Chapter 5. Using Geographic and Inflation Deflators

In this chapter, we apply selected geographic and inflation cost-adjustments to nominal (actual) expenditures, in order to illustrate the differences obtained, and to illustrate that the choice of a particular geographic or inflation deflator may influence the conclusions reached by education finance researchers.

Geographic and Inflation Cost Adjustments

Let us turn first to two geographic cost adjustments for the Washington, DC metropolitan statistical area, one a "cost-of-living" adjustment by McMahon and Chang (1991), and the other, the Teacher Cost Index, a "hedonic" adjustment by Chambers and Fowler (1995). As previously described, the cost-of-living geographic cost adjustment provides estimates based upon 1990 Census demographic data, mapped to school-district boundaries defined by the National Center for Education Statistics (NCES). The adjustments for school districts are contained in an index number that

runs from 108 to 126, which suggests that school districts in this area have costs that are from 8 percent to 26 percent above the average school district in the Nation (table 5-1). The cost-of-living index is based upon the labor market characteristics for a larger geographic area than a single school district, which sometimes results in the same index adjustment for individual school districts. For example, Calvert, Montgomery, and Prince George's counties in Maryland all show cost-of-living indices of 108 (8 percent).

Table 5-1.— Washington, DC metropolitan statistical area geographic cost adjustments

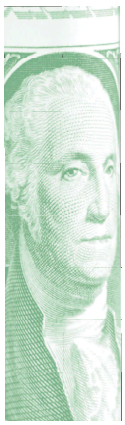
School district	Teacher Cost Index cost-adjustment	McMahon cost-adjustment
Falls Church City (VA)	89.5	113.3
District of Columbia	101.7	125.5
Stafford County (VA)	103.3	113.3
Loudoun County (VA)	103.1	113.3
Prince Georges County (MD)	104.5	108.3
Calvert County (MD)	104.9	108.3
Manassas Park City (VA)	107.5	113.3
Prince William County (VA)	106.5	113.3
Manassas City (VA)	108.9	113.3
Montgomery County (MD)	108.1	108.3
Fairfax County (VA)	110.7	113.3
Alexandria City (VA)	108.3	113.3
Arlington County (VA)	110.6	113.3

SOURCE: Fowler, William J. Jr. and Chambers, Jay. 1995. *Public School Teacher Cost Differences Across the United States*. Washington, DC: U.S. Department of Education, National Center for Education Statistics, NCES 95–758.

Chambers' Teacher Cost Index cost adjustment, based upon his hedonic methodology, results in school district specific indices. For example, Prince Georges and Calvert have Teacher Cost Indices of 105, while Montgomery has a Teacher Cost Index of 108. The most dramatic differences, however, appear for two school districts: the District of Columbia and Falls Church. Even more troubling, the two

index corrections are in different directions, that is, McMahon finds Washington, DC with an enormous 25 percent higher cost than the nation's average school district, while Chambers shows it as only having 2 percent higher costs. McMahon concludes that Falls Church has costs 13 percent higher than the nation's average, while Chambers concludes that Falls Church's costs are 11 percent *lower* than other school districts. Let us turn to how these researchers arrive at these contrary findings, and the implications of such dramatic differences.

McMahon bases his findings upon a regression that includes the median value of owner-occupied housing, the per capita personal income, and the percent change in population over the preceding decade. Chambers obtains his findings from an analysis of teacher characteristics, and the cost to employ similar school personnel with similar characteristics into similar job assignments. In addition, he considers the amenities of urban and rural life. He particularly excludes cost-of-living variables such as housing and personal income, but considers such job amenities as pupil/teacher ratio. One way of looking at these different perspectives is to realize that housing and average income in Washington, DC are quite a bit above national figures. The median value of owner-occupied housing in 1990 in the District of Columbia is $121,665, compared with a national median in 1990 of $78,500, and the 1990 median household income is $30,927, compared with the national median income in 1990 of $30,006. Chambers' model, however, recognizes that teachers employed by the District of Columbia might not live there. As a result, his analysis shows that the cost of hiring equivalent teachers in Washington, DC is only 2 percent higher than the national average. Why might teachers not be as costly as the cost of living? Chambers responds that teachers may be willing to trade salaries for the amenities of living in the Washington, DC metropolitan area,



and in recognition of the metropolitan competitive labor market. In addition, they may be able to reside in Fairfax, Montgomery, or Prince George's counties, effectively lowering their cost of living, but still retaining many of the amenities of the Washington, DC metropolitan area, choosing to commute.

Most educators would suggest that the District of Columbia Public Schools (DCPS) is a high spending school district with a high cost of living. The high expenditures, educators would anticipate, would be to attract and retain comparable staff with its surrounding suburban school districts, particularly in light of such disamenities as violence and safety issues. Those beliefs would fly in the face of Chambers' index showing less than a 2 percent geographic cost adjustment, and lean toward confirming McMahon's 25.5 percent cost adjustment. However, the reader is reminded that Chambers is attempting to compare the cost of employing similar staff. DC teachers do not have similar training and experience levels, nor comparable salaries, to teachers in the DC suburbs. For example, for the year 2000, a teacher with an M.A. and the maximum experience level receives $57,454 in DC, $61,383 in Alexandria, and $66,435 in Fairfax (Fairfax County School Board Auditor 1999). Experienced teachers often leave the DC public schools for the amenities of the surrounding suburban school systems. In addition, the District of Columbia Financial Control Board found that much of the funding is not reaching the classroom. The DCPS employed 16 teachers for every central administrator employed, compared with its peer districts, who employed 42 teachers for every central administrator (Ladner 1998).

The reader who has followed the alternative arguments thus far may be willing to accept the researchers' differing findings regarding the District of Columbia, but may still be puzzled when examining the differences for the tiny (1,214

student) school district of Falls Church, VA. The reported current expenditure per pupil (CEPP) for Falls Church in the 1991–92 school year was $8,660, even higher than Washington, DC's reported $8,404. Applying McMahon's 1.13270 cost-of-living index to the reported current expenditure per pupil (8,660/1.13270), we obtain a cost-adjusted per pupil expenditure of $7,645. In other words, McMahon would reduce the reported expenditure by $1,015 (about 12 percent, with rounding), in order to reflect the lower purchasing power of the school district's expenditures.

Applying Chambers' Teacher Cost Index of 0.89490 to the current expenditure per pupil ($8,660/0.89490), Chambers obtains a cost-adjusted per pupil expenditure of $9,677, or $1,017 *more* than the reported expenditure. How can a school district effectively spend *more* on acquiring comparable teachers? Chambers responds that the pupil/teacher ratio in Falls Church of 13.5, compared with such neighboring school districts as Fairfax, with a pupil/teacher ratio of 16.1, or Washington, DC, with a pupil/teacher ratio of 16.9, demonstrates that Falls Church, a small, high-spending school district, is using its resources to create even better job amenities for its teaching staff. Chambers' view would be that Falls Church is able to attract and retain comparable teachers better than any of the school districts in the DC metropolitan area, offering them not only superior salary and benefits, but also smaller class sizes.

STABILITY OF THE GEOGRAPHIC COST ADJUSTMENTS

Chambers raises an issue of the stability of his school district geographic indices in his latest Cost of Education Index across geographic locations work (1998). Table 5-2 demonstrates Chambers' hedonic Teacher Cost Index and Cost of Education Index across geographic locations cost

Table 5-2. —Comparison of Chambers cost adjustments

School district	Enrollment	Teacher Cost Index	Cost of Education Index across geographic locations	Difference
Chicago	408,830	120.7	110.5	-10.2
Philadelphia	190,979	116.1	101.8	-14.3
Detroit	168,956	110.6	99.6	-11.0

SOURCE: Geographic Variations in Public Schools' Costs. February, 1998. Washington, DC: NCES, Working Paper No. 98–04., p. 33

adjustments for three of those school districts with enrollments greater than 100,000 students.

As Chambers' acknowledges, differences in the regression components and other "refinements" in his statistical approach are most apparent in Chicago, Philadelphia, and Detroit, where the differences between the index numbers are 10.2; 14.3; and 11.0, respectively. In short, the earlier Teacher Cost Index would have overestimated the geographic index number, resulting in a 10 to 14 percent greater reduction in the nominal per pupil expenditure from the latest hedonic approach.

Such large differences in the geographic cost adjustment index numbers are troubling. Although the later GCEI incorporated a variety of new variables and expanded the staff to include principals and other staff, 10 to 14 percent fluctuations for some of the largest school districts might cause users to pause before utilizing the index numbers for such uses as state aid, to which we turn next.

Geographic Cost Adjustments and State Aid to School Districts

Another application of geographic cost adjustments is to modify state aid to school districts. Here there are two concerns; first how differing methodologies and index num-

bers might affect the amounts of state aid to a school district; and second uncertainty that school districts might respond in such a way as to influence the geographic cost-adjustment measurement, in a way to increase state aid to the school district.

Let us turn to how McMahon's and Chambers' indices might be used in a Virginia education state aid formula for the school districts of Falls Church and Danville. Virginia's general school aid formula is typical in the sense that property-wealthy school districts receive a smaller percentage of state aid than property-poor school districts. As seen in table 5-3, Danville's median value of owner-occupied housing is about one-fifth of that in Falls Church. As a result, Danville receives about 45 percent of its total revenue from the state, while Falls Church receives only about 7 percent. Many states have such general school aid patterns to assist poor school districts (although the actual formula may rely upon the local property wealth per student) (American Education Finance Association, National Education Association, and National Center for Education Statistics Forthcoming).

However, school districts in high cost-of-living areas often argue for additional state aid to offset these geographic costs.

Table 5-3. —Comparison of two Virginia school districts

School district	Danville	Falls Church
Per pupil expenditure	$4,231	$8,533
Median household income	$20,413	$51,011
Median value owner-occupied housing	$46,628	$223,006
Percentage revenue from state	44.6%	7.1%
Student/teacher ratio	15.6	12.8

SOURCE: U.S. Department of Education, National Center for Education Statistics, *Common Core of Data (CCD) School Years 1991–92 through 1995–96* (CD-ROM), Washington, DC: 1998, NCES 98–209.

Virginia, for example, included a cost-of-living factor of about 13 percent, by which it increased its general school aid to Falls Church.

McMahon would recognize the Falls Church school district as a geographically high-price area, receiving proportionally less state education aid than those districts in geographically lower-price areas, such as Danville. Chambers, however, would view Falls Church as a school district having such wherewithal that it is receiving proportionally more state education aid than a district such as Danville, which is in a geographically lower-price area. Table 5-3 displays the relevant profiles of both school districts.

For the majority of education finance researchers, Danville is more needy than Falls Church, when considering state education aid, and a cost adjustment should recognize this. The State of Virginia's 12.89 percent adjustment is designed to reflect these additional needs.

McMahon is concerned that the Chambers' cost adjustment might lead to "cost endogeneity," that is, that the local school district may influence future state aid, increasing it by adjusting its behavior in some way that is under the control of the school district (McMahon 1996). He believes that a school district cost adjustment (and even a regional cost adjustment) based on local teachers' and administrators' wages is vulnerable to just such manipulation, inviting "inefficiency and … disaster" (McMahon 1996, 95). Rather, he asserts that a cost-of-living index (such as his own) reflects conditions that are outside the school district's control. This is particularly true, he believes, since school district expenditures and state reimbursements would constitute such a small proportion of the expenditures that compose the cost of living in an area. Amenities, such as proximity to major cities, cultural events, pleasant neighborhoods, and resort locations are incorporated into local price

levels. McMahon also asserts that the Teacher Cost Index includes diseconomies of small scale, and if these costs are reimbursed, a "Falls Church" has no incentive to merge to reduce the its costs. Finally, he argues that because education is such a human-capital intensive operation, the cost-of-living "… is more likely to approximate the true cost of living faced by teachers and administrators with comparable skills in different localities …" (McMahon 1996, 97).

The Virginia adjustment of 12.89 percent in costs for nine Northern Virginia school districts is an attempt by the state to address all these issues. It provides a paradigm of the difficulties involved in adjusting state aid formulas for geographic cost differences. As we noted in the original Washington, DC metropolitan area example, the cost of living may not be an accurate reflection of the cost of employing comparable staff in comparable positions. While McMahon may argue that these nine school districts have the same cost of living, Chambers would respond that they may not, using Falls Church as an example.

We originally began this discussion by raising twin concerns: the amount of state aid a school district receives, and how it might influence that amount. In the Virginia adjustment, the nine school districts in the high-cost area are receiving state aid of about 13 percent more than they would receive if they were located elsewhere in the state, such as the Norfolk metropolitan area. If these school districts had low expenditures, and slight fiscal capacity, no one could object to such an adjustment. However, when we examine the wealth of these nine school districts, in comparison to a "Danville," we find them very well situated. Thus, the adjustment would seem to be more disequalizing, than equalizing, in terms of achieving per pupil expenditure equity in the state of Virginia.

What of the other concern, how school districts might influence the Virginia cost adjustment? The nine school districts might assert that the cost-of-living differential is really the 25 percent higher cost of living that McMahon finds for the District of Columbia, to which they are proximate. They might then lobby their state legislators to include them in the number of school districts that receive a cost adjustment. The nine school districts might also opt to run a higher-quality school system, through those things which the school district has control over, such as hiring more experienced and degreed male teachers, and maintaining low pupil/teacher ratios.

In short, the Virginia cost adjustment seems to suffer from the problems we do not want in a geographic cost adjustment used in a state aid formula, while having few of the virtues of one we would desire. Let us now turn to examples from other states.

Here we provide an overview of how various units of government at both the federal and state levels have made use of cost indices in the operation of their respective schooling systems. As we shall see, much of these existing efforts involve attempts to use geographically based cross-sectional adjustments to alter the flow of financial aid to schooling systems. The federal government as well as a number of states have begun explore this application of cost indices. Our purpose here is to report and not to make judgments about the various applications that have been made. Readers can judge for themselves the appropriateness of each application for their specific areas of responsibility.

In the latter portion of this chapter, we illustrate how cross-sectional indices can be used to assess a state's progress toward conventional measures of equity in school finance formulae. Our purpose is to demonstrate what has now be-

come possible and to encourage further refinement of the available adjustments.

The Use of Geographic and Inflation Cost Indices to Adjust Aid Flows

Both the federal government and a number of individual states have begun to use geographic cost indices to adjust the aid paid to local education agencies. There is no common agreement about how best to accomplish this task, and many of the efforts are at best only loosely connected to the research on the topic that we reviewed in chapter 3. We provide sketches below of the various approaches that have been used.

Existing Applications of Inflation Adjustments by the Federal Government

The most widespread inflation index used by the federal government is the CPI-U. The NCES uses this deflator to report expenditures from 1919 to the present (U.S. Department of Education 1996, table 37). Few other federal government statistics are reported over such an extended time period, without extensive change in the underlying statistic. Even the reported Consumer Price Index has changed over this 77-year time period, as statistics for "urban wage earners and clerical workers" were reported through 1977, and for "all urban consumers" since 1978. In addition, the CPI-U is specifically designed to capture the price change in a "market basket" of goods. Whether the CPI-U is adequate as an adjustment for education expenditures has been discussed in chapter 4.

Recently, a President Commission (the Boskin Commission) has asserted that the CPI-U *overstates* inflation by some 1.1 percent a year. If empirically accepted, this would dramati-

cally affect the *Digest of Education Statistics* figures and tables.

The Gross Domestic Product (GDP) deflator has been available since 1959. The Gross Domestic Product implicit price deflator is useful as the denominator in an indicator of public education revenue as a percentage of Gross Domestic Product. It is an attempt to assess the percent of all income in the economy that is being used for education. However, it is important to remember that revenue per student is deflated using the CPI-U. This measure peaked in 1972 for elementary/secondary education, at 4.6 percent (U.S. Department of Education 1995, Indicator 52), and has since hovered around 4.1 percent.

A third measure, used by the federal government to measure the change in the cost of labor (salaries and employee benefits), is the Employment Cost Index (ECI), reported by the Bureau of Labor Statistics (BLS) of the Commerce Department, U.S. Department of Labor. The Employment Cost Index is available from 1975 to the present. Two changes occurred in this index during this period. Prior 1986, jobs were classified from the 1970 Census. From June 1986 through December 1994, jobs were classified according to definitions used in the 1980 Census. Beginning in March 1995, job were classified according to the 1990 Census. In addition, fixed employment weights used to calculate the indices have been reweighted. These weighting schemes followed the use of the various Censuses.

Although little-known, the Employment Cost Index contains a subscale by occupation and industry group of "elementary and secondary schools." These indices, one for compensation, one for benefits, and one composite, are useful not only for assessing change since 1975 in elementary and secondary school salaries and benefits, but also for measuring changes in those items compared with all workers.

Cost Adjustments for the Title I Program

Title I of the Elementary and Secondary Education Act (ESEA) of 1965 is the largest single federal elementary and secondary education grant program to local school districts, about $6.7 billion in fiscal year 1996 (GAO 1996). The purpose of Title I is to provide remedial programs and resources for students in poverty who are poor achievers. These programs and resources are intended to provide additional educational opportunities that may help such students succeed in regular education programs, attain grade-level proficiency, and improve their achievement. State allocations are based, in part, on the state average per pupil expenditure. Within a ceiling and a floor (105 percent and 95 percent, respectively), states that spend more receive a higher Title I allocation. This formula might have originally been designed to reflect a state's geographic cost. From 1988 to 1994, the legislation also required that 10 percent of the appropriations be distributed to local education agencies in counties where children in poverty equaled either at least 6,500 or 15 percent of children aged 5–17. The 1994 reauthorization attempted to improve the "concentration" or "targeting" aspect of the grants, by creating an Education Finance Incentive Program (EFIP). The targeted grants under EFIP weighted students based on the county's or local education agency's child poverty rate and number of poor school-age children. The 1994 reauthorization also included additional dollars by measuring the effort and equity of the recipient state's elementary and secondary education state financing system. The Education Finance Incentive Program basically used a modified coefficient of variation (C.V.) as a measure of equity. The 1994 reauthorization of the Elementary-Secondary Education Act attempted to provide an incentive within Title I to decrease disparity in expenditures across school districts. The EFIP contained a formula that incorporated both a disparity and effort index into the allocation process. Specifically, each

state's allocation is based on its population aged 5–17 multiplied by an effort index derived from per-capita income, and an equity index based on a pupil-weighted coefficient of variation of expenditures per pupil. This pupil-weighting factor may be additionally modified by counting low-income pupils as 1.4 students, and by applying additional similar factors to other special needs children. One of the additional factors mentioned in the legislation is the potential to recognize different geographic costs. Although the 1994 reauthorization included $200 million for the Education Finance Incentive Program, no funding has ever been appropriated for this program.

State Governments

Appendix A sketches individual state uses of cost adjustments, listed alphabetically, which are drawn from the American Education Finance Association's compilation of state aid plans, unless otherwise indicated (Gold, Smith, and Lawton 1995). All of the reports cover the 1993–94 school year. We made follow-up telephone calls to the identified states to clarify points and to collect information about subsequent changes in the methods being used.

New York State incorporated a cost adjustment in 1997–98 to its building aid formula. The building aid cost adjustment was based upon wage and compensation data for construction-trade occupations, using the New York Department of Labor's Occupational Employment Survey. A regional cost factor is applied to the State Building Aid formula for contracts signed on or after July 1, 1998 to assist school districts in regions with high labor costs. The regional cost factor will be multiplied times the maximum cost allowance to arrive at a regionally adjusted maximum cost allowance. State building aid will be paid on the lesser of the actual contract expense or the regionally adjusted maximum cost allowance. The regional cost factor is calculated by dividing the county composite labor rate by the

median state-wide composite labor rate. The county composite labor rate is calculated by adding up the hourly labor rate plus supplemental benefits for carpenters, electricians and plumbers. New York City has a cost index of 1.8191, while Albany has a cost index of 1.0077. In this representation, NYC costs are almost 82 percent higher than Albany's for the hourly rate for building aid employees (New York State Education Department 1999).

We view this adjustment as precisely the type of regional cost adjustment that McMahon recommends to avoid "cost endogeneity." In his view, the existence of such a cost factor, determined by wages and benefits not directly controlled by the school district will not lead to higher building costs in those school districts that receive the additional aid. McMahon would argue that these prices already include factors outside the control of the school district, such as competitive labor market, underlying cost-of-living differences, amenities, and climatic conditions.

Chambers, however, would respond that this methodology does not use hedonic modeling, that is, it cannot incorporate differences in the training, experience and skill levels of those employed, nor the quality of the building. In essence, the school district can choose to hire more experienced and talented artisans to obtain superior quality construction, and attribute that cost to higher salaries. In this way, the school districts can manipulate the costs of building through the wages and benefits carpenters, electricians and plumbers receive through their contracts, and permit the state to provide ever-higher reimbursement. Should the local markets not be competitive, even greater dislocations and diseconomies might occur.

Both McMahon and Chambers are concerned with the same "cost endogeneity" phenomena, and propose different methods and mechanisms to prevent such effects of state aid for-

mulas. This has led Hanushek (1999) to propose combining the approaches, using the hedonic methodology for an entire labor market. For example, if the New York aid approach applied hedonics to control for differences in the training, experience and skill levels of the wages and benefits carpenters, electricians and plumbers obtained, and controlled for the quality of the work performed, it would be independent of school district choices in bargaining, hiring, or aesthetically pleasing construction.

The Use of Geographic Cost Indices to Measure Equity

Much of the research in public elementary and secondary education finance stems from a long battle between property-rich and property-poor school districts to achieve equity in expenditures per student. Various advocates for per pupil expenditure equalization have found plaintiffs in property-poor school districts for whom they could challenge existing state education aid formulas in court. After the 1973 U.S. Supreme Court ruling which held that a rational state public elementary and secondary funding system that produced expenditure inequities was not unconstitutional, advocates for plaintiffs in poor school districts turned to state supreme courts, where the state constitution may set a stricter standard (*San Antonio Independent School District v. Rodriguez*, 411 US 1 [1973]). About one-half of all states have court suits challenging the particular state's education funding formula, and plaintiffs are successful in about one-half of the rulings (Hickrod 1997). There have been various analyses of public school expenditure disparities (see Riddle and White 1994), but, traditionally, pupil need adjustments, rather than cost adjustments have been the primary focus if some modified spending figure other than nominal (actual) per pupil expenditures were used. Parrish,

Matsumoto, and Fowler (1995) were early pioneers in using both student need and cost adjustments (using Chambers' TCI) when examining differences in school district spending. We have reconstituted a portion of a table from *Disparities in School District Spending* by Parrish, Matsumoto, and Fowler (1995), and placed it in table 5-4.

Five equity measures appear in table 5-4. The restricted range is obtained by ordering school districts from high to low per pupil spending, and calculating the difference between the 95th and 5th percentile. The larger the difference, or restricted range, the greater the inequality in school district spending. As can be observed in table 5-4, the restricted range becomes *smaller* when the per pupil expenditures are modified by applying the TCI cost adjustment to them. Thus, cost adjusting the per pupil expenditures suggests that some of the inequality that is usually measured by standard equity measures captures geographic differences in cost. To date, we know of no state court in which this argument has been made to suggest that the nominal (actual) disparities are misleading, and that nominal expenditures should have geographic cost adjustments applied to understand the proportion of the observed disparities that is due to differences in geographic costs. Although the equity measures show less disparity after cost adjustment than before, substantial variation remains.

Table 5-4. —Spending measures of variation

Per pupil expenditures	Restricted range	Federal range ratio	McLoone index	Coefficient of variation	Gini coefficient
Actual	$4,186	1.5	0.850	31.0	0.158
Cost-adjusted	3,373	1.1	0.869	24.6	0.129

SOURCE: Parrish, T. B., Matsumoto, C. S., Fowler, W. J. *Disparities in Public School District Spending, 1989–90.* (1995) Washington, DC, NCES 95–300, p. A-17

Let us return to the example of TCI-adjusted per pupil expenditures that we used in earlier in this chapter (table 5-1) in the Washington, DC metropolitan statistical area. The 13 school districts in the Washington, DC metropolitan statistical area (008840) had an average 1991–92 per pupil expenditure of $6,420, with a standard deviation of $1,473. Dividing the mean by the standard deviation yields the coefficient of variation, which in this case is 4.36. The TCI per pupil spending average of these 13 school districts is $6,146 (or 4.3 percent less than the actual per pupil average), and their cost-adjusted standard deviation is $1,622 (or 10.1 percent greater than the actual standard deviation). The cost adjusted coefficient of variation is 3.79. Here again, in table 5-5, we see that the Chambers' TCI cost adjustment results in a lower coefficient of variation, which is usually interpreted as greater equality between school districts in their spending.

Equity measures are not always affected in this way, however. Peternick, Smerdon, Fowler, and Monk (1998) find that while excluding New York City from an analysis of New York State school districts that were cost adjusted did lead to a lower coefficient of variation (that is, more equity), however, the McLoone index led to just the opposite conclusion. Including New York City, the coefficient of variation was higher (less equity), and but the McLoone was lower. The authors conclude:

> *Measures of equity do not always increase or decrease depending on the adjustment employed. Instead these results indicate one's need to be aware of the basis for the adjustments and the power they hold when considering whether or not to employ them in one's work (p. 167).*

Table 5-5. —Washington metropolitan area per pupil spending, with geographic cost adjustments

School district	TCI cost-adjustment	Per pupil spending in 1991–92 school year	Per pupil spending after cost-adjustment
Falls Church City (VA)	89.5	$8,660	$9,677
District of Columbia	101.7	$8,404	$8,625
Stafford County (VA)	103.3	$4,573	$4,428
Loudoun County (VA)	103.1	$5,791	$5,629
Prince Georges County (MD)	104.5	$5,723	$5,475
Calvert County (MD)	104.9	$5,356	$5,104
Manassas Park City (VA)	107.5	$4,567	$4,249
Prince William County (VA)	106.5	$5,338	$5,014
Manassas City (VA)	108.9	$5,317	$4,882
Montgomery County (MD)	108.1	$7,419	$6,866
Fairfax County (VA)	110.7	$6,368	$5,752
Alexandria City (VA)	108.3	$8,152	$7,524
Arlington County (VA)	110.6	$7,788	$7,044
Mean		$6,420	$6,146
Coefficient of variation		4.36	3.79

SOURCE: Author's illustration using cost indices from Fowler, William J. Jr., and Chambers, Jay. 1995. *Public School Teacher Cost Differences Across the United States*. Washington, DC: U.S. Department of Education, National Center for Education Statistics. NCES 95–758.

Summary of Applying Geographic and Inflation Deflators

Our exploration of the application of geographic and inflation cost adjustments has been quite sobering. Examining geographic cost adjustments, we find that the approaches used by two proponents of cost adjustments result in differing conclusions about whether a particular school district's costs are 13 percent higher than the nation's average, or 12 percent lower than the nation's average. Nor is replication of a single advocates' approach comforting, as small changes in Chambers' hedonic approach leads us to similarly large differences in measuring the hedonic geographic cost ad-

justment for Chicago, or Philadelphia, or Detroit in 1991–92 and 1993–94.

As we have also demonstrated, equity measures that employ these geographic cost adjustments will also be greatly affected by the accuracy of the geographic cost adjustment and the particular technique employed to obtain the cost adjustment. While it is generally desirable to apply geographic cost adjustments to better understand the underlying differences in expenditures not due to differences between location, great care must be exercised in being precise about the difference between two school districts.

It may be precisely this concern that has led the federal government and states to apply geographic "cost-adjustments" that employ far less sophisticated adjustments that may be less accurate, but far more stable. Of course, if the school district or state can manipulate the components of the index to its advantage, then McMahon's concern with "cost endogeneity" may be well taken.

Chapter 6. Lessons to Learn and Directions for Future Work

We use this final chapter to note lessons that can be learned from the available research and to offer advice for future explorations and applications in this very important area of public policy. We deal with the geographic and longitudinal indices, in turn.

Geographical Cost Adjustments

It is clear that it costs more to provide comparable educational services in some places compared with others. It is also clear that having a good index of these cost variations would provide important benefits to policymakers with responsibilities for achieving equity as well as efficiency in the distribution and use of education resources. Finally, it is clear that while substantial progress has been made in resolving conceptual as well as estimation problems, much work remains to be done. As researchers and policymakers look to the future, we are confident that the future models will become more sophisticated. We also believe ef-

forts need to be made to educate the public about the nature of cost adjustments in education. It would be a mistake to make progress toward constructing more sophisticated cost models without a parallel effort to educate the public. There is an important political dynamic associated with cost adjustments in education, and this needs to be faced squarely. We devote this section to a review of the challenges and include some advice about how to deal with political realities that will surround most attempts to incorporate an index of cross-sectional differences in cost into public policy.

The Generalizeability of the Index

Recall that most of the available indices are focused on one type of cross-sectional cost difference that can exist in education. In particular, most of the attention has been focused on differences in the unit price of teachers, and it follows that policymakers need to make judgments about how appropriate it is to generalize from differences in the cost of a single input to overall differences in the cost of producing learning outcomes. As a matter of principle, the more comprehensive the index, the better, and in this regard the Chambers GCEI is superior to the remaining input-oriented indices. While the production function-based approach is, in theory, even more appropriate since it gets to the bottom-line question of what it costs to produce gains in learning, this approach is the least well developed of all that we considered and is only available within certain individual states.

The Distinction between Controllable and Non-Controllable Influences

We have indicated previously that costs are measures of minimum resources required to achieve some outcome or result. We have also stressed the importance of removing voluntarily elected expenditures from cost considerations.

Analysts disagree about how best to remove these controllable influences on spending, and policymakers must make a judgment about their level of comfort with the several options that are available. Recall, that Chambers' work with the hedonic index is relatively ambitious and involves drawing distinctions between influences on the cost of teachers that are within and outside of the control of local school officials. Chambers is explicit about how he drew these distinctions, and policymakers must judge for themselves their level of comfort with the approach.

The Level of Aggregation

Teacher price indices can be constructed at any number of different levels of aggregation. The largest unit typically conceived is the state as a whole rather than regional groupings of states, due largely to the difficulties associated with characterizing differences in the regulatory environment that exists across state boundaries. One of the drawbacks to indices that cover large geographic regions is that they can conceal internal variability. Nelson (1991) notes, for example, that the cost of living alone can vary as much within a state as between states. He cites the differences between the estimate he uses for the cost of living in the Buffalo metropolitan area (100.5) and New York City (150.9) and notes that this discrepancy is larger than the difference between New York State and any other state in the nation.

As Barro put it:

> *There is likely to be more variation in amenities within than among states. The same state may contain both highly attractive suburbs and decaying, crime-ridden central cities—school systems where teachers eagerly seek work and systems where they work only as a last resort. Indicators of state-average amenities may prove misleading. If, for example, the central-city districts in a state were reducing staffs in response to declining enrollment while the suburban districts were doing most of the teacher hiring, an analysis of*

the state average teacher salary in relation to the statewide average level of amenities would yield incorrect results. (Barro 1994, 41)

However, more narrowly drawn regions present their own difficulties. Suppose we were to define cost indices at the individual school district level. Also, suppose we found that the costs in one district were quite a bit higher than the costs in a neighboring district. Teachers may or may not reside in the districts in which they teach. Indeed, in terms of making a decision about whether or not to accept employment in a particular district, the teacher is more reasonably concerned with cost of living in the region rather than the neighborhoods located within the prospective employing district.

The Potential for Double Counting

We have already noted in chapter 2 that adjustments for cross-sectional costs may already be present within existing aid distribution mechanisms even if they are not explicitly labeled as cost adjustments. However, policymakers cannot simply assume that these adjustments are present and that their magnitudes are correct simply because they may have entered the system implicitly. In other words, there may be serious equity and productivity problems associated with a decision to do nothing and in effect assume that it is best to work with nominal dollars magnitudes that are not adjusted for cross-sectional differences in cost. A judgment needs to be made about the degree to which cost considerations may have entered previously made decisions about weights and other features of aid distribution systems. The most prudent path for a policymaker to follow would involve making efforts to estimate differences in cost coupled with the use of simulation exercises that would show the impact of alternative cost-oriented adjustments that might be added to existing formula. In cases where cost differences have been implicitly introduced using presum-

ably crude weighting adjustments, real progress ought to be possible by looking separately at cost differences and dealing directly with whatever differences might be revealed using sophisticated cost models.

Political Considerations

Finally, there are some stark political realities that surround debates over the construction and utilization of cross-sectional cost indices. This is true whether the index is designed to make adjustments across states or across districts within individual states. To the degree that the index is used to adjust the flows of school aid (either to states or local education agencies), the contentious politics of redistribution need to be considered. These political difficulties become all the more divisive if the index is applied to the distribution of a fixed pool of resources. In other words, if the size of the pool is rising at the same time that a cost-related adjustment is applied, individual sites will lose ground in a relative sense, but to some degree they can be held harmless from absolute drops in the resources they receive.

The divisiveness of the politics surrounding geographical cost index adjustments is particularly pronounced because as a general rule input price differentials accentuate already existing political cleavages. Consider the case of individual states like Missouri or New York. Both of these states have made efforts to construct teacher price indices and have not succeeded at having the results adopted by the respective state legislatures. Why? Some of the explantation is related to the fact that the proposed indices worked to the advantage of one well defined political interest group (urban and suburban areas) and to the disadvantage of second political interest group (rural areas). In New York this division connects to party affiliation with upstate Republi-

cans seeing very little merit in the cost index proposal in contrast to the positive views of downstate Democrats.

One of the perplexing parts of the debate over geographically based cost indices is that a political standoff between urban, suburban, and rural interests, to some degree, can be averted if there is a willingness to broaden the notion of cost. Recall the input, service, and outcome hierarchy that we introduced in chapter 2. Recall also that the school district enables the delivery system to operate, and that the school district organization has a dramatic impact upon costs. These costs arise in part because of scale economies and diseconomies (that is, the size of the district and its schools). As a general rule, small and rural districts can be expected to face higher costs due to scale-related differences. We have already suggested that these districts tend to enjoy relatively low teacher input prices, according to the available estimates. Thus, the two types of cost work to offset one another. It follows that a preoccupation with one type of cost to the exclusion of the other, will work unfairly to the disadvantage of a key political unit. A broadened approach to making adjustments for geographically based differences in cost such that both individual ingredients (teachers) price differences and scale-related differences (school district size) are dealt with in the same legislative proposal can serve to enhance the political appeal of the proposal. Texas has been pursuing a variant of this broadened approach, and, in contrast to places like New York where the focus has been on only the individual ingredients (teachers) price differences, has succeeded in implementing a cost adjustment within its program of state aid for education (Monk and Walker 1991).

There is one further point that needs to be made about the political viability of cost adjustments. It is abundantly clear that these adjustments are more complicated than is commonly supposed, and serious analysts quickly find them-

selves working with complex models and sophisticated econometric tools. There is a degree of suspicion and distrust that surrounds complex statistical analysis, and experts' assurances that various things have been controlled for statistically can ring hollow, particularly when the results have the potential to shift the distribution of large sums of resources. In this light, it is not surprising to find remarkably crude adjustments in place. The federal government's current practice of adjusting Title I funds on the basis of nominal differences in per pupil spending in different states (subject to certain caps) is a good case in point. No statistical regression model needs to be estimated for these adjustments to be made. The thinking seems to be that some adjustment is appropriate given the wide differences in spending across regions in the country coupled with the underlying belief that some, but not all, of this is due to differences in the cost of providing comparable educational services. There are very real limits to what the traffic will bear in terms of more sophisticated adjustments and policymakers need to keep this point in mind as they contemplate moving forward with adjustments of the type we have reviewed in this chapter. Further, once any given practice is in place, legislators are often loath to tinker with the accepted adjustment, as the new formulation will require forming a new consensus.

Longitudinal Cost Indices

Chambers (1997) compared several of these inflation measures for the six years from 1988 to 1994, which coincided with three administrations of the national Center for Education Statistics (NCES) Schools and Staffing Survey (SASS). This permitted him to compare the inflation measures with the changes in teachers' salaries, holding constant such attributes as degree status and experience. Remarkably, the CPI, GDP, and ICEI results are very similar for this short

period. Only the NSI and SPI have markedly different inflation rates. The Employment Cost Index falls in between the CPI, GDP, ICEI, and the NSI and SPI. This was quite unexpected, and suggests that a general consensus is possible about the rate of education inflation.

Nevertheless, considerable work remains to be done on these inflation indices. We need to understand why there are differences between the price adjustments, beyond different methodologies. As Chambers acknowledges, the GDPD measures price differences for all consumer and investment goods and services in the Nation's domestic economy. The CPI captures price differences for consumer goods and services. The CEI and the ICEI intend to capture price differences in elementary and secondary education personnel. That they are in such agreement in Chambers' work is encouraging, but even Chambers noted that the measures diverged in the latter 3-year time period he studied. Again, the reasons are not known, but should be.

Potential future improvements in the ICEI include obtaining more information about fringe benefits, and the role of noncertified personnel. Since SASS administrations are at least five years apart, some study of the use of a surrogate measure, such as the CEI, are in order.

Advice for Next Steps

In light of all of the foregoing, we have a number of guiding principles for policymakers to consider as they seek to take advantage of what has been learned about variations, both cross-sectional and longitudinal, in the costs of education.

Cost Adjustment Guiding Principles

1. Keep the indices as simple and understandable as possible.

2. Strive to reach consensus about how ambitious you wish to be with respect to cost adjustments in full knowledge of the flaws that remain in the available tools.

3. Keep in mind that not all adjustments are beneficial to all parties. Be particularly wary of flawed adjustments that benefit one set of political interests over others.

4. Provide for gradual phase-ins. Consider "quasi-leveling up" strategies and take advantage of inflation: e.g., you can level up and achieve a reallocation as long as you have the units that need to grow at a rate that is higher than the units who need to shrink. This takes more time, but patience is sometimes warranted.

5. Place primary emphasis on supporting the further improvement of the available indices.

CONCLUSIONS

Our first conclusion is that the education research community has not paid sufficient attention to both geographic and inflationary differences in the costs of education. In most cases, geographic cost adjustments have not been applied when assessing, for example, intra-state fiscal equity. The courts, plaintiffs, and defendants have all used nominal (actual) per pupil current expenditures in their arguments. However, there is ample evidence that geographic cost differences are something those contemplating per-pupil expenditure equity should remove from their considerations. Generally, the use of geographic cost adjustments reduces most measures of disparity. Although the equity measures show less disparity after cost-adjustment than before, substantial variations remain. However, for those school districts that are acquiring higher-quality staff, or

greater numbers of staff (reducing pupil/teacher ratios), the correction of their nominal expenditures will cause their expenditures to be even greater than before (see chapter 2). The most common use of geographic cost adjustments has been to give school districts in high cost-of-living areas higher state aid. However, this common usage should be reconsidered, since such aid may be disequalizing, that is, it may aid wealthy school districts to the detriment of the poor. In addition, it is not, we would argue, the cost of living for which we wish to compensate these school districts. Rather, we would wish school districts be compensated for the acquisition and retention of comparable staff, wherever they reside. This is why we feel more conceptually comfortable with the hedonic rather than the market basket approach. Some school districts in tony locations with a cachet and superb facilities and a student body with panache may acquire and retain very talented teachers for much less than their less fortunate neighbors, who can only attract such a staff by paying a large premium. To date, educational researchers have not emphasized these differences, in part because a suitable methodology for estimating these effects has been unavailable. The good news is that indices of this kind are becoming available. The not so good news is that the available indices remain flawed because they fail to distinguish perfectly between expenditures and bonafide costs and may introduce perverse incentive effects that could increase spending on education with little resulting gain.

Our second conclusion is that existing cost adjustments are frail reeds, indeed. Despite his precision and intricate methodologies, Chambers arrives at very different geographic cost adjustments for 1990–91 and 1993–94 for Chicago, Philadelphia, and Detroit. These differences pale in comparison to differences between researchers and methodologies. What would be desirable would be an emerging consensus about the appropriateness of a given technique, and general unanimity regarding its application, at least in ad-

justing nominal (actual) revenues or expenditures. Instead, we see researchers still vociferously debating the merits of their own work, and the defects of the approaches of their similarly situated brethren. Until the academic community agrees in the robustness of any cost adjustment, the future use of any adjustment seems unsustainable. If the cost adjustments are not viewed as hardy, commonplace and utilitarian tools, then there will no longer continue to be an investment on the part of the research community to attain them.

We were also unprepared for the sobering discovery that these worthwhile and desirable adjustments would provoke such rancor. The simple use of one geographic cost adjustment versus another was sufficient for one researcher to suggest that state-aid systems that employ such an adjustment "...encourages inefficiency and invites disaster (McMahon 1996, 95)." Another highly regarded economist interprets an analysis of measurement issues by Mishel and Rothstein on how to include the effects of inflation in measuring school spending as "...while not their interpretation, ...their analysis provides perhaps the most persuasive case for a productivity collapse [in education] (Hanushek 1997, 185)." We suspect the reader will join us in urging all participants to understand that we are all engaged in a search for mechanisms that will permit us to report school spending more accurately, and that we admonish all involved to suspend critical judgement about the implications of attempted advances in this endeavor until each advocate has had ample opportunity to rethink the mechanism he proposes.

Our third and final conclusion is that more effort needs to be devoted toward building consensus in the methodologies that can be used as geographic cost adjustments and as deflators. There is a great need in the education finance research community for these mechanisms in order to bet-

ter understand education spending in real terms. We even would go so far as to suggest that it is improper to analyze education spending without correction for differences in geographic costs, or differences in costs over time without correction for the effects of inflation. However, we also find it improper to analyze "adjusted" figures where details surrounding the nature of the adjustments are inaccessible to the consumer. Situations like these cry out for the use of sensitivity analyses so that analysts, policy makers, consumers, and taxpayers alike can have an understanding of how sensitive the results of the analyses are to the use of one rather than another of the possible cost adjustment techniques.

Appendix to Chapter 5. Descriptions of Existing State Cost Adjustments

Alaska

Alaska makes use of two conceptually distinct types of cost adjustments in its state aid system. One adjustment is based on a cost-of-living index. One such index is defined for each of the 54 school districts in the state. In addition, Alaska makes use of an adjustment for "instructional units" that reflects differences in scale economies that can be realized in districts of different sizes. Thus, the Alaska system includes adjustments for both differences in the cost of inputs and differences in the cost of combining inputs into educational services.

Colorado

Colorado has established a formula that explicitly introduces a "cost-of-living" factor. This adjustment reflects differences in the costs of housing, goods, and services among different regions of the State. It is constructed by the Legislative Council and is expected to be re-calculated every two years. The factor is applied to that portion of the base that deals with personnel costs. The cost-of-living adjustment is focused on differences in the costs of inputs that enter the Colorado system.

The Colorado formula also introduces a "personnel cost factor" that is designed to capture the effects of economies of scale. The personnel cost factor is designed to recognize scale related differences in the costs of producing educational services.

Florida

The state of Florida is well known for its long standing use of a market basket based cost-of-living index to make adjustments in its state aid distributions. The index is known as the Florida Price Level Index and is constructed by the executive office of the Governor. The index is constructed annually and is introduced into the funding formula using a moving three-year average. In 1993 the Florida Legislature structured the index so that it ranged from a low of 1.000 to a high of 1.2279. Thus, no district receives less aid in an absolute sense because of the adjustment. Florida's index is focused entirely on differences in the cost of inputs.

Massachusetts

Massachusetts uses what it calls a "wage adjustment" factor that generates an index for each of 25 regions of the state. The factor is updated annually and for 1998 aid, it ranged between a low of .834 and a high of 1.073. Thus, in contrast to what we saw for Florida, districts can receive aid allocations that are smaller in absolute amount thanks to the cost adjustment. There is a further provision which stipulates that no district with a high incidence of poverty can be assigned a cost index smaller than 1.0. The Massachusetts index is designed to offset geographically based differences in the costs of inputs entering the system.

Ohio

McMahon (1996, 95) notes that Ohio uses a Cost of Government Services (COG) type of index to adjust for differences in the cost of education in its funding formula. This is an adjustment that is based on prevailing wage differences in the public sector. One of the concerns expressed by McMahon is that the approach used by Ohio places unwarranted emphasis on salary differences for workers with relatively low levels of skills. School districts, in contrast to many areas of the public sector, rely relatively heavily on highly skilled labor.

The Ohio index is known as the "cost of doing business" factor and is entered explicitly into the calculation of the basic aid program provided by the state. It is an input-oriented adjustment that is calculated by the Ohio Department of Education and is based on wage data provided for all workers in the state provided by the Ohio Bureau of Employment Services. It is based on the average weekly wages for the county in which each district is located plus its contiguous counties. The current range is between 1.00 and 1.089, and is similar to the Florida adjustment in the sense that it gives rise to no absolute reductions in aid.

Texas

Texas provides for cost adjustments that are rooted in both input price differences and scale economy differences. The state has made use of a hedonic type of index in which an effort is made to distinguish between controllable and uncontrollable influences on teacher salaries. The state is divided into a variety of categories that include region, size, area, density, educational characteristics, and economic conditions. Adjustments have also been made for fast enrollment growth and other factors that have bearing on needs for facilities. The Texas approach is noteworthy because there have been explicit efforts to incorporate input prices as well as service cost differentials into a comprehensive treatment of cost.

Virginia

Virginia provides for adjustments that affect nine districts in the state, seven county districts and two city districts. These districts are located in the northern area of the state, near Washington, DC. The goal of the program is to recognize the high cost of living for the Washington, DC metropolitan area relative to elsewhere in the state and takes the form of input-oriented cost adjustment.

Miscellaneous

It is worth noting that District Percentage Equalizing state aid plans include elements of a crude input cost differential to the extent that they are driven by expenditures. These aid plans have a "spend to get" feature since they provide state matches for revenues raised at the local level. If costs are higher in a particular district, expenditures will tend to be higher, and all else equal, the state will find itself providing higher levels of support than would otherwise be the case. We say the adjustment is "crude" because if it is simply tied to expenditures, there is no provision for isolating uncontrollable costs. Recall that the distinction between costs and expenditures is very important and that sophisticated cost indices include efforts to single out costs for adjustment.

States operating programs with percentage equalizing elements include: Rhode Island, Connecticut, New York, and Pennsylvania. However, these plans typically operate with numerous restrictions and special rules that typically limit the degree to which they function as expense-driven aid systems.