The vast majority of education finance researchers would concede that cost of living issues are legitimate variables for any education finance distribution program. Equally important, however, is that the cost of living variables be properly measured and accounted for in the formula

Funding Public Education Based on the Concept of Cost of Living

by R. Craig Wood and David C. Thompson

Introduction

Generally, it is assumed that the cost of providing public education varies within most states. Thus, equal educational opportunities may not, in fact, be present within a given state if the costs of providing educational services were not accounted for within the state aid distribution formula. Often, it is argued that the state aid distribution formula fails to reflect the true costs of providing educational opportunities to students in rural as well as urban school districts. Thus, perfect equality of spending is flawed on two fronts. The first flaw would be that different classifications of students obviously need different educational services. These classifications, by necessity lead to various weightings in order to reflect the costs of providing those specific services. This concept is generally accepted within many state aid distribution systems. The second concept is much more difficult to properly operationalize in that school districts, and potentially each school therein, provides educational services that must be accounted for based on the cost of providing public education in that community operationalized on what those services cost within the given community.

School Districts as Consumers

At any point in time, given their income, individuals in society have a certain degree of purchasing power. This degree of purchasing power is a reflection of income as well as the relative cost of goods and services within the community in which they reside. The cost of living reflects the cost of goods and services which varies throughout our society.[1] However, its quantification, as to actual application to a given community, is exceedingly difficult because research does not fully explain all the relevant variables and interactions. To move this theoretical overview and then to apply this concept to public agencies is even more difficult since research clearly indicates that school districts are not typical "consumers." Thus, despite the general acceptance of a market basket approach to determining relative differences in consumer prices, both over time and between localities, creation of a counterpart index focused on the cost of educational inputs has proven far more elusive.

Numerous states have expressed concern regarding the cost of educational resources in relation to a perceived inequality of educational opportunity. In fact, at various times the states of Alaska, California, Florida, Georgia, Idaho, Illinois, Kentucky, Maryland, Missouri, Nevada, Ohio, Pennsylvania, Tennessee, and Texas have studied this issue in relation to public education finance.[2] Despite these forays, no studies have " . . . been reported that adequately explain the causes of differences in the costs of educational resources."[3] Further evaluation of the research indicates that no study has yet to emerge in the research literature that adequately explains these differences. It should be noted that the authors are not stating that such differences do not exist but simply that there is no research evidence that explains them. The difficulty in explaining why the cost of providing education in one locality varies from that in another is perhaps best illustrated by examining teacher compensation—the largest component of the public elementary and secondary educational expense.

Teacher Compensation Component of School Expenditures

A school district's primary purchases involve labor. Obviously, public education is a highly labor intensive industry. Most studies conclude that the typical school district in America spends more than two thirds of its general budget on salaries and fringe benefits for its employees. This is perfectly understandable given the nature of the teaching and learning process in American public schools. All other purchases are relatively minor once this category, specifically salaries and fringe benefits associated with classroom teachers, is fully met. Moreover, it is vital to understand that the cost of hiring and retaining public classroom teachers is not a function of the cost of living of the local community. It is instead a function of those individuals who are in the labor pool. Those individuals who possess, or are qualified to possess, valid teaching certificates as public classroom teachers are within the applicable general labor pool. There also are discrete subpools, since districts need to employ teachers with certification to teach specific topics.

The major cost for public school districts is a function of the classroom teacher market of the state, the region, and even perhaps the nation. In reality, however, explaining or predicting such cost is made exceedingly complex by virtue of the collective bargaining process that exists within a given state. The cost of an educational input, i.e., classroom teachers, thus may not be a function of the labor market at all but a function of the scope, intensity, as well as the sophistication, or lack thereof regarding the collective bargaining process that exists within a given school district.

This collective bargaining process has been, and is, highly affected by the price of teacher inputs in neighboring or similarly situated school districts. The collective bargaining model assumes that both sides, teachers as well as the local school board, will take into account the competing wage scales of other school districts.[4] In doing so, an upward spiral is created that is independent of internal market forces. These observations are supported by the work of Dunlop and Ross as far back as 1948.

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Dunlop observed that the concept of job clusters existed in which wages were paid to individuals holding relatively stable positions over time. Ross observed that the existence of an orbit of similar comparisons indicated that salaries were largely a function of what other employees received in similar organizations.[5] This research suggests that wage levels seek a form of equilibrium only in part affected by supply and demand principles.

Equally questionable is a direct correlation between teacher salaries and ordinary cost of living measures. Studies have shown that teachers' salaries may not be a function of external variables, such as the Consumer Price Index.[6] These data suggest there is no evidence that, where cost-of-education measures are utilized by a given state, they result in commensurate teacher salaries, higher or lower.

Specifically, the higher cost of living concept argues that a school district with a higher cost of living must pay more for the same teacher input than a district with a lower cost of living. In reality, urban school districts that may have a higher cost of living status also possess a greater number of individuals who are in the qualified specific labor pool by virtue of the size of the community. Further, if a community had a higher cost of living index and if it were to have an effect it would be reflective of the existing salary scales within affected school districts. Thus, it should be expected that salary levels will have already reached the appropriate equilibrium if this relationship does, in fact, exist. Thus, it can be suggested that if this cost of living data were an accurate predictor, teachers' salaries would be highly statistically correlated with such indices.

Research reflects that demand is a function of income and overall demand by the change of population. As the demand rises, the cost of goods and services also rise due to a lack of perfect elasticity. With a larger population, economies of scale should set in and lower the price of goods and services. However, this generally does not prevail in that the costs of services rise in terms of police, fire, transportation, sanitation services, as well as in a variety of social services. This is particularly evident in large urban areas that suffer from municipal overburden in which the necessary governmental services simply cannot meet the demand. Table 1 reflects teachers' salaries for 1988–89 in terms of average teacher salaries for each state divided by an interstate cost-of-living index in order to calculate an "adjusted average salary." The authors of this research strongly caution that these data do not reflect the fact that employers recruit employees for specific job assignments and that individuals seek remuneration "according to their perceptions of working conditions and amenities and disamenities of where they must work and live."[7] Further, the authors state, "[t]he average teacher salary in a particular state also depends on the experience level of the average teacher, which is influenced by enrollment trends, pay practices, and demography. The academic and credentialing standards for entry to the professions and a variety of other supply and demand conditions also affect average teacher salaries."[8]

A number of interpretations could be suggested for these data and such comparisons:

- Classroom teachers, as a whole, are either underpaid or overpaid in relation to the cost-of-living; classroom teachers should immediately receive a pay raise, in order to make them "average." On the other hand, one could argue the opposite point of view of reducing salaries in certain states, in order to make classroom teachers "average." The third view would be to maintain relatively higher salaries in all states, in order to create a given salary structure that reflects societal commitment to public education.
- In below average states, classroom teachers, as a whole, are not as experienced as that of the nation;
- In a below average state, one could argue that classroom teachers have chosen to live in that state for various personal reasons including lifestyle;
- In below average states, classroom teachers have not experienced success during the collective bargaining process;
- The cost of living concept has no merit in that, if these pressures were indeed meritorious, the average adjusted salaries would not exist as they do, and/or
- The cost of living concept has no merit in that the fiscal ability of a given state must be accounted for in such comparisons.

It is important to note that these observations, singularly or in any combination, may be offered. No one can tell conclusively why a difference between teacher salaries and cost of living exists. Nonetheless, classroom teachers, in certain states, are underpaid in terms of the cost of living as measured by the CPI. These specific classroom teacher salary data are shown in Table 1. The relative changes of such data may be seen in Table 2.

Where cost of education indices have been employed, or at least formulated for study, teachers' salaries were the overriding issue. In a California study it was noted:

> [T]eacher cost differences tend to be the major driving factor of the overall differences in education costs, since teachers account for almost 60 percent of the school district budgets . . . The metropolitan areas of the state tend to exhibit relatively higher costs of school personnel than the nonmetropolitan areas although certain remote areas (with low population density and only small or no urban population) tend to have relatively high personnel costs.[9]

It is reasonable to conclude that in other states it is the relatively higher density populated areas, i.e., urban school districts, that will have higher cost indices. If this were true, those districts that possess high cost indices would have to show that they received less moneys than appropriate.[10]

The dilemma with this type of methodology is apparent. On the one hand, if school districts truly cannot afford to pay appropriate salaries due to legitimate inequities and inadequacies of the distribution plan, their salaries will in fact be relatively and consistently low. Those districts that have high cost of living issues will theoretically pay in kind in order to compete within the appropriate workforce. All cost of education plans are inherently based on what school districts spend in previous times. Thus, by its very nature expenditure data cannot truly reflect the costs of providing an education if, in fact, poor districts are unable to provide those services. Moreover, were such an index developed, a number of issues would have to be quantified and examined whenever salaries were adjusted.

An examination of cost of living research reveals several key points for consideration. In one state, 88 percent of the variance in resource costs among public school districts were related to the differences in the beginning salaries of classroom teachers.[11] No evidence exists that the CPI has been a determinant of teacher salaries over time within the United States.[12] Thus, when one examines national data that clearly reflects the massive costs associated with classroom teachers in relationship to educational expenditures, the concept of a cost of education index becomes somewhat suspect from any perspective. This is not to say that there is not a phenomenon occurring. It is to say, that given the present state of knowledge and research, there is more that is not explained, as compared to what can be explained, regarding these interrelationships.

Simple cursory observations based on individualistic and intuitive feelings will not resolve issues of such magnitude. If one were to assume that there is truly a cost of living impact on public school districts and that school districts are attempting, in however a modest fashion, to meet a supply and demand function of public classroom teachers, there would exist an overall positive association between the CPI and public classroom teachers salaries. However, on a national level over a ten year period between the years 1969–79, only the 1974–75 salaries were found

Table 1. Average Teacher Salary Adjusted by the Interstate Cost-of-Living Index[a]

State	Average Salary ($)	Index	Adjusted Av. Salary ($)	Adjusted Rank	Original Rank
Michigan	35,530	95.4	37,247	1	4
California	35,172	105.9	33,220	2	5
Minnesota	31,395	95.6	32,849	3	11
Wisconsin	31,046	95.4	32,530	4	14
New York	36,654	113.2	32,369	5	3
Rhode Island	34,234	106.8	32,067	6	6
Illinois	31,195	97.4	32,038	7	13
Indiana	29,169	92.9	31,396	8	17
Oregon	29,385	94.2	31,186	9	16
Pennsylvania	31,248	101.3	30,835	10	12
Maryland	33,900	110.8	30,609	11	7
Delaware	31,585	103.2	30,595	12	10
Ohio	29,166	95.8	30,441	13	18
Washington	29,146	97.0	30,062	14	19
Connecticut	37,659	125.8	29,947	15	1
Virginia	29,056	97.1	29,930	16	20
Wyoming	27,689	93.4	29,650	17	23
Colorado	29,557	99.8	29,612	18	15
Nevada	28,836	98.1	29,406	19	21
Georgia	26,920	94.1	28,605	20	25
Vermont	26,819	93.9	28,565	21	26
DC	36,787	129.8	28,341	22	2
Kansas	25,992	91.7	28,330	23	29
Arizona	28,499	100.8	28,272	24	22
Texas	26,513	94.1	28,168	25	28
Missouri	25,981	92.9	27,974	26	30
Florida	26,937	97.3	27,671	27	24
Iowa	25,884	93.6	27,662	28	31
Tennessee	25,619	93.1	27,530	29	33
Alabama	25,190	91.9	27,420	30	34
North Carolina	25,650	93.6	27,410	31	32
Maine	24,938	92.0	27,116	32	36
South Carolina	25,060	92.6	27,063	33	35
Kentucky	24,920	92.1	27,053	34	37
Montana	24,421	91.1	26,793	35	39
Massachusetts	32,200	121.8	26,430	36	9
New Mexico	24,554	92.9	26,416	37	38
New Jersey	32,862	125.8	26,121	38	8
Nebraska	23,845	92.9	25,659	39	40
Oklahoma	23,400	92.5	25,304	40	41
Mississippi	22,579	90.3	25,000	41	44
Idaho	22,732	91.3	24,903	42	43
Utah	23,023	92.9	24,779	43	42
New Hampshire	26,703	107.9	24,753	44	27
North Dakota	22,249	92.2	24,138	45	46
Louisiana	22,469	93.4	24,063	46	45
Arkansas	21,736	90.9	23,901	47	48
West Virginia	21,904	91.9	23,831	48	47
South Dakota	20,525	91.6	22,408	49	49
U.S. Average	29,614	100.0	29,614		

[a]F. H. Nelson "An Interstate Cost-of-Living Index," *Educational Evaluation and Policy Analysis*, Spring 1991, vol. 13, no. 1 109.

to have a statistically significant relationship between the CPI and classroom salaries in America.

Specific research regarding beginning teachers' salaries in the state of Florida yielded several observations of importance. Regional salary leaders were those districts offering beginning teachers' salaries higher than any contiguous district. In the seven year period under study, only one of the sixty-seven school districts was found to be a regional salary leader for the entire period of time. "[T]he assumption of an equilibrium existing among districts in relation to salaries offered teachers was rejected. It was concluded that competition among districts in terms of beginning teachers' salaries was dynamic rather than static."[13] The research demonstrated that school districts "tend to pay salaries close to those of their neighbors, but those having greater revenue generating potential than their neighbors are likely to pay higher salaries than their neighbors."[14] In particular it was noted:

> More recent analysis of data from the Florida study has produced additional evidence against the use of cost of living differentials to adjust state school finance plans. When the mean beginning teachers' salaries of abutting districts, Price Level Indices (PLIs) for each district, and district revenue potentials were entered into regressions on beginning teachers' salaries for each district for each

Table 2. State Rankings by 1990–91 Average Teacher Salary Adjusted by the 1990 AFT Interstate Cost-of-Living Index[a]

State	Average Salary ($)	Index	Adjustment	Adjusted Av. Salary ($)	Adjusted Rank	Original Rank
Michigan	$37,800	94.3	2,265	$40,065	1	8
New York	42,080	113.4	(4,981)	37,099	2	13
California	39,118	108.2	(2,974)	36,144	3	5
Illinois	34,642	96.5	1,274	36,916	4	14
Minnesota	33,128	92.9	2,524	35,652	5	16
Wisconsin	33,077	92.9	2,523	35,600	6	17
Indiana	32,931	93.4	2,331	35,262	7	19
Pennsylvania	36,057	103.6	(1,258)	34,799	8	11
Nevada	35,269	101.5	(507)	34,762	9	12
Maryland	38,312	110.7	(3,707)	34,605	10	7
Rhode Island	38,220	111.0	(3,779)	34,441	11	9
Connecticut	43,398	126.3	(9,044)	34,353	12	2
Virginia	32,692	95.6	1,499	34,191	13	20
Delaware	35,246	103.9	(1,338)	33,908	14	13
Oregon	32,295	95.7	1,460	33,755	15	21
Ohio	31,964	95.7	1,449	33,413	16	22
Washington	32,975	99.5	158	33,133	17	18
Kentucky	29,115	89.4	3,461	32,576	18	29
North Carolina	29,165	91.3	2,771	31,936	19	28
Florida	30,555	95.3	1,332	31,887	20	26
Alaska	43,406	137.0	(11,723)	31,683	21	1
Georgia	28,950	92.0	2,527	31,477	22	31
Colorado	31,819	101.8	(576)	31,243	23	23
Vermont	29,714	95.3	1,473	31,187	24	27
Tennessee	28,248	90.8	2,849	31,097	25	33
Texas	28,100	90.5	2,940	31,040	26	36
Wyoming	28,996	93.5	2,032	31,028	27	30
Kansas	28,188	91.2	2,733	30,922	28	34
Arizona	30,773	100.1	(34)	30,739	29	25
District of Columbia	39,362	128.4	(8,706)	30,656	30	4
South Carolina	28,174	93.2	2,070	30,244	31	35
New Jersey	38,411	127.2	(8,208)	30,203	32	6
Iowa	27,636	92.5	2,252	30,201	33	37
Missouri	27,636	91.6	2,530	30,166	34	38
Maine	28,531	95.1	1,469	30,000	35	32
Alabama	26,846	90.0	2,969	29,815	36	39
New Hampshire	31,273	105.1	(1,505)	29,768	37	24
Nebraska	26,592	90.9	2,674	29,266	38	41
Massachusetts	36,090	124.0	(6,988)	29,102	39	10
West Virginia	25,966	89.4	3,067	29,033	40	43
Montana	26,696	92.2	2,256	28,952	41	40
Louisiana	26,170	91.0	2,604	26,774	42	42
New Mexico	25,800	92.4	2,125	27,925	43	44
Mississippi	24,609	88.3	3,276	27,885	44	47
Utah	25,415	92.3	2,123	27,538	45	46
Idaho	25,510	92.8	1,973	27,483	46	45
Oklahoma	24,378	89.2	2,955	27,333	47	48
Arkansas	23,735	88.7	3,034	26,769	48	49
North Dakota	23,574	90.4	2,517	26,091	49	50
South Dakota	22,363	89.5	2,632	24,995	50	51
Hawaii	33,548	135.0	(8,698)	24,850	51	51
U.S. Average	32,880	100.0		32,880		

[a]AFT Research Dept. personal correspondence from the author, F. H. Nelson.

of the seven years examined, mean beginning teachers' salaries of contiguous districts entered first in each case . . . [I]n head-to-head statistical competition with the mean beginning salaries of contiguous districts, Florida PLIs lost seven times out of seven in predictions of local beginning teachers' salaries. In fact, once the mean beginning salaries of contiguous districts were entered, PLIs added nothing of statistical significance ($p < .05$) . . . to the prediction of local teachers' salaries.

Apparently, great emphasis is not placed on the local cost of living when decisions are made regarding the salaries . . . However, a legitimate alternative explanation may be that local costs of living affect the supply of applicants willing to accept employment in a particular school district.[15]

When public school superintendents were questioned, the cost of living concept significantly trails the issues of moneys available as well as what salaries other districts pay by an

overwhelming margin.[16] Hence, an analysis of those who actually determine and bargain contracts for public schools indicates the CPI is of minor importance. An examination of these data reveals several explanations. The most plausible and reasonable explanation is that school superintendents make these decisions largely on the amount of moneys that will become available for salaries, with secondary thoughts toward salaries paid in other school districts.[17]

In summation, traditional supply and demand theory does little to explain variations in the cost of teacher inputs. In many school districts of the nation, particularly large urban school districts, school districts have engaged in non-hiring patterns including reductions in force, while at the very same time significantly increased teacher salaries due to a variety of reasons, including the collective bargaining process.[18] With declining enrollments throughout many portions of the country and with rising costs with reductions in corresponding state aid, it can be clearly demonstrated that supply and demand functions do not apply to public classroom teachers' salaries. If this overall theory were to apply, these school districts would not be raising teachers' salaries. An overall assessment of the research yields the clear conclusion that supply and demand functions are not applicable to teachers' salaries. Variations in the cost of living also have been shown to have little explanatory weight in assessing why teacher salaries vary among districts within a state.

Development of a Hypothetical Cost of Education Index

A hypothetical educational index would have to identify every variable within every school district in order to make every service identical. Anything less than this successful identification and quantification would mean failure by its own definition. Hence, an index would have to be created that would determine the cost of providing each and every discrete service to every applicable child in every school district in the state. Thus, by necessity the index would have to be applied to each child in each school building within a state and would be computed for every educational service across the state. Additionally, an index would have to be developed to cost out the differences in providing services to different identified pupil needs across the state. This would result in every service being indexed based on a "market basket" approach that would be applicable to every school district and ultimately every school and every child within the state. Every year these data would have to be adjusted up or down in order to ensure proper fiscal and educational allocations.

Several different approaches to ascertaining a cost of education index have been utilized in the past. These are essentially ones that involve: 1) a statistical approach, 2) a supply and demand approach, and 3) a behavioral approach.[19] It is interesting to note that no one methodology has yet to be accepted as the best methodology.

It is often assumed that the quantity and quality of teaching applicants are affected by local classroom salaries and/or the desire of local school officials to employ teachers of the highest quality. However, the variability is enormous among districts in terms of the salaries paid to teachers.[20] The use of average daily attendance, the cost of land and housing, the degree of urbanization, population density, the population of the county, and the distance of the county from the nearest city with a population over 100,000 in computing teacher cost indices has been widely questioned. In fact, this concept has been referred to as "shot gun empiricism."[21]

One of the major inherent weaknesses of an educational index is that in all such programs they essentially measure a wide variety of items. This concept has received significant criticism. Wentzler has written:

> The single equation approach does not, however, enable one to empirically distinguish supply from demand variables; consequently, the researchers must rely on an ad hoc designation of supply and demand variables when constructing the aggregate supply price index. This procedure leads to especially questionable indexing results if the researchers adopt crude proxies for the supply (demand) variables which are synonymous with demand (supply) variables.[22]

The simultaneous equation approach cannot be accurate or appropriate given the variables in question. For example, family income could easily serve as a proxy for socioeconomic characteristics of a given community (a district amenity) as it could serve as a cost of living proxy (a district disamenity). The same would be true of a host of other variables such as the cost of land and housing. Local housing costs would normally be highly correlated with the socioeconomic status of a given local population.[23] Even the use of average daily pupil attendance is a subject of great dispute. Such adjustments were shown to be inappropriate due to a number of systematic problems, since "absolute size of the coefficient on the enrollment variable effectively dampens the supply influence of the remaining variables in the equation when enrollment is included among the supply variables."[24]

Matthews and Holmes summarized the overall thoughts of Wentzler and Johnson in the following statement:

> According to Johnson, [t]here is an 'absence of well grounded theory of the teacher market that contains maintained hypotheses that lead to specification of substantive, reliable and consistent relationships.' Although Wentzler based her work on existing thought, she also recognized that 'one problem that arises with the estimation of both the single and the simultaneous equations models is the lack of data corresponding to the theoretical variables.'[25]

In fact, the degree of elasticity concerning the supply of classroom teachers has not, as of yet, been determined. If changes were made in either individual school districts, or as a state as a whole, a supply function does not exist in order to determine the response of those who qualify for teaching positions. The only specific study on this question determined that the differences that existed among school districts in Georgia was almost exclusively a function of the salaries of beginning teachers for those teachers who were mobile. Relocation decisions of experienced classroom teachers have historically reflected very little, if any, evidence to suggest that salary was a function of their personal decisions.[26] In a Michigan study, average teacher salaries resulted in teacher price differentials from two to three times as large as when they used beginning teachers salaries as the dependent variable. As it has been observed, the choice of the dependent salary variable is critical to these studies. The study concluded in stating, "every single alternative assumption does not appear to produce a unique price index."[27]

In order to develop an educational index a methodology is presented for review. This is not to suggest that this is the only acceptable methodology. It does reflect the minimal elements of sound research protocol regarding the investigation of such an issue. In order for a state to properly develop a cost of education index, its agencies would have to engage, at a minimum, in the following analyses:[28]

- An education index would be developed for certified personnel including teachers, all school building level administrators, as well as all central office administrators,
- An education index would be developed for all noncertified personnel including instructional aides, clerical and secretarial personnel, custodial and maintenance personnel, and
- An education index for the nonpersonnel school consumables, e.g., utilities.

Generally, some form of multivariate regression analysis would be engaged in to determine and to explain the salaries as

discussed in items 1 and 2 and the nonconsumables. Overall analysis of variations to be examined would include such items as the following, at a minimum:

Personnel

- Age of every school district employee,
- Experience of every school district employee with the district as well as total experience,
- Educational attainment of each employee,
- Field of certification of every employee and status of the certification,
- Sex of every school district employee,
- Race of every school district employee,
- Job titles as well as the duties of every school district employee, and
- Days of work per year by every school district employee

Characteristics of individual classrooms

- Background characteristics of pupils, including demographic and scholastic data by classroom in every school in the state

School data

- Curriculum of every school in the state,
- Pupil characteristics from classrooms aggregated by school and district

School district data

- Pupil achievement data on every standardized test,
- Age of educational facilities and improvements therein,
- District size in terms of enrollment

Regional data

- Cost of housing within all school districts,
- Percent urban population within all school districts,
- Population density of all school districts,
- Access to urban areas from all school districts

It is of utmost importance to note that, while much of these data can be gathered from various state agencies, much of these data do not exist within a given data bank, or any variety of sources, within many states. Hence, scientific survey research must be engaged in to determine certain information. The surveys must be piloted and judged as to the level of statistical reliability and validity. For example, in California a survey was found necessary to receive certain data. A survey instrument was sent to over 9,000 individuals in order to ascertain certain information. As with all such surveys with less than 100 percent response rates, inference may be drawn but not a complete status report.

Once these data are gathered and analyzed, certain research explanatory variables must be divided into two overall categories: 1) those variables that are within the control of the local school district, and 2) those that are outside control of the local school board. Indices of these educational resources should reflect only variations in expenditures associated with factors outside local control. Factors which are reported as being within the control of local school districts include such characteristics of classroom teachers such as age, race, and sex.[29]

An index of this type attempts to essentially measure the cost of goods and services of those items within the control of the school district against the average cost of those same goods and services within the control of all other school districts. Hence, an index is developed which reflects higher than average costs or lower than average costs. Each index for each component is then combined into a single index for each school district within a state.[30] Generally, transportation will have a separate index developed for it due to the nature of the task.

Overall and specific data for each school district in the state would include at a minimum the mean, standard deviation, range for overall data, as well as each subset of data and each classification of school districts. The subsets would reflect such issues as size and metropolitan/nonmetropolitan locations. Overall data in such a study would include parameter estimates for the personnel and transportation regression equations.

Inasmuch that these data change constantly, all such studies must be reanalyzed periodically for state aid purposes. Relative changes can thus be noted. Additionally, the volatility of these data is quite apparent.

Based on an examination of the research to this point in time it should be noted that at least two states have conducted rather massive and complex studies of the differentiated costs of public education. A California study and a Georgia study revealed very similar cost differentials for public schools within the respective states. California reflected a cost differential of .892 to 1.132 while the Georgia study ranged from .944 to 1.179.[31] From a research perspective such differentials may tend to reflect similar such differentials throughout the nation.

Using a California study as a basis of illustration of how such a study would be conducted and assuming it could be modified for a given state, the mean, the standard deviation, and range would be reported for all school districts. Additionally, these data are broken down in relationship to school districts' proximity to their location to cities as divided into four groups varying from greater than 500,000 to those with less than 100,000 population as well as districts located in nonmetropolitan areas.[32] Rationales would have to be developed for an individual state for classification systems based on a state's population parameters. Overall eight indices would be developed for every school district as follows:

- Teachers' Cost Index,
- Principals' Cost Index,
- Administrators' Cost Index,
- Secretaries' Cost Index,
- Custodians' Cost Index,
- Instructional Aides' Cost Index,
- Natural Gas Cost Index, and
- Electricity Cost Index.

Personnel costs, the greatest sector of expenditures, would be held statistically constant for all school districts. Estimates must be obtained by simulating the variations in those school districts which employ similar kinds of personnel based on job classifications and job descriptions obtained from every school district. Descriptive data such as job titles, work days, classroom and school demographics, age and condition of school facilities and achievement test scores must be held statistically constant across school districts. The study would actually use the variables incorporated within the general state aid formula, the cost of land and housing, the degree of urbanization, population density, and the population of the county, and the distance of the county from the nearest standard metropolitan statistical area.

If, in certain school districts the cost of living, or for that matter, the cost of education is in fact high and thus classroom teachers should be paid more, then the converse should be true. That is to say, if the cost of living or education were to decrease, then state fiscal assistance should decline. However, given the nature of the conceptual model of correlating salary increases in other districts the likelihood of this occurring is extremely slim. No where does the research, or in common thinking, suggest that if the cost of living, or the cost of education, were to decline then such salaries should be reduced. This concept is simply not addressed.

It can be generally predicted that those districts that exhibit higher teacher costs per pupil would tend to dominate any state education index concept. The reason for this is rather

straightforward. As discussed herein, the cost of classroom teachers in terms of salaries and fringe benefits generally dominate the general fund budgets of most school districts regardless of geographical issues or other considerations. Thus, high expenditures are associated with higher costs for classroom instruction on a per pupil basis.

Generally, energy costs will be directly correlated with climatic conditions. That is, those districts in relatively colder regions of the state will spend more regardless of the energy efficiency of the school facilities located within these school districts. Advocates of a cost of education index have long argued that such an index should be reflective of an overall state aid to the school districts.[33] It should not be utilized to adjust teacher salary scales.

Examples of States that Utilize a Cost of Education and Cost of Living Formula

Contemporary examples of states that utilize various forms of measuring the varying costs of providing educational services vary greatly. No two states appear to follow the same methodology. This is reasonable given the assumption that each state's true cost of providing education is distinctly different than others. Florida and Texas are discussed, in a limited manner in that each state represents the predominant methodologies engaged in by the various states in attempting to account for a cost of living/education concept. Florida illustrates a state that has chosen to concentrate its attempt at meeting a cost of living concept while Texas has chosen to measure a cost of education concept. Both states illustrate different methodologies if the costs of living/education were indeed higher for certain school districts. Such methodologies, for example, would be necessary before any moneys could be allocated for these purposes. This discussion is provided as illustration as to what complexities are involved in such cost of living/cost of education fiscal adjustments within state education finance formulas.

Florida

The state of Florida provides for what is essentially an adjustment for the cost of living in school districts.[34] The Florida Price Level Index (FPLI) was established by the Florida Legislature to determine what is referred to as the District Cost Differential in the state aid formula. The stated purpose of the FPLI is to measure the differences from county to county in the cost of purchasing a specific market basket of goods and services, at a particular point in time.[35] The FPLI measures either relative inflation or relative price levels. The FPLI measures relative price levels among all the state's counties as a cross-sectional index.

In 1991, seven counties had an index above the state average of 100.00. The highest levels were in the southern, more populous part of the state. Of the seven counties, two are over 1,000,000 population, four are between 100,000 and 1,000,000, and one is less than 100,000. The northern, least populated, portion of the state, had the lowest index values. Typically, Monroe County, i.e., the Florida Keys, has ranked as having the highest index meaning that the cost of living is highest within the state.

The FPLI places each selected item in either food, housing, transportation, apparel, and health, recreation and personal services. According to the FPLI, the costs of living for the typical consumer were distributed approximately as follows for every dollar spent:

- 22 cents were spent on food,
- 37 cents were spent on housing and related items,
- 7 cents were spent on clothing,
- 19 cents were spent on transportation, and
- 5 cents were spent on health, recreation and other personal services.

Each category index is grouped in order to calculate a population weight relative to the population weighted average of 100.00. Comparisons across counties is then possible within each category. It is noteworthy that the county rankings, and thus the school district's can vary from year to year. The overall rankings for the following selected years are shown for illustrative purposes in Table 3.

Cost of Living Description

The state measures a theoretical 117 item marketbasket of goods. These goods and services are commonly utilized items. Housing prices for each county are computed with the help of the Department of Revenue's Ad Valorem Tax Division.

Rental prices are estimated by the state utilizing regression analysis. The resultant standardized apartment rents are then weighted according to the number of units available in order to determine the average rent price for each county.

Hospital costs and health professional costs are surveyed. Health and automobile insurance costs are determined by surveying private insurance companies. Utility rates are obtained from the Public Service Commission.

Computation of Index Value

Once the retail prices are computed, they form an initial index for each county. This computation is by weighting the county average relative price for each item by the appropriate item weight. The final procedure consists of weighting the initial index by the population (see Table 4). A weighted average of the indices is thus determined by multiplying the index by the county population. The products of the count determinations is then summed and divided by the state's population. Thus, a statewide average index is determined. This final value is then divided into the initial index values and multiplied by 100 to produce the FPLI.

These indices are averaged for the last three years by each county. This lessens the positive or negative impact on individual school districts. Additionally, the state recognizes diseconomies of scale relative to smaller school districts via a different formula.

Texas

The state of Texas attempts to measure the cost of delivering educational services via a Cost-of-Education Index (CEI). The development of the CEI attempts to measure for uncontrollable regional price variations and for diseconomies of scale due to differences in the size of school districts.[36]

Price Effects Component

The price component within the Texas formula is designed to adjust for geographic price variations that are beyond the control of local school districts. In that the primary operating expense of school districts is teacher salaries, the factors which affect variations in teacher payroll costs are examined. The monthly average salary was used as the dependent variable. The model identifies variations in teacher salary costs. The uncontrollable factors are as follows:

- contiguous county beginning teacher average salary,
- location in a rural county,
- percent low-income pupils,
- district type (suburban, independent town, and rural), and
- district size in terms of student population

Controllable factors at the local school district level were as follows:

- property wealth per teacher,
- total effective tax rate,
- teacher benefit level per pupil,
- graduation rate,
- number of secondary teachers,
- percent minority teaching staff, and
- nonsalary expenditures

Table 3. Florida Price Level Index—1988 to 1990 (Population weighted state average = 100.00)

County	1991	Rank	1990	Rank	1989	Rank	1988	Rank
Alachua	94.31	33	95.97	24	94.93	31	94.96	27
Baker	90.06	62	89.01	64	90.67	58	88.19	65
Bay	93.81	36	93.82	35	92.22	47	90.68	51
Bradford	92.04	50	90.61	58	94.19	35	92.52	41
Brevard	99.12	14	100.55	11	97.30	20	98.31	14
Broward	105.99	03	107.76	02	106.59	03	107.12	02
Calhoun	89.85	64	90.73	56	89.01	66	88.67	62
Charlotte	95.83	26	96.62	23	97.62	17	96.54	20
Citrus	91.76	51	91.03	54	91.61	51	91.37	45
Clay	96.07	24	94.60	32	96.20	24	95.16	25
Collier	100.11	07	103.16	04	100.69	08	101.37	08
Columbia	91.46	52	93.41	48	91.61	51	89.74	58
Dade	107.98	02	91.98	03	107.38	02	107.10	03
Desoto	96.30	22	97.42	36	96.01	26	94.56	31
Dixie	93.53	37	95.44	47	90.62	59	91.03	48
Duval	95.81	27	97.42	20	94.49	34	95.30	24
Escambia	94.67	32	92.75	42	93.27	41	93.22	39
Flagler	96.90	21	95.44	29	97.46	19	95.45	23
Franklin	95.00	30	93.07	38	93.44	38	93.43	37
Gadsden	91.00	55	92.91	39	90.10	62	90.60	52
Gilchrist	90.73	58	90.97	55	90.98	56	91.27	46
Glades	99.23	13	98.07	19	99.68	11	97.93	17
Gulf	92.29	47	91.57	49	91.02	55	89.24	59
Hamilton	90.82	57	91.40	50	93.34	40	88.88	61
Hardee	90.48	59	91.31	51	90.25	61	91.21	47
Hendry	96.23	23	96.84	22	95.66	27	97.01	19
Hernando	92.83	42	94.23	33	96.35	22	93.34	38
Highlands	93.33	39	95.51	28	94.11	37	94.13	32
Hillsborough	99.51	12	100.67	10	99.01	12	100.64	11
Holmes	89.74	65	90.55	59	92.87	43	90.22	54
Indian River	99.61	10	97.37	21	97.50	18	100.87	10
Jackson	88.24	67	89.82	61	90.40	60	88.97	60
Jefferson	93.40	38	90.64	57	92.19	48	90.52	53
Lafayette	90.40	60	89.73	62	91.32	54	88.65	63
Lake	95.88	25	95.71	30	94.73	32	93.44	36
Lee	99.68	09	100.09	12	100.08	10	99.19	12
Leon	98.10	18	98.17	17	96.11	25	95.52	22
Levy	90.90	56	89.43	63	89.08	65	92.35	42
Liberty	92.37	45	92.14	46	92.73	45	89.89	56
Madison	89.93	63	87.26	67	88.38	67	87.86	66
Manatee	100.25	06	101.20	09	101.79	06	101.51	07
Marion	92.36	46	92.43	44	92.14	49	92.21	43
Martin	100.51	05	102.48	06	102.03	05	101.12	09
Monroe	116.79	01	112.79	01	115.03	01	113.98	01
Nassau	94.73	31	95.69	25	94.13	36	93.96	33
Okaloosa	93.23	41	94.16	34	93.11	42	92.54	40
Okeechobee	95.47	29	92.90	41	96.90	21	93.79	34
Orange	98.90	15	98.58	14	98.30	15	97.78	18
Osceola	94.20	34	98.33	15	96.24	23	98.02	15
Palm Beach	103.84	04	102.35	07	105.09	04	104.18	04
Pasco	93.90	35	94.79	31	94.58	33	94.78	23
Pinellas	92.39	17	101.84	08	100.67	09	101.63	06
Polk	98.89	40	92.63	43	95.38	29	94.98	26
Putnam	92.39	43	93.28	37	93.35	39	92.07	44
Saint Jonas	98.89	16	98.08	18	98.35	14	96.05	21
Saint Lucie	99.55	11	98.67	13	98.15	16	97.99	16
Santa Rosa	91.11	54	91.07	53	91.94	50	89.79	57
Sarasota	99.93	08	102.60	05	101.66	07	101.78	05
Seminole	97.63	20	98.20	16	98.79	13	98.69	13
Sumter	92.39	43	92.36	45	91.60	53	93.63	35
Suwannee	89.07	66	87.57	66	89.19	64	88.49	64
Taylor	92.07	49	90.25	60	92.84	44	89.94	55
Union	91.30	53	91.18	52	92.67	46	90.91	50
Volusia	97.90	19	95.52	27	95.63	28	94.71	29
Wakulla	95.75	28	95.55	26	95.00	30	94.65	30
Walton	92.14	48	92.91	39	90.95	57	91.01	49
Washington	90.23	61	87.97	63	89.74	63	87.76	67

Table 4. Population Weighted Category Indices

County	Rank	Total	Food	Housing	Clothing	Transportation	Health
Alachua	33	94.31	99.21	89.33	96.45	97.19	93.54
Baker	62	90.06	94.25	81.84	93.99	98.88	89.27
Bay	36	93.81	98.36	86.21	97.41	98.86	96.14
Bradford	50	92.04	95.94	85.13	86.73	97.10	98.33
Brevard	14	99.12	104.41	95.35	102.10	98.65	98.90
Broward	03	105.99	101.27	113.65	97.68	100.92	106.24
Calhoun	64	89.85	99.90	77.82	94.34	97.42	90.33
Charlotte	26	95.83	97.72	89.78	100.71	99.33	99.95
Citrus	51	91.76	96.01	87.49	93.69	96.46	88.12
Clay	24	96.07	101.06	92.72	94.12	98.53	94.08
Collier	07	100.11	98.48	99.66	108.97	98.52	101.19
Columbia	52	91.46	93.19	83.32	92.73	100.46	95.36
Dade	02	107.98	101.66	115.83	102.11	103.70	107.94
Desoto	22	96.30	103.28	87.71	114.28	98.29	93.88
Dixie	37	93.53	98.14	86.78	93.85	97.92	96.27
Duval	27	95.81	100.40	90.62	98.87	97.65	96.94
Escambia	32	94.67	96.40	87.47	105.61	100.48	95.64
Flagler	21	96.90	100.89	96.40	91.60	97.95	93.30
Franklin	30	95.00	98.33	90.79	95.36	95.58	98.77
Gadsden	55	91.00	96.85	83.80	76.46	98.67	96.23
Gilchrist	58	90.73	99.14	81.19	92.61	96.73	91.30
Glades	13	99.23	101.14	98.88	94.33	99.54	99.24
Gulf	47	92.29	99.61	81.68	104.04	98.92	91.18
Hamilton	57	90.82	99.82	81.05	92.84	95.69	92.43
Hardee	59	90.48	92.75	87.48	88.15	94.33	90.18
Hendry	23	96.23	100.89	89.46	93.30	98.53	103.40
Hernando	42	92.83	96.00	90.44	80.00	98.37	92.89
Highlands	39	93.33	96.18	88.83	93.17	97.45	94.17
Hillsborough	12	99.51	103.43	96.40	104.37	100.13	97.47
Holmes	65	89.74	95.01	81.46	95.68	97.07	88.37
Indian River	10	99.61	101.97	95.77	100.92	103.69	98.94
Jackson	67	88.24	96.43	77.37	84.01	97.45	91.18
Jefferson	38	93.40	99.56	79.98	104.73	99.62	101.33
Lafayette	60	90.40	99.42	81.32	84.59	96.97	92.19
Lake	25	95.88	99.15	91.44	91.77	100.65	97.14
Lee	09	99.68	98.84	99.10	105.53	99.30	99.79
Leon	18	98.10	101.29	93.20	101.89	99.38	101.01
Levy	56	90.90	92.68	82.97	89.32	102.17	92.80
Liberty	45	92.37	101.50	80.71	96.63	98.60	95.25
Madison	63	89.93	95.85	82.09	91.77	99.19	86.16
Manatee	06	100.25	97.43	105.59	97.16	99.24	102.02
Marion	46	92.36	100.41	83.40	98.52	96.43	92.47
Martin	05	100.51	96.16	102.46	105.55	101.97	98.17
Monroe	01	116.79	111.80	138.81	99.21	102.26	101.11
Nassau	31	94.73	94.45	92.15	92.30	99.37	96.36
Okaloosa	41	93.23	97.01	85.99	102.19	97.05	94.77
Okeechobee	29	93.23	98.46	93.16	84.80	98.79	97.42
Orange	15	95.47	104.35	94.42	100.07	99.32	99.87
Osceola	34	98.90	92.96	95.57	82.49	98.57	93.20
Palm Beach	04	94.20	100.99	105.76	114.52	98.81	104.78
Pasco	35	103.84	96.71	90.88	86.78	99.83	92.57
Pinellas	17	93.90	97.22	100.38	95.81	100.34	97.32
Polk	40	98.84	94.75	88.55	92.41	98.98	95.20
Putnam	43	93.30	97.35	89.07	93.82	95.77	92.54
Saint Johns	16	92.39	100.48	100.00	94.09	99.67	95.35
Saint Lucie	11	98.90	101.14	95.20	107.48	102.26	99.69
Santa Rosa	54	99.55	94.12	81.12	98.50	98.56	96.31
Sarasota	08	91.11	92.12	103.14	110.19	99.83	99.25
Seminole	20	99.93	102.10	94.04	98.28	100.28	95.35
Sumter	43	97.63	98.51	86.21	86.93	97.14	94.01
Suwannee	66	92.39	97.46	81.78	77.47	97.70	87.93
Taylor	49	89.07	98.10	83.76	92.48	98.60	93.50
Union	53	92.07	97.53	82.31	95.87	96.08	94.12
Volusia	19	97.90	99.28	97.69	97.94	97.65	96.62
Wakulla	28	95.75	103.44	87.22	102.20	98.99	96.30
Walton	48	92.14	90.87	87.15	102.24	97.54	93.52
Washington	61	90.23	97.05	80.40	94.24	97.67	90.93

Controllable factors at the teacher level were determined to be:

- whether the teacher has an advanced degree,
- whether the teacher has no college degree, and
- total years of teaching experience.

Scale Effects Component

The scale effects component adjusts for the perceived diseconomies of scale due to differences in district size. The Texas methodology for the development of the scale component is as follows:

- School districts were grouped according to grade span,
- Districts were ranked by size,
- Classes taught within each district were classified,
- Information determined average class size,
- The number of students in each class level was divided by the appropriate class average size. The result equated to the number of classes required according to school district size grouping.
- The number of classes needed was converted to a required number of teachers.
- The number of teachers was converted to a dollar cost for a standardized teacher salary. Total dollars are then divided by the district pupil count yielding an average cost per pupil related to size differences.
- These steps were repeated, using administrator costs.
- Total salary costs were examined in terms of district size.

These data determined that there were five steps. These steps corresponded to different cost patterns relative to district size—for ADA of 130, 300, 700, and 1,000. Four equations were constructed. These equations are shown in the following table.

ADA of the District	Calculation of Scale Factor
More than 2,000 ADA	1.0
1,000 to 2,000 ADA	1.0 + [(2,000 - ADA) * .00014]
700 to 999 ADA	1.14 + [(1,000 - ADA) * .00023]
300 to 699 ADA	1.209 + [(700 - ADA) * .0008]
Less than 300 ADA	1.529 + [(300 - ADA) * .00485] except that 130 is used for ADA if ADA is less than 130

Final Cost-of-Education Index

The scale component is calculated from a series of formulas, while the price component is arrived at from a table derived from the results of regression analysis.

1. The final cost of education index is a combination of its two components. It is calculated as follows:

   price component × scale component = final cost-of-education index

2. The final index is applied to 71 percent of the basic allotment. The 71 percent corresponds to the percent of statewide total operating expenditures (excluding transportation, career ladder payments, debt service and capital outlay), accounted for by professional salaries and their proportionate share of benefits. The result is the adjusted basic allotment.

   (basic allotment × .71 × cost-of-education index) + (basic allotment × .29) = adjusted basic allotment

According to the Texas Education Code, the CEI must be applied in a formula "in a manner that appropriately reflects the relative significance of the costs adjusted by the index to the overall cost of a minimum accredited regular program represented by the basic allotment." Of the 85 percent of general fund operating expenses spent for salaries and benefits, 71 percent is paid to professional employees.

Impact of the Cost-of-Education Index

The index is described by a curve; the prior adjustment is reflected as two linear functions, one for districts greater than 300 square miles and the other, for districts which are smaller in area. Districts below 300 ADA receive a higher adjustment than they would have under the SDA from prior statute, as do districts that range in size from 1,600 to 2,000 ADA. Districts from about 500 to 1,500 ADA receive a smaller adjustment. A district between 300 and 500 ADA would fare better if its area is less than 300 square miles; its adjustment would decrease if its area is greater.

Scale Index Calculation

The cost-of education index has two parts. One part reflects diseconomies of scale and is analogous to the small district adjustment. The following text describes the development of the formulas for the scale portion.

1. Once total salary costs per pupil (for teachers and administrators combined) were determined, a graphic representation was constructed which plotted the number of pupils on the x-axis, and the salary cost per pupil on the y-axis. There were several "break points" in the "curve," at 130, 300, 700, 1,000, and 2,000 students in ADA.
2. Four equations were constructed to describe the slope of the line segment between each break point. The basic equation to describe the slope of a line is the result of the change in the x-value divided by the change in the y-value. This equation was adjusted to take into account the proportional change in each segment from the base cost of $1,616.

   Slope of Line Segment A–B: (234/1616)/1000 = .0014
   Slope of Line Segment B–C: (344/1616) - [(1850 - 1616)/1616)/300
   Which reduces to: (1950 - 1850)/(1616 * 300) or (110)/(1616 * 300) = .0023

   The reduced form of the last two segments is as follows:

   Slope of Line Segment C–D: 518/(1616 * 400) = .0008
   Slope of Line Segment D–E: 1333/(1616 * 170) = .00485

   Details for these calculations are as follows:

Break Point Label	Value on the x-Axis (ADA)	Value of the y-axis Salary Cost Per Student
A	2,000	$1,616
B	1,000	$1,850
C	700	$1,960
D	300	$2,478
E	130	$3,811

Line segment values that generate the scale component formulas are shown as follows:

Line Segment	Differences in the x-Axis Values	Differences in y-Axis Values
A–B	2,000 - 1,000 = 1,000	1,850 - 1,616 = 234
B–C	1,000 - 700 = 300	1,960 - 1,850 = 110
C–D	700 - 300 = 400	2,478 - 1,960 = 518
D–E	300 - 130 = 170	3,811 - 2,478 = 1,333

3. Four more equations were constructed to produce the final scale index values. Index values are calculated in reference to the base salary cost per student of $1,616 and each is added to the index value at the beginning break point. The results are as follows:

ADA of the District	Calculation of Scale Factor
More than 2,000 ADA	1.0
1,000 to 2,000 ADA	1.0 + [(2,000 - ADA) * .00014]
700 to 999 ADA	1.14 + [(1,000 - ADA) * .00023]
300 to 699 ADA	1.209 + [(700 - ADA) * .0008]
Less than 300 ADA	1.529 + [(300 - ADA) * .00485] except that 130 is used for ADA if ADA is less than 130

Adjustment for Price Effects

The adjustment for price variations is based on the regression analysis that was completed to explain the variation in beginning teacher salaries. The appropriate number of points from the "Index Contribution" column are added or subtracted from a base value of 1.00.

Conversion of the Regression Results to the Price Component Table

Regression analysis produces an equation which predicts the value of the dependent variable (in this case, the salary of an individual teacher) based on the values of one or more independent variables (in this case, characteristics of the teacher and the district in which the teacher teaches).

The base equation is as follows:

Log of teacher salary = 7.82729186 (intercept term) +
(0.03678998 * 1 if teacher Has No Degree) +
(0.01707559 * 1 if teacher is Assigned Secondary Teaching Duties
(0.02898405 * Number of Years of Experience for Teachers) +
(-0.000412168 * Square of Experience of Teacher) +
(-0.02527647 * Total Effective Tax Rate for State Aid Purposes) +
(.00000000906152 * Taxable Property Value Per Teacher) +
(.000045564 * Percentage of Minority Teachers) +
(-0.02858745 * Graduation Rate) +
(0.000071112 * Non-Salary Benefits Expenditure per Student) +
(0.000022884 * Competing Average Beginning Teacher Salaries) +
(-0.000969745 * Percentage of Low-Income Students) +
(0.000013348 * Square of Percentage of Low-Income Students) +
(0.004578901 * 1 if District is Classified Major Suburban) +
(-0.01200070 * 1 if District is Classified Independent Town) +
(0.01213998 * 1 if District is Classified Rural +
(0.01137511 * 1 if County Population Less than 40,000) +
(-0.31896171 * Log of Average Daily Attendance) +
(0.04335643 * Square of Log of Average Daily Attendance) +
(-.001817481 * Cube of Log of Average Daily Attendance)

Each of the factors in the equation contributes to the expected value of a specific teacher's salary through the coefficients identified. The variables listed account for approximately 85 percent of the variation in teacher salaries.

Indices are generally created to represent the relationship between a specific observation and the minimum value of the distribution of all values, or the relationship between a specific observation and the mean of all values. The cost component of the CEI seeks to represent an index to form the relationship between an individual district and a base level of cost.

The objective of the regression analysis is to identify the impact of certain uncontrollable factors on teacher salaries, then allow variation in those factors to alter the prediction of the salary of a teacher if all other characteristics are held constant.

By assessing the impact on the predicted salary of a teacher of a change in value for an uncontrollable characteristic on which an index is to be based, a revised predicted teacher salary can be obtained. For every unit of change in an uncontrollable characteristic, a change in expected teacher salary would occur, and each new expected teacher salary can be related to the base value in order to determine an index.

There were five uncontrollable characteristics of school districts found to have an impact on teacher salaries: average salary of beginning teachers in the surrounding area, the percentage of low income students, location of the district in a county with fewer than 40,000 residents, classification of the district as either rural or independent town, and the average daily attendance of the district.

The process for determining the impact of a change in the value of an uncontrollable characteristic is set forth in the following steps:

1. The mean or average value of all characteristics is used to determine a base predicted teacher salary by substituting the mean values in the equation.
2. For a single uncontrollable characteristic, the minimum value is substituted in the equation, holding all other characteristics at their respective mean values.
3. The resulting predicted value for the dependent variable, teacher salary, is then compared to the value determined in step 1. (This process actually involves taking the exponent of the logarithmic value used in the regression so that a meaningful comparison can be made.)
4. Steps 2 and 3 are repeated for the full range of values of the single uncontrollable characteristic until the maximum is reached. This gives a range of predicted values, generated by values for the uncontrollable characteristic, extending from a minimum prediction based on a minimum value for the uncontrollable factor to the maximum based on the maximum value of the uncontrollable factor. When compared to the base value in step 1, a range of percentage variations can be determined, and these variations can be translated into index contributions.

A specific range in an uncontrollable characteristic can be defined so that it corresponds to a specific contribution toward the index value.

Summary

The authors, by design, have discussed the issues of the cost of living in funding public elementary and secondary education. Further, they have replicated state documents to reflect the complexities of two selected state methodologies. The determination of the cost of providing public educational services is complex and costly for any state. It should be noted that there are essentially two different methodologies in attempting to measure the cost of education. The first methodology, as illustrated by the Florida example is essentially one of measuring the cost of living within school districts. The proponents of this methodology argue that the vast majority of expenses of a school district are in fact labor. The school district must in fact purchase labor and it cannot do so without accounting for its labor costs. Thus, in a circuitous manner the district is purchasing services who must live in the community. On the other hand, opponents state that such measures do indicate the cost of living, but the cost of living has very little, if anything, to do with the cost of providing educational services in that the school district is not purchasing the same items that individuals purchase. Hence, such models are a cause of inflation in a given state in that labor costs will always tend to rise while productivity remains the same.

The Texas methodology attempts to measure the controlled and uncontrolled costs associated with providing educational services by school districts. The size, location, and nature of professional staff indicate the costs of providing such services. This latter model is conceptually different than the former. While both purport to measure the same thing, it is a reasonable observation to make that the methodologies measure different attributes affecting school districts. Which methodology is superior and worthy of greater research is a continual debate by education finance researchers. Further investigation of running both models within the same state would yield interesting observations as to the effects on public education and the equity and adequacy issues inherent within education finance discussions. The vast majority of education finance researchers would concede that cost of living issues are legitimate variables for any education finance distribution program. Equally important is that the cost of living variables be properly measured and accounted for within a state distribution formula.

References

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3. Matthews and Holmes, "Implications of Regional Cost Adjustments," *Educational Administration Quarterly*, 69.
4. Research regarding this observation can be found in D. Gerwin, "An Information Processing Model of Salary Determination in a Contour of Suburban School Districts," *American Educational Research Journal*, vol. 10, no. 1, (1973) 5–20.
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11. K. M. Matthews, *A Study of the Impact of Resource Cost Variations on Equality of Educational Opportunity in Georgia* (Athens, GA: The Georgia School Finance Study, 1978), 98.
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14. K. M. Matthews and C. T. Holmes, "Implications of Regional Cost Adjustments," *Educational Administration Quarterly*, 85.
15. Matthews and Holmes, "Implications of Regional Cost Adjustments," *Educational Administration Quarterly*, 76–77.
16. Matthews and Brown, "Determinants of Metropolitan Teachers' Salaries," *Journal of Education Finance*, 286–287.
17. Matthews and Holmes, "Implications of Regional Cost Adjustments," *Educational Administration Quarterly*, 81.
18. See R. Craig Wood, "Reduction in Force," in R. C. Wood, (ed), *Principles of School Business Management*, (Reston, VA: Association of School Business Officials, Inter., 1987), 537–557; J. G. Ward, "Fiscal Trends in Urban School Districts," (Paper presented the American Education Finance Association, Annual Meeting, March 1983), 5.
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20. Matthews and Holmes, "Implications of Regional Cost Adjustments," *Educational Administration Quarterly*, 77–78.
21. G. P. Johnson, *Cost of Education Indices: The State of the Art and Implications for Indiana School Finance Reform*, (Indianapolis, IN: Indiana School Finance Study, 1978), 162.
22. N. Wentzler, "Adjusting for Input Price Differences Across School Districts: A Comparison of Alternative Techniques," *Journal of Education Finance* 6 (Winter 1978), 313.
23. Wentzler, "Adjusting for Input Price Differences Across School Districts," *Journal of Education Finance* 313 and Matthews and Holmes, "Implications of Regional Cost Adjustments," *Educational Administration Quarterly*, 78. Specifically regarding the latter point, Fox found a Pearson Correlation Coefficient of .857 between the Florida Price Level Indices, which was based largely on housing costs and mean family income, see J. N. Fox, "Cost of Living Adjustments: Right Intent, Wrong Technique," *Phi Delta Kappan* 56 (April 1975) 549.
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25. Matthews and Holmes, "Implications of Regional Cost Adjustments to School Finance Plans," *Educational Administration Quarterly*, at 79 citing Johnson, *Cost of Education Indices*: 162 and Wentzler, "Adjusting for Input Price Differences Across School Districts," *Journal of Education Finance* 327.
26. Matthews and Holmes, "District Revenue Potential and Teacher Salaries in Florida Implication," *Journal of Education Finance*, 351.
27. L. Stiefel and R. Berne, "Price Indexes for Teachers in Michigan," in *Selected Papers in School Finance* 1981 (Washington, DC: National Institute of Education), 184.
28. Similar methodologies may be found in a number of studies, this particular methodology is based upon Chambers, "The Development of a Cost of Education Index:," *Journal of Education Finance*, 262–281.
29. The researchers are reporting the methodology and questions how a school district can control for race, age, and sex in the absence of a specific court order regarding such areas as racial integration.

30. It should be noted that school districts, dependent upon type and classification, will have a different market basket of goods and services from which an index is developed.
31. See Chambers, "The Development of a Cost of Education Index:," *Journal of Education Finance*, 270, and K. M. Matthews, *A Study of the Impact of Resource Cost Variations on Equality of Educational Opportunity in Georgia*, (Athens GA: The Georgia School Finance Study, 1978) 92.
32. Matthews and Brown criticized this variable, in particular, as being highly questionable as to even remotely related as to any relationship that could be causal in nature. See Matthews and Brown, "The Development of a Cost of Education Index:," *Journal of Education Finance*, 236.
33. It is of the utmost importance to note that the advocates of such cost of education indices have acknowledged in the research literature that such programs are only intended to compensate school districts for costs outside their control. Further, and more specifically, the researchers have acknowledged that such plans do not take into account the differences in pupil needs among school districts.
34. For a detailed explanation of the Florida methodology see *The Florida Price Level Index 1991*, (Tallahassee, FL: Office of Planning and Budgeting, Revenue and Economic Analysis Unit) 1–12. The explanation of the Florida methodology as contained herein is taken almost verbatim from this document.
35. It should be noted that in the state of Florida school districts are organized on a county basis.
36. For a detailed explanation of the Texas methodology see *Cost of Education Index 1992–92 Biennium*, (Austin, TX: Legislative Education Board, State of Texas) March, 1991, 17–26. The explanation of the Texas methodology as contained herein is taken almost verbatim from this document.