



# LEGISLATIVE BUDGET BOARD

## Overview of Cost of Education Indices

PREPARED BY LEGISLATIVE BUDGET BOARD STAFF

FEBRUARY 2017

---

# **Overview of Cost of Education Indices**

---

---

---

# OVERVIEW OF COST OF EDUCATION INDICES

## WHAT IS THE COST OF EDUCATION INDEX?

The Cost of Education Index (CEI) is an adjustment within the Foundation School Program (FSP), as required by the Texas Education Code, Section 42.102. The intent of the adjustment is to account for regional variations in the price of goods and services beyond the control of school districts. Each public school district in Texas has an assigned CEI value that was determined through a quantitative analysis conducted in 1990. The district's CEI value is a multiplier that increases the district's basic allotment, which is a primary determinant of FSP entitlement. In any given year, the CEI accounts for about 7 percent of the maintenance and operations portion of FSP entitlement. Pursuant to current law, the CEI is estimated to provide \$2.8 billion in FSP entitlement for school districts and charter schools in each fiscal year of the 2018–19 biennium.

## COMPONENTS OF THE TEXAS COST OF EDUCATION INDEX

The Texas CEI is made up of two primary components: the price component and the scale component.

### THE PRICE COMPONENT

The primary portion of the CEI is the price component that applies to the calculation of FSP entitlement for all school districts. The price component of the CEI is the portion that is designed to account for regional variations in the price of goods and services that are beyond the control of school districts. The price component of the CEI was developed in 1990 using a polynomial regression methodology to explain the variation in teacher salaries among school districts. The regression equation included both district characteristics and individual teacher variables and accounted for approximately 85 percent of the variation in salaries among school districts. Among the explanatory variables included in the regression, five were identified as being beyond the control of districts: the average beginning teacher salaries in a contiguous county area; school district location within a county having fewer than 40,000 people; the percentage of low-income students in the school district; the district's community type characteristic (metropolitan, rural, etc.); and the average daily attendance (ADA) of students in the district.

The regression parameters associated with each of the five uncontrolled variables were used to construct an index. Figure 1 shows the matrix used by this process. Starting with a base of 1.0, the district's characteristics are applied to each of the five portions of the matrix and the results are summed. The resulting index value is the CEI price component for the district that was implemented beginning with the 1992–93 biennium.

School district CEI price component index values range from 1.02 to 1.20. In general, districts that had high average beginning teacher salaries, high concentrations of low-income students, and larger student populations in 1990, have larger CEI price component index values. The index values calculated in 1990 remain in effect and are still used to determine FSP entitlement for each district. **Figure 1** shows the CEI price component matrix established in 1990.

### THE SCALE COMPONENT

The scale component of the CEI applies to a limited number of districts, those having between 1,600 and 2,000 students in average daily attendance. The scale component is intended to address the gap created by the difference between the fixed operating cost of a small school district and the limited revenue generated by a smaller population. This phenomenon is known as a diseconomy of scale, and the CEI component designed to address such situations is the scale component.

For the 1990 study, a series of cost functions were constructed using educator salary cost per student arrayed by groupings of district size with controls for grade levels offered, course offerings, and average class size. The analysis determined that costs tended to stabilize for districts with approximately 2,000 students in average daily attendance. The CEI scale component did not replace the Small District Adjustment, which is a multiplier applied to a district's adjusted allotment with an average daily attendance below 1,600 to account for diseconomies of scale. However, because the Small District Adjustment applied only to districts with fewer than 1,600 students and the 1990 CEI analysis identified labor-related operation cost pressure for districts with fewer than 2,000 students, a limited CEI scale component was implemented for districts with 1,600 to 2,000 students.

**FIGURE 1  
COST OF EDUCATION INDEX PRICE COMPONENT MATRIX, 1990**

| AMOUNT ADDED TO<br>BASE OF 1.0 | CONTIGUOUS COUNTY<br>AVERAGE BEGINNING<br>TEACHER SALARY | DISTRICT LOCATED<br>IN COUNTY HAVING<br>POPULATION LESS<br>THAN 40,000 | DISTRICT<br>COMMUNITY TYPE<br>CATEGORY | PERCENTAGE LOW<br>INCOME STUDENTS | NUMBER OF<br>STUDENTS IN<br>AVERAGE DAILY<br>ATTENDANCE |
|--------------------------------|--|--|--|-----------------------------------|---|
| -0.01                          |  |  | Independent Town                       |                                   |   |
| 0.00                           | Below \$17,300   | No   |  | Below 50%                         | 200 to 499  |
| 0.01                           | \$17,300 to \$17,750                                     | Yes  | Rural                                  | 50 to <68%                        | 500 to 999 or <200                                      |
| 0.02                           | \$17,751 to \$18,250                                     |  |  | 68 to <77%                        | 1,000 to 1,599  |
| 0.03                           | \$18,251 to \$18,700                                     |  |  | 77 to <86%                        | 1,600 to 2,399  |
| 0.04                           | \$18,701 to \$19,100                                     |  |  | 86 to <93%                        | 2,400 to 3,599  |
| 0.05                           | \$19,101 to \$19,500                                     |  |  | 93% or more                       | 3,600 to 5,399  |
| 0.06                           | \$19,501 to \$20,000                                     |  |  |                                   | 5,400 to 8,499  |
| 0.07                           | \$20,001 to \$20,450                                     |  |  |                                   | 8,500 or more   |
| 0.08                           | \$20,451 to \$20,850                                     |  |  |                                   |   |
| 0.09                           | \$20,851 or more   |  |  |                                   |   |

SOURCE: Legislative Education Board, March 1991.

The CEI scale component is determined using the following equation, which was developed as a result of the 1990 study:

$$\text{CEI Scale Component} = (1.0 + ((2000 - \text{ADA}) \times 0.00014))$$

While each district's CEI price component is static and does not change from the value determined in 1990, the scale component is calculated each year using the current number of regular program students in average daily attendance. Therefore, it is possible for a district to grow into or out of the CEI scale component. In fiscal year 2018, 27 districts are expected to meet the size criteria for the CEI scale component.

**COMPOSITE CEI VALUE**

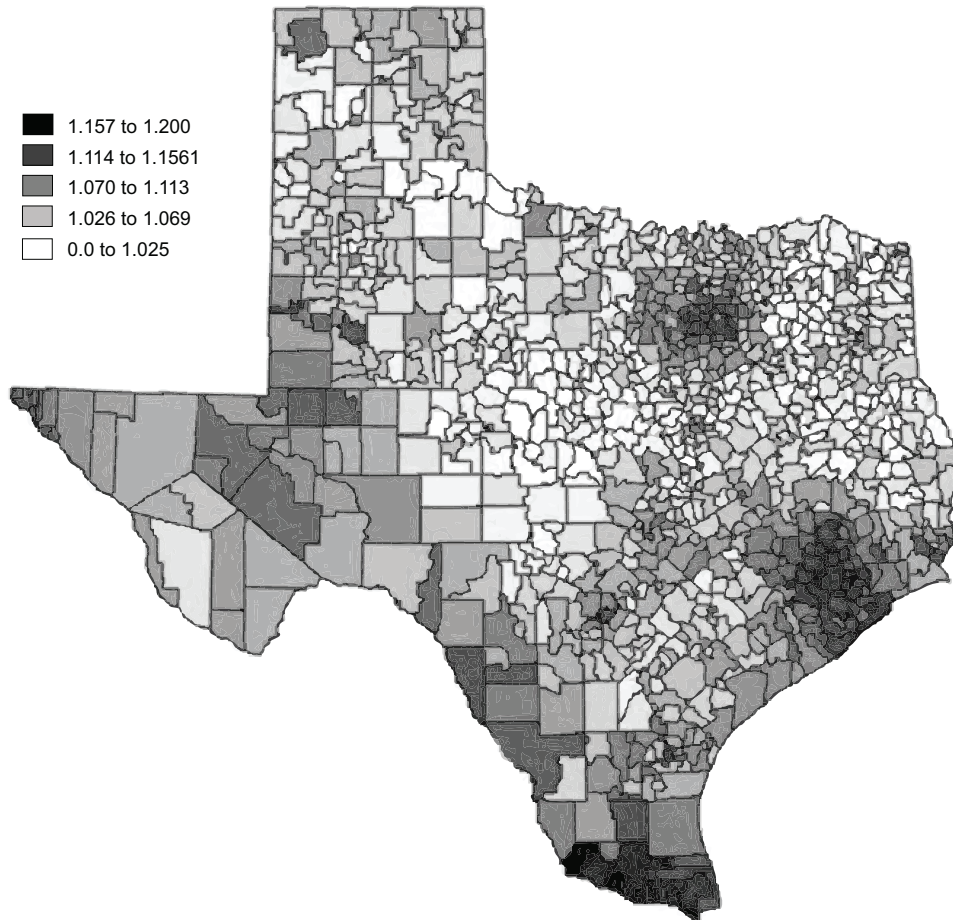
The product of the CEI price and scale components are combined to form each district's CEI composite value. If a district does not meet the size criteria for the CEI scale component, the CEI composite value is equal to the CEI price component. For a district with 1,600 to 2,000 students, the CEI composite value is calculated using the equation:

$$\text{CEI Price Component} \times \text{CEI Scale Component} = \text{Composite CEI Value}$$

Across Texas, the districts with lowest composite CEI value are Memphis ISD, North Hopkins ISD, and San Saba ISD with a CEI of 1.02, and the districts with the highest composite CEI value are La Joya ISD and Roma ISD with a CEI of 1.2.

**Figure 2** shows a map with CEI values by district throughout the state of Texas with districts that have a higher CEI having a darker shade than those with a lower CEI value.

**FIGURE 2**  
**COST OF EDUCATION INDEX FOR TEXAS PUBLIC SCHOOL DISTRICTS, FISCAL YEAR 2017**



SOURCE: Legislative Budget Board.

**HOW THE CEI AFFECTS FSP ENTITLEMENT**

The CEI directly affects the calculation of Tier 1 formula funding, including the allotments for regular education, special education, career and technical education, compensatory education, bilingual education, gifted and talented education, and the public education grant. The CEI is also a direct component in the calculation of weighted average daily attendance (WADA) which is used to calculate Tier 1 hold harmless funding for property tax relief, Tier 2 entitlement, and the level of local revenue subject to recapture under the wealth equalization provisions of the Texas Education Code, Chapter 41.

Each district’s CEI value is a multiplier that is applied to 71 percent of the district’s basic allotment, and the resulting enhanced basic allotment is known as the adjusted basic allotment (ABA). The following formula applies the CEI to the basic allotment:

$$\text{Adjusted Basic Allotment} = \text{District Basic Allotment} \times (((\text{CEI} - 1) \times 0.71) + 1)$$

For a district with a fiscal year 2016 basic allotment equal to \$5,140 and a CEI composite value of 1.08, the formula would produce an ABA equal to \$5,432 as follows:

$$\$5,432 = \$5,140 \times (((1.08 - 1) \times 0.71) + 1)$$

The ABA is further adjusted by the small or mid-sized district adjustment, if applicable, forming the adjusted allotment (AA) which is multiplied by student counts and program weights to produce the Tier 1 allotments listed above.

The calculation of WADA includes 50 percent of the Tier 1 effect of the CEI.

FSP entitlement for charter schools is also affected by the CEI since current law provides for charter funding to be calculated using averages of the funding elements described above.

The portion of FSP entitlement for maintenance and operations attributable to the application of the CEI varies by district, ranging from about 1 percent among districts with lower CEI values to more than 10 percent among districts with the highest CEI values. Although the percent of entitlement attributable to the application of the CEI mainly depends upon the district's CEI value, the interaction of the CEI value with other district characteristics can increase or decrease this proportion.

On a statewide basis, the CEI is projected to provide an estimated \$2.8 billion in FSP entitlement for school districts and charter schools in each fiscal year of the 2018–19 biennium. This amount represents approximately 7.0 percent of total maintenance and operations entitlement.

## **METHODOLOGIES USED BY OTHER STATES TO CALCULATE CEI**

For the purpose of this review, three main types of methodologies used to calculate CEIs in various states were considered: competitive wage index (CWI), market-basket index, and hedonic modeling. Dr. Lori Taylor of Texas A&M University has submitted numerous studies on regional cost indices, which provided most of the basis for the background information on the competitive wage index, the market-basket approach, and the hedonic model.

### **COMPETITIVE WAGE INDEX (CWI)**

A CWI measures the extent to which the demographically and occupationally adjusted earnings of non-educators differ from one labor market to another. In a CWI, a region's non-educator salaries are used as a proxy for differential educator personnel costs, since districts must recruit in the same employment conditions as non-educational employers.

The primary advantages of a CWI include: (1) providing a measure of the cost of education that is outside the control of the local school district, clearly distinguishing high-spending school districts from high-cost ones; (2) since the CWI is demographically and occupationally-adjusted, it is unlikely that the CWI will be artificially high because the education labor force is more experienced; and (3) unlike a market-

basket approach, to the extent that local salaries compensate for the desirability in living conditions of a labor market, the CWI provides a more complete picture by reflecting regional differences in amenities, such as climate or access to health care, as well as the cost of goods and services.

The principle disadvantages of a CWI include: (1) if education or experience levels of the non-educator population vary significantly from the educator population in a region, then the CWI could be skewed; (2) a CWI only compares regions and, therefore, cannot detect variations between districts within a region; and (3) a CWI depends on a mobile labor force that can move into or out of a particular location. Examples of states that utilize a CWI are Florida, Massachusetts, Missouri, New Jersey, New York, and Virginia.

Please see Appendix A for a discussion of a study that presents a Competitive Wage Index for the state of Washington.

### **MARKET-BASKET APPROACH**

The second personnel cost measure reviewed was a “market-basket” approach. This approach uses indices intended to measure the cost of living within a geographic region by comparing the costs of a certain market-basket of goods and services in each analyzed geographic region. This avoids a feedback loop of the school district salaries impacting the area's non-education salaries.

The primary advantages of a market-basket approach include: (1) it is straightforward and easily understandable; (2) it is easily updated; and (3) all costs included are outside the control of school districts so there is no danger of the information being skewed by high-spending school districts.

The primary disadvantages include: (1) the difficulty of accurately measuring the same quality of goods and services across regions; (2) the possibility that some school district personnel may live in a different region than the school district in which they work; and (3) the market basket approach assumes individuals across the state purchase the same “basket” of goods and services across all regions of the state. An example of state that use a market-basket approach is Colorado.

Please see Appendix B for a discussion of a study that presents a Market Basket Approach for the state of Colorado.

### **HEDONIC MODEL**

The third approach uses a statistical analysis called hedonic modeling. A hedonic approach attempts to quantify

attributes that educators find attractive or repelling about a given career opportunity. A hedonic model uses regression analysis to determine whether the variation in teacher salaries is attributable to teacher characteristics, working conditions, or location.

A hedonic model determines how much each school district must pay equivalent personnel relative to other districts. The hedonic model does this by determining whether certain explanatory factors are uncontrollable or discretionary, and holding those discretionary variables constant. Examples of discretionary variables include teacher education, teaching assignments, and the length of school year, while uncontrollable variables include the cost of living, geography, and student demographics.

Advantages of using a hedonic model include: (1) in determining the model, teacher salary data is used, making it more directly applicable to school districts; and (2) the model controls for differences in personnel among school districts by using regression analysis.

Disadvantages of using a hedonic model include: (1) the model is subject to human error because the researcher must make a judgement call on which cost drivers are uncontrollable costs; and (2) the cost indices use school district expenditure data, which risks confusing high expenditure districts with high cost districts. Examples of states that use a hedonic model are Texas, Alaska, Maine, Maryland, and Wyoming (which uses a combination of a hedonic model and a market basket approach).

Please see Appendix C for a discussion of a study that uses a hedonic model for the state of Wyoming.

## **CONSIDERATIONS IN UPDATING THE TEXAS COST OF EDUCATION INDEX**

In 1999, the Texas Legislature engaged the University of Texas at Austin to conduct a study that included an update of the existing CEI price component as well as proposals for alternative indices based on different methodologies. In 2004, the Joint Committee on Public School Finance engaged a principal researcher from the 1999 study, Dr. Lori Taylor, to update the alternative indices. However, neither update of the CEI nor the alternative indices were implemented.

A number of significant issues are involved in any consideration of modification of the CEI. Given the estimated \$2.8 billion in funding provided via the index, and

the complexity of its relationship to the rest of the Foundation School Program, changes to the CEI have equally complex ramifications. Parameters and questions that would need to be addressed in a framework of CEI modification include those related to funding, elements, and structure. Items that would need to be addressed include but are not limited to:

A primary question is one of updating the CEI in its current structure versus reconstructing the index overall. Methodological and structural faults with the current CEI create obstacles to simply updating it with current data. Alternatively, a fundamental reconstruction of the CEI, which would require several significant methodological decisions, may yield a more comprehensive outcome. Decision points for the Legislature include deciding on the type of CEI to use, determining the relevant data to include, and specifying the entity responsible for the update and identifying the necessary resources.

Any modification to the Foundation School Program funding elements would create a redistribution of entitlement funding. The CEI is no different; updating the CEI is likely to result in redistribution, with some districts receiving more funding and some receiving less. The scale and scope of redistribution would be largely dependent on, in turn, the nature of modifications made to the Index. Modifications in the school finance system could be implemented to ease the fiscal impact to districts, but such a transition mechanism could have significant fiscal implications. A final consideration would be whether the Legislature would choose at the onset of a new CEI to establish a process for a regular updating of the CEI, including how often it is updated and who is responsible for the update.



**APPENDIX A****COMPETITIVE WAGE INDEX – WASHINGTON**

Washington State conducted a 2012 CWI study authored by Dr. Lori Taylor of Texas A&M University. The study utilized a CWI published by the National Center for Education Statistics (NCES) that was designed to capture regional wage differences for college graduates who are not educators and updated it using data from the 2008, 2009, and 2010 American Community Survey (ACS), which is conducted annually by the U.S. Census Bureau. The study purposefully used the ACS because it is updated annually, which would make it possible to update the CWI on an as needed basis.

The study used regression analysis of individual earnings, excluding certain populations, including: workers with incomplete data; those without a high school diploma; anybody who was employed in elementary or secondary education; self-employed workers; individuals who worked less than half-time or more than 90 hours per week; workers younger than age 18 or older than age 80; or workers employed outside the United States. In total, the study considered a sample of 2,443,000 employed individuals from 447 occupations and 259 industries. The resulting regression analysis was applied to 14 Washington labor markets to determine a local wage prediction. The local wage prediction of each district was then compared to a statewide average.

According to the study's findings, base salary allocations for school districts in Seattle should be 9 percent higher than the state average, and the base salary allocations for school districts in nonmetropolitan eastern Washington should be 14 percent lower than the state average to equalize resource needs.

The study compared its results to other measures as a check for reasonableness, including the regional differences in the cost of housing, and two separate analyses on regional differences in the cost of labor and found similar trends.

**APPENDIX B**

**MARKET BASKET APPROACH – COLORADO**

The 2015 Colorado School District Cost of Living Analysis, conducted by Pacey Economics, compares the cost of living in different regions of Colorado for a three-person family with an annual income of \$51,900. The annual income of \$51,900 was used because it was determined to be the average salary of a Colorado teacher with a Bachelor’s degree and 10 or more years of teaching experience. The authors used a separate study, *The Consumer Expenditure Survey*, conducted by the U.S. Bureau of Labor Statistics, to determine the typical expenditures of a similar household to develop the market basket of goods and services used to compare the different regions of Colorado. **Figure B1** provides the percentages of major spending categories utilized to measure the cost of living. Once the expenditure data was collected, the relative cost differences were calculated, and the school districts’ cost of living were ranked.

**FIGURE B1  
SPECIFIC MAJOR CATEGORY EXPENDITURE WEIGHTS  
UTILIZED IN MEASURING COST OF LIVING, AS MEASURED  
IN PERCENTAGE OF INCOME, 2015**

| EXPENDITURE CATEGORY                | PERCENT OF INCOME |
|-------------------------------------|-------------------|
| Food                                | 13.67%            |
| Alcoholic Beverages                 | 0.60%             |
| Housing                             | 31.55%            |
| Apparel                             | 3.21%             |
| Transportation                      | 17.72%            |
| Healthcare                          | 7.74%             |
| Entertainment                       | 4.72%             |
| Personal Care Products and Services | 1.13%             |
| Tobacco                             | 0.87%             |
| Personal Taxes                      | 5.12%             |
| Other                               | 13.66%            |
| <b>TOTAL</b>                        | <b>100%</b>       |

SOURCE: Pacey Economics. (2015). 2015 Colorado School District Cost of Living Analysis.

**APPENDIX C**

**HEDONIC MODEL – WYOMING**

The Wyoming Regional Cost Adjustment (RCA) is used in Wyoming’s school funding model. For any given district within Wyoming, the RCA is the higher of Wyoming Cost of Living Index (a market-basket approach), the Wyoming Hedonic Wage Index (HWI), or 100. The focus of this appendix is on the HWI. The HWI was developed in 2005 and updated in 2010.

The study included 3,896 full-time classroom teachers who taught in Wyoming for three consecutive school years (2003, 2004, and 2005 school years). The analysis focused on teacher base salaries, but included average additional earnings for teachers as well for opportunities available to teachers such as coaching. Examples of discretionary variables accounted for included teacher degree level, total years of experience, and differences in annual contract days. **Figure C1** provides a list of discretionary and uncontrollable factors considered.

The final hedonic model incorporates the effects of the above through regression analysis to determine the regional cost differences of teacher salaries in Wyoming.

**FIGURE C1  
DISCRETIONARY AND UNCONTROLLABLE FACTORS  
CONSIDERED IN WYOMING’S HEDONIC WAGE INDEX  
2005**

| <b>DISCRETIONARY FACTORS</b>           | <b>UNCONTROLLABLE CONDITIONS</b>                   |
|--|--|
| Teacher Degree Level                   | <b>School District Conditions</b>                  |
| Teacher Experience                     | School Poverty                                     |
| Teacher Assignment (Full Time Teacher) | School LEP/ELL                                     |
| Grade Level (Secondary/Elementary)     | School Unduplicated at Risk County                 |
| Teacher Race                           | School Mobility Share                              |
| Teacher Gender                         | School Disability Share                            |
|  | District Average Additional Earnings Opportunities |
|  | <b>Geographic/Location Measures</b>                |
|  | Area Density                                       |
|  | Distance to Yellowstone                            |
|  | Distance to 15k City                               |
|  | Distance to 50k City                               |
|  | Regional Costs of Living (WCLI)                    |

SOURCE: An Evidence-Based Approach to Recalibrating Wyoming’s Block Grant School Funding Formula, Prepared for the Wyoming Legislative Select Committee on Recalibration, prepared by Lawrence O. Picus and Associates, 2005.

**BIBLIOGRAPHY**

Lawrence O. Picus and Associates. (2005). An Evidence-Based Approach to Recalibrating Wyoming's Block Grant School Funding Formula, Prepared for the Wyoming Legislative Select Committee on Recalibration.

Pacey Economics. (2015). 2015 Colorado School District Cost of Living Analysis.

Taylor, Lori. (2011). Updating the Wyoming Hedonic Wage Index.

Taylor, Lori. (2012). An ACS-Based Regional Cost Adjustment for the State of Washington.

Taylor, Lori. (2015). Options for Updating Wyoming's Regional Cost Adjustment.