if it is an integral part of an elementary school or a regularly established school system.

Enrollment is defined as the count of students on the current roll on or about October 1, 1989.

The **federal range ratio** is a statistical measure of dispersion. It is the difference between the values at the 95th and 5th percentiles divided by the value at the 5th percentile. It indicates how many times greater the resources are at the high end of the distribution than at the low end.

A **federally operated agency** is any elementary, secondary, or combined education program operated by a federal agency (such as Bureau of Indian Affairs).

General administration and support refers to those expenditures for school and district administration and school lunch expenditures.

Geographic region refers to district location within a region of the country. The regional designators for this analysis are:

- Northeast – ME, NH, VT, MA, RI, CT, NY, NJ, PA
- Midwest – OH, IN, IL, MI, MN, IA, MO, ND, SD, NE, KS, WI
- South – DE, MD, DC, VA, WV, NC, SC, GA, FL, KY, TN, AL, MS, AR, LA, OK, TX
- West – MT, ID, WY, CO, NM, AZ, UT, NV, WA, OR, CA, AK, HI

Individualized Educational Program (IEP), as used here, is defined as a written instructional plan for students with disabilities designated as special education students under IDEA – Part B.

Instructional expenditures are expenditures for activities dealing directly with the interaction between students and teachers (salaries, including sabbatical leave, employee benefits, purchased instructional services, and supplies).

Limited English Proficient (LEP) is defined as children 5 years and over living in households in which English is not the spoken language, who speak English “not well” or “not at all.”

Median household income is defined as the 1989 median income of the householder and all other persons 15 years and over in the household, whether related to the householder or not.

Median value owner-occupied housing is defined as the median value of specified owner-occupied housing units.

Metropolitan status is the classification of an education agency’s service area relative to a Metropolitan Statistical Area. Categories and distinctions are:

- urban/central city – primarily inside a central city
- suburban/metropolitan – primarily outside a central city
- rural – nonurban area

A **Metropolitan Statistical Area (MSA)** is so defined if it is the only MSA in the immediate area and it has a city of at least 50,000 population; or if it is an urbanized area of at least 50,000 with a total metropolitan population of at least 100,000.

Minority enrollment refers to the number of students who are black, Hispanic, Asian, American Indian, and Alaskan native.

A **Non-MSA City** is a city or place not in an MSA with a minimum population of 25,000 inhabitants and a population density of at least 1,000 per square mile, and does not have a Census Urbanized Area Code.

Outside urbanized area is defined as an area not contiguous to any city or urban fringe area with a minimum population of 2,5000 inhabitants; an area with a population density of at least 1,000 per square mile, and without a Census Urbanized Area Code.

Other agency is defined as any elementary, secondary, or combined education program that cannot be appropriately classified using another CCD designation and that has been reported as such by the state’s CCD Coordinator.

Other current expenditures are expenditures for food services, and expenditures on behalf of LEA for other current expenditure.

Population in poverty is defined as persons for whom poverty status was determined in 1989, living below poverty level. In this study it is measured by the percentage of persons in a school district below the poverty level.

A **Primary Metropolitan Statistics Area (PMSA)** is a Component of CMSA Public School Institution which:

- provides education services;
- has one or more grade groups (PK-12) or is ungraded;
- has one or more teachers to give instruction;
- is located in one or more buildings;
- has as assigned administrator;
- receives public funds as primary support; and
- is operated by an education agency.

Regional education service agencies (RESA) are agencies that provide special services (such as regional vocational/technical or special education) to other public elementary and secondary education agencies.

A **regular school district** is an agency responsible for providing free public elementary and secondary education for school-age children residing within its jurisdiction. These agencies may include special and vocational education in a comprehensive education setting. In some cases, these education agencies contract with other agencies to provide services rather than operating schools themselves.

Revenues are defined as increases in the net current assets of a government fund type from other than expenditure refunds and residual equity transfers. These are reported as revenues from local, state, and federal sources.

Revenues from federal sources are direct grants-in-aid from the federal government; federal grants-in-aid through the state or an intermediate agency; and other revenue such as that received in lieu of taxes because the tax base was not subject to taxation.

Revenues from local sources are revenues from a local education agency, including local property and nonproperty tax revenues, local government, tuition, transportation, food services, student activities, donations, and property rentals.

Revenues from state sources are revenues from a state government source including those that can be used without restriction, those for categorical purpose, and revenues in lieu of taxation.

Revenues from State for/on Behalf of School Districts are revenues from payments made by a state for the benefit of the LEA or contributions of equipment or supplies. Such revenues include:

- the payment of a pension fund by the state on behalf of an LEA employee for services rendered to the LEA;
- contributions of fixed assets (property, plant, and equipment) such as school buses and textbooks.

Rural defines an area with 2,500 inhabitants or fewer; and/or population density of less than 1,000 per square mile; and/or does not have a Census Urbanized Area Code.

A **school district** is a geographic area within a state where a public school system operates as a governmental entity with responsibility for operating public schools in that geographic area.

School-age at-risk children refer to children 6 to 19 years old living with mother, mother not high school graduate and single, divorced, or separated, and family income was below the poverty level in 1989.

School-age children in poverty is defined as children 5 years of age and over for whom poverty status was assigned in 1989.

Secondary is defined as the general level of instruction classified by state and local practice as secondary and composed of any span of grades beginning with the next grade following the elementary grades and ending with or below grade 12.

Special education student are students for which curriculum, materials, or instruction is adapted or for which special services are provided. This includes students with any of the following disabling conditions:

- hard of hearing,
- deaf,
- speech-impaired,
- health-impaired,
- orthopedically impaired,
- mentally retarded,
- seriously emotionally disturbed,
- multihandicapped, and
- deaf and blind.

A **state-operated agency** is a state-operated entity charged, at least in part, with providing elementary and/or secondary instruction or support services.

A **student** is an individual for whom instruction is provided in an elementary or secondary education program that is not an adult education program and is under the jurisdiction of a school, school system, or other education institution.

A **Supervisory Union** is an education agency where administrative services are performed for more than one school district, by a common superintendent.

Support Services Expenditures are expenditures for:

- student support services (attendance, guidance, health, speech, and psychological);
- staff support services (improvement of instruction and education media, including librarians);
- general administration (board of education and central office);
- school administration (principal);
- business (fiscal services, purchasing, warehousing, and printing);
- operation and plant maintenance;
- student transportation services; and
- central expenditures (research, information services, and data processing).

Student/teacher ratio is defined as the number of students in a district divided by the number of teachers in the district. The ratio represents an average across the district. While there is undoubtedly great variability across prekindergarten, elementary, and secondary grade levels, and across programs such as special education and gifted and talented, these distinctions are not presented.

Teachers are defined as individuals who provide instruction to prekindergarten, kindergarten, grades 1 through 12, or ungraded classes in a classroom or an environment other than a classroom setting.

Total Expenditures are defined as decreases in net financial resources for the purpose of public education. These consist of current, property, and facilities acquisition expenditures, and other current expenditures not directly related to pre-K through 12 programs. These “other current expenditures” are reported as community services and direct cost expenditures.

An **urbanized area** is defined as an area with a population concentration of at least 50,000; generally consisting of a central city and the surrounding, closely settled, contiguous territory and with a population density of at least 1,000 per square mile.

A **vocational education district** is defined as a public elementary/secondary district that focuses primarily on vocational education, and provides education and training in one or more semiskilled or technical occupations.