MANAGEMENT ANALYSIS & PLANNING, INC.

The Differential Impact of the TACIR and CBER Equalization Formulas on Tennessee's K-12 Public Education Finance System

A Report Commissioned by
Tennessee School Systems for Equity

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July 8, 2008

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Executive Summary

Purpose

This research study was commissioned by Tennessee School Systems for Equity (TSSE) to examine Tennessee's K-12 public education finance system, the Basic Education Program Funding Model, version 2.0 (BEP 2.0). The study endeavored to answer the following questions:

- How are the Tennessee Advisory Commission on Intergovernmental Relations (TACIR) and Center for Business & Economic Research, University of Tennessee (CBER) equalization formulas calculated?
- What are the effects of a full phase-in of the CBER equalization formula?
- What is driving the effects of a full phase-in of the CBER equalization formula?
- What are plausible policy options to address these effects?

Overview of Analyses

To answer the research questions, the following analyses were undertaken:

- Audit and reconstruction of BEP 2.0, and the TACIR and CBER equalization formulas;
- Simulations of BEP 2.0, including estimation of districts' respective total per-pupil expenditures under 101 unique scenarios, starting with a 100% TACIR/0% CBER equalization scenario and moving at 1% increments to a 0% TACIR/100% CBER equalization scenario;
- Examination of the results from these simulations to determine the differential effects of the TACIR and CBER equalization formulas on districts' respective local fiscal burdens; and
- Identification of the drivers of these effects within the distinct calculations of the TACIR and CBER equalization formulas, respectively.

Overview of Data Sources

Data for this study were either drawn from state and state-affiliated websites or furnished by representatives of the state, TACIR, and CBER.

Overview of Findings

Evidence from these analyses suggested the following regarding a hypothetical full phase-in of the CBER equalization formula:

- Approximately three-quarters of all districts would witness an increase in their respective fiscal burdens. A disproportionately larger number of these districts would be TSSE

members. Moreover, the negative impact on these TSSE districts would be disproportionately greater than the negative impact on non-TSSE districts.

- Approximately one-quarter of all districts would witness a decrease in their respective fiscal burdens. A disproportionately smaller number of these districts would be TSSE members. Moreover, the positive impact on these TSSE districts would be disproportionately weaker than the positive impact on non-TSSE districts.
- There is consistent evidence that districts' local fiscal burdens, generally speaking, would grow more uniform under CBER equalization, indicating a relatively greater level of fiscal neutrality. That is, their calculation would be less sensitive to county-level economic indicators, such as per-pupil property and sales wealth. However, in the aggregate, this increased level of fiscal neutrality would not necessarily be detrimental. Districts' prescribed fiscal responsibility would continue to exhibit a strong relationship to county-level economic conditions under the 100% CBER equalization scenario.
- The dynamic by which individual districts would be negatively or positively impacted by a full phase-in of the CBER equalization formula is neither clean nor uniform, reflecting the difficulty inherent in devising a single formula funding scheme for a state as heterogeneous as Tennessee. However, the districts most negatively impacted (of which all but three are members of TSSE) appear singularly predisposed to poor outcomes. Most of these poor outcomes could be attributed to the lack in the CBER equalization formula of controls for per capita income and the ratio of residential and farm property to total property, and to the related and disproportionately greater emphasis in this formula on property wealth.

Policy Options

These findings suggested the following policy options for TSSE's consideration:

- Identification of a differential treatment approach to district types under the CBER formula through a weighting and/or grouping scheme;
- Incorporation of additional variable(s) into the CBER equalization formula to account, in whole or part, for the unique variables of the TACIR formula;
- Incorporation of a more refined collar on districts' respective increases in local responsibility;
- Identification of an alternative, but equally transparent county-level model; and/or
- Identification of a system-level equalization formula, as opposed to the present county-level models, given both districts' and counties' operational and economic idiosyncrasies.

Purpose

This research study was commissioned by Tennessee School Systems for Equity (TSSE) to examine Tennessee's K-12 public education finance system, the Basic Education Program Funding Model, version 2.0 (BEP 2.0). The study endeavored to answer the following questions:

- How are the Tennessee Advisory Commission on Intergovernmental Relations (TACIR) and Center for Business & Economic Research, University of Tennessee (CBER) equalization formulas calculated?

- What are the effects of a full phase-in of the CBER equalization formula?

- What is driving the effects of a full phase-in of the CBER equalization formula?

- What are plausible policy options to address these effects?

Analyses

To answer the research questions, a five-pronged analytical approach was employed.

The first prong involved the audit and reconstruction of the following components of Tennessee's K12 public education finance system for fiscal year 2007-2008 using publicly-available and state-supplied data, information, and models:

- Basic Education Program Funding Model, version 2.0 (BEP 2.0);

- Tennessee Advisory Commission on Intergovernmental Relations (TACIR) equalization formula; and

- Center for Business & Economic Research, University of Tennessee (CBER) equalization formula and model.

The second prong involved conducting and analyzing simulations of the state's finance system. Specifically, districts' respective total per-pupil expenditures were estimated under 101 unique scenarios, starting with a 100% TACIR/0% CBER equalization scenario and moving at 1% increments to a 0% TACIR/100% CBER equalization scenario. District-level results from these simulations were analyzed in the aggregate, by TSSE affiliation, and on a case-by-case basis to determine the effects of a full phase-in of the CBER equalization formula.

Presently, the 50% TACIR/50% CBER equalization scenario is the status quo, with a collar mechanism for each county that limits the contribution of the CBER formula's fiscal capacity index to 130% of the TACIR formula's fiscal capacity index, in the event the CBER fiscal capacity index is at least 30% greater than the TACIR fiscal capacity index. For instance, if fictional MAP County's fiscal index capacity index was 1.00% and 2.00% under the TACIR and CBER equalization formulas, respectively, then its calculated fiscal index capacity under BEP

2.0 would be 1.15%, or [(1.00%)*50%] + [((1.00%+(1.00%*30%))*50%], given that CBER's index of 2.00% is more than 30% greater than TACIR's index of 1.00%. In order to make transparent the effects of a full phase-in of the CBER equalization formula, however, no simulated scenario incorporated this collar.

The third prong involved examining the equity implications of these identified effects. Three distinct equity-related analyses were undertaken. Specifically, the estimated change in local fiscal responsibility resulting from a full phase-in of the CBER equalization formula was examined:

- On a district-by-district basis to confirm the effects identified in the second prong of analysis, and to the determine whether the largest of these changes would represent relatively inequitable departures from the norm change;

- Across all districts to determine whether districts' per-pupil fiscal burdens would become more or less uniform; and

- Across all districts to determine whether districts' prescribed fiscal responsibilities were more or less responsive to county-level economic conditions under CBER equalization than under TACIR equalization, and to ascertain whether the magnitude of any identified difference was indicative of a detrimental level of fiscal neutrality.

The fourth, and final, prong involved isolating the drivers of the identified effects of a full phase-in of the CBER equalization formula. As means to isolate these drivers within the calculation of the TACIR and CBER equalization formulas, districts were analyzed both in groups based on a series of relevant attributes and on a case-by-case basis.

Districts were grouped according to, or in combinations of, the following attributes: TSSE affiliation; change in percentage share of all district's fiscal burdens in the aggregate; and district type (i.e., sole district within a county; county district in which one or more special school and/or city districts also operate; city district; or a special school district).

Data Sources

Data for this study were either drawn from state and state-affiliated websites or furnished by representatives of the state, TACIR, and CBER.

County economic and district operational data were drawn from the following sites: U.S. Census Bureau, Housing and Household Economic Statistics Division, Small Area Estimates Branch; U.S. Department of Commerce, Bureau of Economic Analysis; Tennessee Comptroller of the Treasury, Division of Property Assessments; Tennessee Board of Equalization, Tax Aggregate Report of Tennessee; Tennessee Department of Revenue; Tennessee Department of Education, Tennessee Schools Report Cards; University of Tennessee, Center for Business and Economic Research; and Tennessee Advisory Commission on Intergovernmental Relations, Fiscal Capacity.

Representatives of the state, TACIR, and CBER furnished 26 Excel- and PDF-based data and informational sources. These data and informational sources included: the BEP 2.0 models for fiscal years 2005-2006 to 2007-2008; the TACIR formula for fiscal year 2007-2008, and all county and district data sources from which the formula drew; and the CBER formula's variables and assumptions.

Results and Findings

How are the TACIR and CBER equalization formulas calculated?

An initial attempt was made to audit and reconstruct Tennessee's K-12 public education finance system for fiscal year 2007-2008 using publicly-available data, information, and models related to BEP 2.0, and the TACIR and CBER equalization formulas. It was determined, however, that the state's finance system cannot be reconstructed on publicly-available resources, alone. There are several critical, but unpublished data sources and assumptions that prevent an appropriately comprehensive reconstruction. Subsequent to this finding, cooperation from representatives of the state, TACIR, and CBER enabled completion of the system's audit and reconstruction.

An overview of the BEP 2.0 model and the TACIR and CBER equalization formulas is provided below. A brief discussion of the study's simulations of BEP 2.0 in fiscal year 2007-2008 follows thereafter.

BEP 2.0

BEP 2.0 comprises the state's system in its entirety, including the TACIR and CBER equalization formulas. For each of the state's 136 districts, and by proxy its 95 counties, the BEP 2.0 model estimates aggregate educational expenditures in three principal categories: classroom instructional positions; all other classroom support; and capital, maintenance and operations, transportation, and system support.

These categorical expenditures are derived from a lengthy series of assumptions, including those related to: inflation factors; benefit rates; staffing; school building construction; salaries; instructional equipment and materials; technology infrastructure; travel costs; free and reduced price meals; substitute teachers; alternative schools; early childhood programs; maintenance and operations, and custodial services; average daily membership; special student populations; and so forth.

Districts' derived categorical expenditures are then aggregated to the county level, totaled across all counties, and adjusted by the appropriate local responsibility factor. Pre-equalization, the state is responsible for 70%, 75%, and 50% of districts' classroom instructional, other classroom support, and capital, maintenance and operations, transportation, and system support expenditures, respectively. School districts (and by proxy the counties in which they reside) are responsible for the remaining 30%, 25%, and 50%, respectively.

Within each expenditure category, the product of this calculation and subsequent adjustment is the statewide total of categorical expenditures for which counties (and their attendant districts)

are responsible in the aggregate. This statewide total is then divided by each county's total categorical expenditures and equalized, i.e. multiplied by that county's predetermined fiscal capacity index. The resultant value is each county's percentage share of total categorical expenditures, which is then applied to the district (or districts) designated as operating within its boundaries.

For example, assume that the state's aggregate prescribed expenditures for classroom instructional positions total $1B, and that fictional MAP County's total share of those expenditures is $10M, or 1%. Assume also that MAP County's predetermined fiscal capacity index is 1.10%. Under BEP 2.0, then, MAP County's local responsibility would be 33%, or the product of the following calculation: [($1B/$10M)*(30%)]*1.10%].

Consequently, MAP County's equalized local responsibility for classroom instructional positions would be 33%, representing an increase of three percentage points over the 30% benchmark. All three districts operating within MAP County – namely school districts M, A, and P – would be responsible for 33% of their respective total expenditures within this particular expenditure category.

The critical element in these calculations is the county's fiscal capacity index, which is pre-determined under the TACIR and CBER equalization formulas, respectively. Presently, the 50% TACIR/50% CBER equalization scenario is the status quo, with a collar mechanism for each county that limits the contribution of the CBER formula's fiscal capacity index to 130% of the TACIR formula's fiscal capacity index, in the event the CBER fiscal capacity index is at least 30% greater than the TACIR fiscal capacity index.

A description of these equalization formulas follows below.

TACIR

The TACIR equalization formula is a county-level model that employs multiple regression techniques to estimate counties' respective fiscal capacities. Specifically, the TACIR model estimates a linear relationship between counties' historical revenue per pupil and a series of county-level economic indicators, including: taxable property per pupil; taxable sales per pupil; per capita personal income; ratio of residential and farm value to total taxable property; and ratio of average daily membership to population.

In essence, this regression model estimates the weighted average influence of each economic indicator on counties' historical revenue generation. These estimates (as well as the model's intercept) are then used to predict each county's fiscal capacity per pupil, and, when multiplied by county-level ADM, each county's fiscal capacity in the aggregate. A county's fiscal capacity index is simply that county's percentage share of all districts' fiscal capacities in the aggregate.

TACIR's regression model employs six total variables: one dependent variable (historical revenue per pupil) and five explanatory variables (the county-level economic indicators). Calculation of each TACIR variable is detailed below for fiscal year 2007-2008.

Local revenue per pupil: County local revenue per pupil for fiscal year 2007-2008 was calculated as each district's average local revenue, appropriations, and operating transfers over calendar years 2004-2006 divided by its average ADM over fiscal years 2004-2006, summed to the county level.

With respect to the sources of local revenue and appropriations, all districts shared in other non-tax revenues and in their respective county's total property taxes, local option sales tax, and total other taxes. Other non-tax revenues were defined as revenues from investment income and licenses and permits, including those related to marriage, cable TV franchises, and other sources. Total property taxes were defined as revenues from: current property taxes; trustees collection; circuit clerk and clerk and master fees; interest and penalty; pick-up taxes; payments in lieu of taxes (TVA); payments in lieu of taxes (utilities); and payments in lieu of taxes (other). Total other taxes were defined as revenues from: hotel/motel tax; local amusement tax; wheel tax; business tax; mineral severance tax; other local option taxes; bank excise tax; wholesale beer tax; coal severance tax; interstate telecommunications tax; and other statutory local taxes.

County districts, special school districts, and city districts also tapped (to varying degrees) additional unshared revenues from total property taxes, local option sales taxes, and city general fund transfers.

Taxable property per pupil: County taxable property per pupil for fiscal year 2007-2008 was calculated as the sum of each county's average tax equivalent payments (TEPS) over calendar years 1993-1995 and average total equalized assessed valuation of property subject to taxation (both local and public utility) over calendar years 2003-2005 divided by its average ADM over fiscal years 2004-2006.

Taxable sales per pupil: County taxable sales per pupil for fiscal year 2007-2008 was calculated as each county's average local sales tax bases over calendar years 2004-2006 divided by its average ADM over fiscal years 2004-2006.

Per capita personal income: County per capita personal income for fiscal year 2007-2008 was calculated as each county's average per capita income over calendar years 2002-2004.

Ratio of residential and farm value to total taxable property: County ratio of residential and farm value to total taxable property was calculated as each county's average equalized assessed valuation of both residential and farm property averaged separately over calendar years 2003-2005, summed, and then divided by the county's average total taxable value of all property over calendar years 2003-2005.

CBER

Under the CBER equalization formula, each county's fiscal capacity is the sum of: its equalized property tax base (including the value of payments in lieu of taxes based on agreements with industrial development boards) multiplied by the statewide property tax rate for education; and its local sales tax base multiplied by the statewide sales tax rate for education.

With respect to fiscal year 2007-2007, each county's property tax base was calculated as the average of the equalized sum of its total real property, total personal property, and public utility assessment over calendar years 2004-2006, plus the product of calendar year 2006 industrial development board payments and a 0.38 multiplier (as means to approximate a three-year average of these payments). Each county's resultant property tax base was then multiplied by a statewide average property tax rate for education, or 0.013043.

Each county's sales tax base was calculated as the average of total county sales over calendar years 2004-2006. Total county sales comprised sales of, or from: building materials; general merchandise; food stores; autos, boats, and aircrafts; service stations; apparel and accessories; furniture and home décor; eating and drinking; and other retail. Each county's resultant sales tax base was then multiplied by a statewide sales tax rate for education, or 0.015669.

Each county's resultant property and sales tax capacities were summed to form its respective fiscal capacity. Similar to TACIR, each county's fiscal capacity index was calculated as its percentage share of all districts' fiscal capacities in the aggregate.

Simulations

Simulations were conducted on the state's audited and reconstructed fiscal year 2007-2008 finance model under 101 unique scenarios, starting with a 100% TACIR/0% CBER equalization scenario and moving at 1% increments to a 0% TACIR/100% CBER equalization scenario. In order to make transparent the effects of a full phase-in of the CBER equalization formula, no simulated scenario incorporated the 30% collar presently in use. This study primarily reports and contrasts results from simulations of the 100% TACIR and 100% CBER equalization scenarios.

What are the effects of a full phase-in of the CBER equalization formula?

Appendix 01 details the impact of a full phase-in of the CBER equalization formula on a district-by-district basis. Results are presented for three equalization scenarios: 100% TACIR; 50% TACIR/50% CBER; and 100% CBER. Also presented is a comparison of results between the 100% TACIR and CBER equalization scenarios. Districts are sorted in alphabetic order.

Appendix 02 contains the same information however districts are sorted by the magnitude of the phase-in's impact, from most negative (largest increase in local fiscal burden) to most positive (largest decrease in local fiscal burden) in descending order.

Effects in the Aggregate

In the aggregate, the BEP 2.0 model prescribed approximately $5.216B in funding for K12 public education in Tennessee for fiscal year 2007-2008.

Under a hypothetical 100% TACIR/0% CBER equalization scenario:

- $3.420B (or 65.6%) of this funding would be the responsibility of the state, and $1.795B (or 34.4%) the responsibility of districts.

- The average school district would spend a total of $38.356M, and the median school district $18.992M.

- 34.4% of the average school district's total spending would be the responsibility of the local system, versus 19.9% in the median school district.

Under a hypothetical 0% TACIR/100% CBER equalization scenario:

- The state's responsibility would be $1.795B (65.7%), while districts' responsibility would be $1.790B (34.3%), representing a decrease in the aggregate local fiscal burden of $5.374M (or 0.30%) relative to 100% TACIR equalization.

- The average school district would spend a total of $38.356M, and the median school district $18.992M.

- 34.4% of the average school district's total spending would be the responsibility of the local system, versus 23.2% in the median school district.

Under both equalization scenarios, the substantial difference between the mean and median expenditure levels ($38.356M versus $18.992M in both instances) would be a function of the disparity in prescribed spending between the smallest and largest school districts in the state.

- Twenty districts each would spend more than $50M on education, and account in the aggregate for 60.6% of all spending.

- In comparison, the smallest 60 districts would spend $8.741M on average, and account in the aggregate for 10.2% of all spending.

As equalization moves from 100% TACIR to 100% CBER, the relative increase in the median district's local responsibility from 19.2% to 23.2% would reflect both an estimated decrease in the fiscal burden among the state's largest districts, and an estimated increase in the fiscal burden among the state's smallest districts.

With respect to the positive effects of a full phase-in of the CBER equalization formula:

- An estimated 33 districts would witness a decrease in their respective fiscal burdens; and these decreases would total $93.492M in the aggregate.

- Five districts among the top 10 largest districts in the state would account for $85.101M (or 91.0%) of this aggregate decrease.

- On average, the local fiscal burden of these five districts would decrease by 11.9%, versus an average increase in local fiscal burden across all districts of 16.4%.

With respect to the negative effects of a full phase-in of the CBER equalization formula:

- An estimated 103 districts would witness an increase in their respective fiscal burdens; and these increases would total $88.118M in the aggregate.

- The remaining five districts among the top ten largest districts in the state would account for only $4.795M (or 5.4%) of this aggregate increase.

- Forty-nine of the 60 smallest districts in the state would account for $19.423M (or 21.8%) of this aggregate increase, despite representing only 8.6% of spending in the state.

- On average, the local fiscal burden of these 49 districts would increase by 30.3%, versus an average increase in local fiscal burden across all districts of 16.4%.

Effects on TSSE Membership

Under a hypothetical transition from the 100% TACIR to 100% CBER equalization scenario:

- 103 (or 75.7%) of the state's 136 school districts would witness an increase in their respective fiscal burdens.

- These increases would total $88.118M in the aggregate (or $855.115K on average).

- These districts' respective fiscal burdens as a percentage of all districts' fiscal burdens in the aggregate would increase, on average, by 24.1%.

- Under the 100% CBER equalization scenario, these 103 districts would represent 59.7% of the total prescribed education funding in the state.

- Of these 103 districts, 65 (or 63.1%) would: belong TSSE; account for 83.3% of TSSE's 78 district membership; and represent 22.6% of the total prescribed education funding in the state, 25.5% of the state's spending, and 17.0% of local systems' spending.

- These 65 TSSE districts' respective fiscal burdens as a percentage of all districts' fiscal burdens in the aggregate would increase, on average, by 32.4%, which is commensurate with their average increase in local fiscal burden of 32.0%.

- In comparison, the 38 non-TSSE districts' respective fiscal burdens as a percentage of all districts' fiscal burdens in the aggregate would increase, on average, by 10.6%, which is commensurate with their average increase in local fiscal burden of 10.2%.

In contrast:

- Thirty-three (or 24.3%) of the state's 136 school districts would witness a decrease in their respective fiscal burdens totaling $93.492M in the aggregate (or $2.833M on average).

- These districts' respective fiscal burdens as a percentage of all districts' fiscal burdens in the aggregate would decrease, on average, by 7.3%.

- Of these 33 districts, 13 (or 39.4%) would: belong to TSSE; account for 16.7% of TSSE's 78 district membership; and represent 3.3% of the total prescribed education funding in the state, 2.1% of the state's spending, and 4.0% of local systems' spending.

- These 13 TSSE districts' respective fiscal burdens as a percentage of all districts' fiscal burdens in the aggregate would decrease, on average, by 5.2%, which is commensurate with their average decrease in local fiscal burden of 5.5%.

- In comparison, the 20 non-TSSE districts' respective fiscal burdens as a percentage of all districts' fiscal burdens in the aggregate would decrease, on average, by 8.3%, which is commensurate with their average decrease in local fiscal burden of 8.5%.

Taken together, these findings indicate that while a full phase-in of the CBER equalization formula would slightly lower districts' fiscal responsibility in the aggregate:

- Approximately three-quarters of all districts would witness an increase in their respective fiscal burdens;

- A disproportionately greater number of these districts would be TSSE members; and

- The negative impact on these TSSE districts would be disproportionately greater than the negative impact on non-TSSE districts.

Furthermore, and with regard to those districts benefiting from a full phase-in of the CBER equalization formula:

- Approximately one-quarter of all districts would witness a decrease in their respective fiscal burdens;

- A disproportionately lesser number of these districts would be TSSE members; and

- The positive impact on these TSSE districts would be disproportionately weaker than the positive impact on non-TSSE districts.

Equity Implications of Effects

Three distinct equity analyses were conducted on results from the simulated full phase-in of the CBER equalization formula.

The first analysis examined within-district variation in fiscal responsibility. Specifically, the analysis examined on a district-by-district basis whether there would be discernible disparity between a district's fiscal responsibility calculated under 100% TACIR equalization and that district's fiscal responsibility calculated under 100% CBER equalization. The objective was two-fold: to confirm the estimated changes in districts' respective fiscal burdens from previous analyses; and to ascertain whether these changes were relatively inequitable. That is, would the largest increases and decreases in district fiscal responsibility represent relatively inequitable departures from the norm change?

The second analysis examined variation in fiscal responsibility across districts. Specifically, the analysis examined whether there would be discernible disparity within the distribution of all districts' fiscal burdens when calculated under a series of scenarios beginning with 100% TACIR equalization and ending in 100% CBER equalization. The objective was to confirm whether variation in districts' respective fiscal burdens would exhibit less equity, more equity, or relatively no change in the transition from a 100% TACIR to 100% CBER equalization scenario. That is, would districts' respective per-pupil fiscal responsibility become more or less uniform over a full phase-in of the CBER equalization formula?

The third analysis re-examined this variation in fiscal responsibility across districts. Specifically, the analysis examined whether the disparity identified between the distribution of all districts' fiscal burdens in the 100% TACIR and 100% CBER equalization scenarios, respectively, would be statistically significant, substantively significant, and indicative of inequality. The objective was twofold: to determine where districts' prescribed fiscal burdens were more or less responsive to county-level economic conditions under CBER equalization than under TACIR; and to ascertain whether the magnitude of any differences identified were indicative of detrimental levels of fiscal neutrality. That is, would districts' respective per-pupil fiscal responsibility become detrimentally less sensitive to the economic circumstance of the counties in which they reside over a full phase-in of the CBER equalization formula?

First Equity Analysis: As previously noted, under a hypothetical transition from a 100% TACIR to 100% CBER equalization scenario:

- 103 (or 75.7%) of the state's 136 school districts would witness an increase in their respective fiscal burdens; and

- Thirty-three (or 24.3%) of these districts would witness a decrease.

Five commonly-employed equity measures were applied to districts' estimated per-pupil fiscal burdens. These measures were calculated within each district across 101 different equalization scenarios, beginning with a 100% TACIR/0% CBER scenario and moving at 1% increments to a 0% TACIR/100% CBER scenario. This approach produced 101 distinct data points for each district, thereby enabling examination of the type of long trend line recommended in the calculation and interpretation of each of these five equity measures.

The objective of this analysis was two-fold: to confirm the estimated changes in districts' respective fiscal burdens from previous analyses; and to ascertain whether these changes would

represent relatively inequitable departures from the norm change. That is, would the largest increases and decreases in district fiscal responsibility represent relatively inequitable departures from the norm change? As such, and generally speaking, these measures would highlight those districts whose prescribed local per-pupil spending would change beyond the norm if the CBER equalization formula were to be increasingly and fully phased-in.

The equity measures employed included the: coefficient of variation; Gini coefficient; Thiel coefficient; federal range ratio; McLoone index; and two variations on the Atkinson's index.

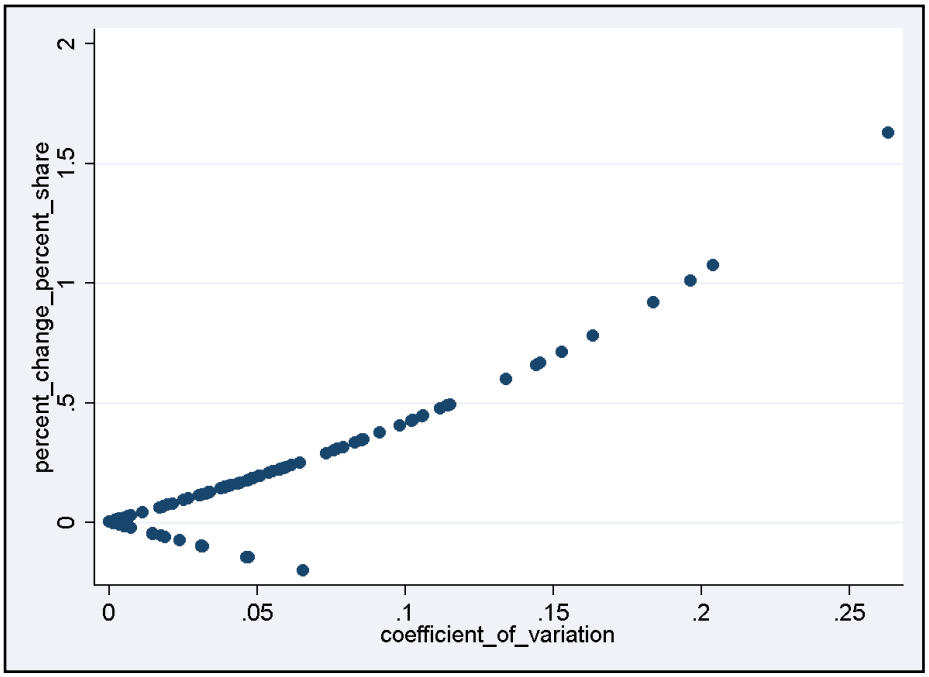
Appendix 03 presents results from equity measures of within-district variation in per-pupil local responsibility over the course of a full phase-in of the CBER equalization formula. Districts are sorted in descending order by the magnitude of the percent change in their respective percentage share of all districts' local fiscal responsibility in the aggregate.

With respect to the former four measures (i.e., coefficient of variation, Gini coefficient, Thiel coefficient, and federal range ratio), higher values are indicative of a comparatively greater level of disparity between districts' respective fiscal responsibilities calculated under the 100% CBER and 100% TACIR equalization scenarios. Conversely, lesser values for the latter three measures (i.e., McLoone index, and two variations on the Atkinson's index) are indicative of a comparatively greater level of disparity.

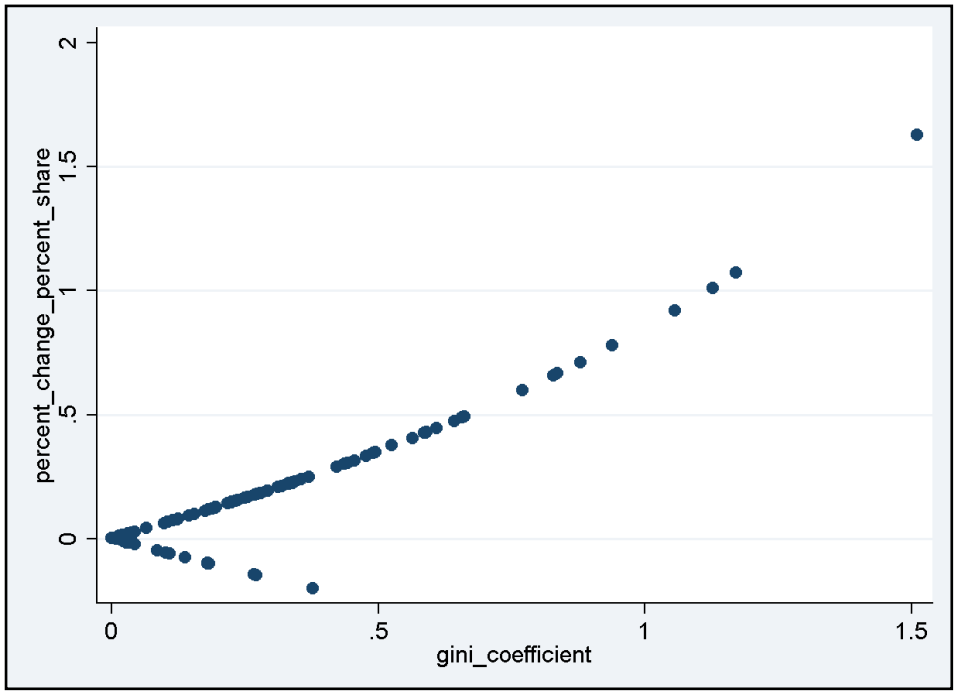
When looking, then, at this within-district variation in per-pupil local responsibility over a full phase-in, there was consistent evidence across all measures that the prescribed local per-pupil spending under CBER equalization would be comparatively more disparate than under TACIR equalization within districts whose local fiscal burden as percentage of all districts' expenditures either would increase by 25% or more.

Graph 01 and Graph 02 below present scatter-plots of the percent change in districts' respective percentage share of all districts' fiscal responsibility against their estimated within-district coefficient of variations and Gini coefficients, respectively. These graphs confirm the disparity in expenditures under the two equalization scenarios for districts whose respective fiscal burdens would increase more than 25%. These graphs also demonstrate the symmetry in the trend of these equality measures for districts whose burdens would increase between 0% and 25% and districts whose burdens would decrease.

Graph 01
Two-way Scatter-plot: Percent Change in Districts' Percentage Share of Aggregate Local Fiscal Responsibility against Within-District Coefficient of Variation



Graph 02
Two-way Scatter-plot: Percent Change in Districts' Percentage Share of Aggregate Local Fiscal Responsibility against Within-District Gini Coefficient



Second Equity Analysis: While the first analysis of equity measures focused on changes to the local fiscal burden within districts, the second analysis focused on changes to the local fiscal burden across (or between) districts, assuming an incremental phase-in of the CBER equalization formula from 0% to 100%. The same five commonly-employed equity measures were applied across all districts' estimated per-pupil fiscal burdens. These calculations were repeated within 101 different equalization scenarios, beginning with a 100% TACIR/0% CBER scenario and moving at 1% increments to a 0% TACIR/100% CBER scenario. This approach produced 101 distinct cross-sectional data points for all districts, thereby enabling examination of a long trend line for each equity measure.

The objective of this exercise was to measure the change in the overall distribution of districts' per-pupil fiscal burdens resulting from a full phase-in of the CBER equalization formula. Specifically, these measures would highlight whether districts' prescribed local per-pupil spending grew more disparate, generally did not change, or moved toward equality assuming the CBER equalization formula were to be increasingly and fully phased-in.

It is critical to note that this analysis was interested not in districts' respective total per-pupil expenditures, but rather in that portion of total per-pupil expenditures for which districts would be responsible. Whereas perfect equality in total per-pupil expenditures would mean that districts spend the same amount on education on a per-pupil basis, perfect equality in per-pupil local fiscal burden would mean that districts are responsible for funding the same per-pupil amount, irrespective of substantially different economic and operational circumstances. Under the latter scenario, perfect equality actually would entail inequity, given that some districts possess substantially greater resources to finance education than others.

Appendix 04 presents results from equity measures of between-district variation in per-pupil local responsibility over the course of a full phase-in of the CBER equalization formula. Results from five equalization scenarios are presented, from 100% TACIR to 100% CBER at 25% increments. The final two columns present the unit and percentage differences between the 100% CBER and 100% TACIR equalization scenarios for each measure.

When looking, then, at this between-district variation in per-pupil local responsibility over a full phase-in of the CBER equalization formula, there was consistent evidence across all measures that the per-pupil distribution of the local match is more equitable under the 100% CBER/0% TACIR scenario than under the 0% CBER/100% TACIR scenario, and that this condition of greater equality steadily increases as scenarios move incrementally from 0% CBER to 100% CBER. That is, the equity measures suggest that districts' respective local fiscal responsibilities generally would grow more uniform if the CBER equalization formula were to be increasingly and fully phased-in.

Third Equity Analysis: It is evident from the previous two analyses that a full phase-in of the CBER equalization formula would entail:

- Certain districts experiencing a substantial change in their fiscal responsibility; and

- Decrease in the variation of all districts' fiscal responsibility on a per-pupil basis, indicating a relatively greater level of uniformity in the amount of per-pupil expenditures for which districts are responsible.

What is not clear, however, is whether this greater level of uniformity represents a less equitable distribution of local fiscal responsibility, or a series of district-by-district shifts with no overwhelming net equity implications in the aggregate, such as those produced by corrections by which some districts that either benefited or were burdened disproportionately under 100% TACIR equalization would be brought more in line with their actual fiscal capacities under 100% CBER equalization.

To investigate the validity of the former scenario, in which districts' respective fiscal responsibilities would be detrimentally more uniform, a series of analyses were undertaken to determine whether districts' per-pupil fiscal burdens under 100% CBER equalization would be less sensitive to economic realities than under 100% TACIR equalization. In other words, would 100% CBER equalization engender a greater level of fiscal neutrality, such that calculation of districts' per-pupil fiscal burdens would be less sensitive to extant variation in counties' respective economic circumstances?

Specifically, two approaches were employed to estimate the strength and direction of the relationship between districts' prescribed per-pupil fiscal burdens under both equalization scenarios and the economic circumstance of the counties in which they reside: coefficient of correlation; and linear regression, with estimates expressed in terms of elasticity.

Table 01 presents descriptive statistics on districts' prescribed per-pupil fiscal burdens and county-level economic indicators under both equalization scenarios.

Table 01
Descriptive Statistics : Equalization Formulae Estimates and Variables

	TACIR	CBER	CIR Variables			CBER Variables**		
	Estimated Per-pupil Fiscal Burden ($)	Estimated Per-pupil Fiscal Burden ($)	Per-pupil Property Wealth ($)	Per-pupil Sales Wealth ($)	Per-pupil Fiscal Capacity ($)	Per-pupil Property Wealth ($)	Per-pupil Sales Wealth ($)	Per-pupil Fiscal Capacity ($)
Mean	1309	1449	94422	43995	1830	1329	695	2024
Median	1203	1354	89292	39630	1656	1253	636	1904
Minimum	354	731	57350	11184	477	812	179	997
Maximum	2739	2707	207682	160559	3936	2839	2522	5290
Standard Deviation	540	497	28163	24159	770	404	378	731
N*	135	135	135	135	135	135	135	135

* Excludes Carroll County School District.
** CBER county-level variables originally expressed in the aggregate; transformed here into per-pupil indicators using county ADM.

Coefficient of Correlation:
A sample correlation matrix was estimated between: districts' imputed per-pupil fiscal burdens under both the 100% TACIR and 100% CBER scenarios; and a series of county-level economic indicators, including property wealth, sales wealth, and total fiscal capacity per pupil, as defined under the TACIR and CBER equalization formulas, respectively. The Coefficient of Correlation indicates the relationship between districts' per-pupil fiscal responsibility and their respective county's per-pupil wealth. Fiscal neutrality increases as the relationship between expenditure and wealth decreases.

Table 02 presents the correlation matrix for districts' imputed per-pupil fiscal burdens under both the 100% TACIR and 100% CBER scenarios; and a series of county-level economic indicators, including property wealth, sales wealth, and total fiscal capacity per pupil, as defined under the TACIR and CBER equalization formulas, respectively.

Table 02
Correlation Matrix : Equalization Formulae Estimates and Variables*

		TACIR	CBER	TACIR Variables			CBER Variables**		
		Estimated Per-pupil Fiscal Burden	Estimated Per-pupil Fiscal Burden	Per-pupil Property Wealth	Per-pupil Sales Wealth	Per-pupil Fiscal Capacity	Per-pupil Property Wealth	Per-pupil Sales Wealth	Per-pupil Fiscal Capacity
TACIR	Estimated Per-pupil Fiscal Burden	1.000							
CBER	Estimated Per-pupil Fiscal Burden	0.913	1.000						
TACIR	Per-pupil Property Wealth	0.780	0.934	1.000					
TACIR	Per-pupil Sales Wealth	0.935	0.922	0.760	1.000				
TACIR	Per-pupil Fiscal Capacity	0.995	0.913	0.792	0.938	1.000			
CBER**	Per-pupil Property Wealth	0.764	0.932	0.986	0.748	0.781	1.000		
CBER**	Per-pupil Sales Wealth	0.928	0.923	0.759	0.997	0.932	0.748	1.000	
CBER**	Per-pupil Fiscal Capacity	0.902	0.992	0.937	0.929	0.913	0.939	0.931	1.000

* N=135; Excludes Carroll County School District.
** CBER county-level variables originally expressed in the aggregate; transformed here into per-pupil indicators using county ADM.

As expected, the relationship between districts' fiscal responsibility and each county-level economic indicator was positive and very strong under both the 100% TACIR and 100% CBER scenarios. Correlations between districts' fiscal responsibility and the series of indicators ranged from 0.76 (CBER's definition of per-pupil property wealth) to 0.99 (TACIR's per-pupil fiscal capacity) under 100% TACIR equalization, and from 0.91 (TACIR's definition of per-pupil property wealth) to 0.99 (CBER's per-pupil fiscal capacity) under 100% CBER equalization.

Comparison between the equalization scenarios is not particularly informative given the consistent and elevated strength of these relationships; any difference between estimates would represent an inconsequential change in fiscal neutrality. However, it is worth noting that the weakest correlation under both equalization formulas involves TACIR's definition of per-pupil property wealth. Within the 100% CBER context, CBER's definition of per-pupil property wealth is the most influential variable in the calculation of fiscal capacity, contributing 67%, on average, of the value of each county's respective aggregate fiscal capacity. In contrast, and within the 100% TACIR context, TACIR's definition of per-pupil property wealth is the least influential variable in the calculation of fiscal capacity, contributing 1%, on average, of the value of each county's respective aggregate fiscal capacity.

This disparity is due in part to TACIR's use of additional variables in its calculations, one of which is also property-related. This variable – the ratio of residential and farm property to total property – actually functions to lower counties' estimated fiscal capacity, such that an increasingly greater concentration of residential and farm property within a county will increasingly lower that county's fiscal capacity in the aggregate. As such, but without judgment on the relative superiority of one model over the other, it is clear that CBER's definition of per-pupil property wealth is far more influential than that of TACIR in the calculation county fiscal capacity (and by proxy districts' respective fiscal responsibilities), and that this inherent difference is likely responsible in part for the identified redistribution of these districts' per-pupil fiscal burdens.

Regression, Expressed in Terms Elasticity:
Ordinary Least Squares regression was employed to estimate a linear relationship between districts' imputed per-pupil fiscal burdens and each of the six identified county economic indicators given that both the TACIR and CBER equalization formulas are county-level models. Specifically, the natural logarithm of districts' imputed per-pupil fiscal burdens under both the 100% TACIR and 100% CBER scenarios were regressed on the natural logarithm of a series of county-level economic indicators, including property wealth, sales wealth, and total fiscal capacity per pupil, as defined under the TACIR and CBER equalization formulas, respectively.

These relationships were expressed in terms of the elasticity of districts' fiscal responsibility to changes in the magnitude of these economic indicators. By way of example, would a 1% increase in districts' respective property wealth per pupil, as defined under the CBER equalization formula, predict on average an increase, decrease, or no change in districts' local fiscal burdens?

Under the condition of fiscal neutrality, there would be no statistical relationship between districts' fiscal responsibility and the economic circumstance of the county in which they reside; districts' respective fiscal burdens would be calculated independently of county's fiscal capacity. This condition, however, is almost exclusively applied to the calculation of total expenditures per pupil, or districts' fiscal burden per pupil plus the per-pupil portion for which the state is responsible. Under the assumption that counties' respective capacity to finance public education may vary substantially, fiscal neutrality applied to per-pupil expenditures for which districts are responsible would imply a state of inequality; all districts would be required to finance the same amount per pupil irrespective of their individual capacity to do so.

As such, one would not expect to find evidence of a textbook definition of fiscal neutrality within the distribution of districts' per-pupil fiscal responsibility, suggesting need also to examine the direction and statistical significance of the difference in the sensitivity of districts' prescribed fiscal burdens to county-level economic circumstance between the 100% TACIR and 100% CBER equalization scenarios. That is, over the course of a full phase-in of the CBER equalization formula, would the distributional equality – or fiscal neutrality – of per-pupil expenditures for which districts would be responsible increase, and, if so, would this increase be statistically significant?

Appendix 05 presents: results from twelve regression models estimating the elasticity of districts' fiscal responsibility to six distinct county-level economic indicators under both the 100% TACIR and 100% CBER equalization scenarios; and the coefficient of correlation for each combination of district fiscal responsibility and county-level economic indicator.

Principal results from these twelve regression models are presented below.

Under both equalization scenarios the relationship between each of the six economic indicators and districts' per-pupil fiscal responsibility was positive and statistically significant across all models. That is, an increase in each indicator of county wealth predicted, on average, an increase in districts' fiscal burdens on a per-pupil basis.

- With respect to districts' fiscal responsibility under the 100% TACIR equalization scenario:
    - A 10% increase in TACIR's definition of property wealth per-pupil predicted an approximate 11.1% (or $145) increase in per-pupil fiscal responsibility. In contrast, a 10% increase in CBER's definition predicted an approximate 11.7% (or $140) increase.
    - A 10% increase in TACIR's definition of sales wealth per-pupil predicted an approximate 7.2% (or $95) increase in per-pupil fiscal responsibility. In contrast, a 10% increase in CBER's definition predicted an approximate 7.3% (or $96) increase.
    - A 10% increase in TACIR's definition of total fiscal capacity per-pupil predicted an approximate 9.8% (or $129) increase in per-pupil fiscal responsibility. In contrast, a 10% increase in CBER's definition predicted an approximate 11.1% (or $145 standard deviation) increase.
- With respect to districts' fiscal responsibility under the 100% CBER equalization scenario:
    - A 10% increase in TACIR's definition of property wealth per-pupil predicted an approximate 10.8% (or $157) increase in per-pupil fiscal responsibility. In contrast, a 10% increase in CBER's definition predicted an approximate 10.6% (or $154) increase.
    - A 10% increase in TACIR's definition of sales wealth per-pupil predicted an approximate 5.4% (or $78) increase in per-pupil fiscal responsibility. In contrast, a 10% increase in CBER's definition predicted an approximate 5.5% (or $80) increase.
    - A 10% increase in TACIR's definition of total fiscal capacity per-pupil predicted an approximate 6.7% (or $97) increase in per-pupil fiscal responsibility. In

contrast, a 10% increase in CBER's definition predicted an approximate 9.7% (or $140) increase.

Each model estimated yielded a coefficient of determination (R^2), which is defined as the proportion of variability in districts' imputed fiscal burdens for which each of the six county-level indicators accounted. Lower coefficients indicate a relatively greater level of fiscal neutrality.

- With respect to the 100% TACIR equalization scenario, the models identified below by their respective explanatory variable yielded the following coefficient of determinations:

    - TACIR's definition of property wealth per-pupil 0.55
    - TACIR's definition of sales wealth per-pupil 0.85
    - TACIR's definition of fiscal capacity per-pupil 0.99
    - CBER's definition of property wealth per-pupil 0.53
    - CBER's definition of sales wealth per-pupil 0.84
    - CBER's definition of fiscal capacity per-pupil 0.77

- With respect to the 100% CBER equalization scenario, the models identified below by their respective explanatory variable yielded the following coefficient of determinations:

    - TACIR's definition of property wealth per-pupil 0.86
    - TACIR's definition of sales wealth per-pupil 0.79
    - TACIR's definition of fiscal capacity per-pupil 0.77
    - CBER's definition of property wealth per-pupil 0.87
    - CBER's definition of sales wealth per-pupil 0.79
    - CBER's definition of fiscal capacity per-pupil 0.99

Finally, results from models under the 100% CBER equalization scenario were compared against results from models under the 100% TACIR equalization scenario. Specifically, the relationship between districts' fiscal responsibility and each of the six county-level economic indicators was examined between the two equalization scenarios. For instance, the results from regressing districts' fiscal burdens under 100% CBER equalization on TACIR's definition of property wealth per pupil were compared against results from regressing districts' fiscal burdens under 100% TACIR equalization on TACIR's definition of property wealth per pupil, and so forth.

The statistical and substantive differences between these estimated relationships are reported below.

- Differences between the relationships estimated under the 100% CBER and 100% TACIR equalization scenarios were statistically significant across the board at all appropriate levels of significance.

- With respect to the direction of these differences, there was a weaker relationship between the six county-level economic indicators and districts' fiscal responsibility under

100% CBER equalization than between those same indicators and districts' fiscal responsibility under 100% TACIR equalization.

- With respect to the magnitude of these differences, the most substantial of the differences between equalization scenarios involved the relationship between districts' fiscal responsibility and:

    - TACIR's definition of total per-pupil fiscal capacity, which would correspond to a decrease in districts' fiscal burden of $41 per pupil (or -31.8%) moving from 100% TACIR to 100% CBER equalization;

    - TACIR's definition of per-pupil sales wealth, which would correspond to a decrease of $24 per pupil (or -25.5%); and

    - CBER's definition of per-pupil sales wealth, which would correspond to a decrease of $24 per pupil (or -24.9%).

Taken together, these results suggest the following regarding a full phase-in of the CBER equalization formula.

- There is consistent evidence that the elasticity, or sensitivity, of districts' prescribed per-pupil fiscal responsibility to both TACIR's and CBER's per-pupil definitions of total fiscal capacity and sales wealth would decrease under the 100% CBER equalization scenario.

- However, this estimated decline in sensitivity would not imply necessarily a detrimental increase in fiscal neutrality. Despite differences in their relative elasticity, all indicators would continue to exhibit a strong relationship to districts' prescribed fiscal responsibility under the 100% CBER equalization scenario.

- Of particular note under 100% CBER equalization is the decrease in elasticity between districts' prescribed per-pupil fiscal responsibility and both TACIR's and CBER's definition of per-pupil sales wealth. Given this variable's critical role in the calculation of fiscal capacity under both equalization scenarios, this result suggests that districts within counties with a greater fiscal reliance on sales would stand to benefit disproportionately under a 100% CBER equalization scenario. That is, under 100% CBER equalization, only 55% of any percentage difference between districts' sales wealth per pupil would translate to the difference in their respective fiscal burden, versus 75% under 100% TACIR equalization.

What is driving the effects of a full phase-in of the CBER equalization formula?

In an effort to isolate the drivers of these effects, each of the TACIR and CBER equalization formulas was: decomposed into constituent variables; and then analyzed and contrasted in terms of these variables' individual and joint influence on the calculation of districts' respective fiscal responsibilities.

Two analytical approaches were employed: analysis of districts in groups; and analysis of districts on a case-by-case basis.

Analysis of Districts in Groups
As means to tease out the differential impact of these variables within and between both equalization scenarios, districts were grouped along a series of relevant dimensions, including: TSSE affiliation; the extent to which their respective fiscal burdens changed over a full phase-in of the CBER equalization formula; and district type.

Grouping by TSSE affiliation principally facilitated examination of the differential impact of the phase-in on TSSE member districts. In contrast, grouping by the magnitude of this impact and by district type facilitated isolation of whether, how, and to what extent the unique calculation of each equalization formula would factor into the redistribution of districts' per-pupil fiscal responsibility.

These districts groups included:

1. All districts;

2. TSSE member districts;

3. Non-TSSE member districts;

4. All districts whose percentage share of all districts' fiscal burdens in the aggregate would increase over the course of a full phase-in of CBER by at least 25.6% (i.e., at least one half of standard deviation above the group median);

5. All districts whose percentage share would change between -0.3% and 25.6% (i.e., in a band between one half of a standard deviation below and above the group median);

6. All districts whose percentage share would decrease more than -0.3% (i.e., at least one half of a standard deviation below the group median);

7. All TSSE member districts in Group 4;

8. All TSSE member districts in Group 5;

9. All TSSE member districts in Group 6;

10. All non-TSSE member districts in Group 4;

11. All non-TSSE member districts in Group 5; and

12. All non-TSSE member districts in Group 6.

All groups were stratified further by district type. Specifically, districts were classified as: the sole district within a county; a county district, in which one or more special school and/or city districts also operate; a city (or municipality) district; or a special school district. For the purposes of this analysis, city and special school districts were referred to as "dependents".

Results of the analyses follow below.

District Group and Type Counts and Frequencies: Appendix 06 arrays all 136 districts in the state by formulated group, and each group by district type. Two descriptive statistics are presented: the count of districts within each group, including by district type; and the frequency (or percentage concentration) of these groupings in relation to all 136 districts.

Average Impact by District Group and Type: Appendix 07 summarizes the impact of a full phase-in of the CBER equalization formula by district group, and within each group by district type. Two descriptive statistics are presented: the count of districts within each group, including by district type; and the average change in districts' percentage share of all districts' local fiscal burdens in the aggregate, by district group and type.

Average Rank of County ADM by District Group and Type: Appendix 08 summarizes by district group and type the distribution of districts by the rank of their respective county's average daily membership (ADM), under the assumption that county ADM is more central to the analysis than district ADM given that both equalization formulas are county-level models. Two descriptive statistics are presented: the count of districts within each group, including by district type; and the average rank of districts' county' ADM, by district group and type.

Average Contribution of TACIR Variables by District Group and Type: Appendix 09 summarizes by district group and type the average absolute contribution of each TACIR variable to TACIR's calculation of districts' respective fiscal capacities, in addition to the count of districts by group and type. These county-level variables include: the regression intercept; property per pupil; local taxable sales per pupil; per capita income; the ratio of residential and farm property to total property; and the ratio of ADM to population. Within the exhibit, green demarcates a variable with a positive coefficient estimate, and hence an estimate that increased districts' respective fiscal capacities on average. Green variables included: the regression intercept; property per pupil; local taxable sales per pupil; and per capita income. Red, conversely, demarcates a variable with a negative coefficient estimate, and hence an estimate that lowered districts' respective fiscal capacities on average. Red variables included: the ratio of residential and farm property to total property; and the ratio of ADM to population.

Average Residual of TACIR Model by District Group and Type: Appendix 10 summarizes by district group and by district type the residuals from the TACIR model as a percentage of counties' actual average local revenue per pupil, in addition to the count of districts by group and type. The TACIR formula employs multiple regression to estimate counties' (and, by proxy, their attendant districts') fiscal capacity to finance education. Specifically, the TACIR model estimates a linear relationship between counties' actual local revenue per pupil and the five county-level variables identified above. TACIR then predicts counties' per-pupil fiscal capacities by multiplying the coefficient estimates of these five explanatory variables by their

actual value and summing the products, county by county. Any prediction that underestimates a county's actual local revenue per pupil produces a negative residual; that is, a county's predicted fiscal capacity per pupil is smaller than its actual local revenue per pupil averaged over the three prior fiscal years. Conversely, any prediction that overestimates a county's actual local revenue per pupil produces a positive residual; the prediction is greater than the actual value.

Average Contribution of CBER Variables by District Group and Type: Appendix 11 summarizes by district group and type the average absolute contribution of each CBER variable to CBER's calculation of districts' respective fiscal capacities, in addition to the count of districts by group and type. These county-level variables include CBER's definition of the county property and sales tax bases, respectively.

Differential Impact of TACIR and CBER Variables by District Group and Type: Appendix 12 summarizes by district group and type the following descriptive statistics: the average change in districts' percentage share of all districts' local fiscal burdens in the aggregate; the average differential contribution of each TACIR and CBER variable to their respective formula's calculation of districts' respective fiscal capacities; the average rank of these variables' respective contributions; the average residual of the TACIR model as a percentage of counties' actual local revenue per pupil; the average change in the rank of counties' total fiscal capacity; the average number of other districts operating within districts' respective parent county; and the count of districts by group and type.

3 of these 9 sets of statistics already have been presented in prior appendices; namely: the count of districts by group and type; the average change in districts' percentage share of all districts' local fiscal responsibility in the aggregate; and the average residual of the TACIR model as a percentage of counties' actual local revenue per pupil. The remaining 6 are either new statistics, or alternative takes on statistics previously presented.

Seven observations emerged from these analyses:

- Districts most negatively impacted by a full phase-in of the CBER equalization formula were predominantly sole district counties affiliated with TSSE and serving relatively smaller populations of students. In contrast, districts positively impacted generally were evenly distributed among the four district types, slightly more likely not to be TSSE members, and, on average, much larger than most.

- TSSE members within each of the three impact-delineated groups (4, 5, and 6, respectively) were relatively worse off than their non-TSSE counterparts. In terms of those districts negatively impacted by a full phase-in, TSSE members witnessed a disproportionately more severe increase in local fiscal burden than their non-TSSE counterparts. In terms of those districts positively impacted by a full phase-in, TSSE members witnessed a disproportionately smaller decrease in local fiscal burden than their non-TSSE counterparts.

- When examining the average contributions of TACIR variables within and across groups, it is evident among those TSSE districts most negatively impacted that their TACIR-

derived fiscal capacities were defined by: a substantially less influential sales tax wealth per pupil; a comparatively less influential per capita income; and a discernibly more influential ratio of residential and farm property to total property, after netting out the counterbalancing influence of the intercept. With respect to the few non-TSSE districts negatively impacted, it is evident that these districts' relatively greater sales wealth per pupil and per capita income were completely counterbalanced by the least influential intercepts and a sufficiently influential ratio of residential and farm property to total property.

- When examining the average contributions of TACIR variables within and across groups, it is evident among those TSSE districts positively impacted that their TACIR-derived fiscal capacities remained defined by a substantially less influential sales tax wealth per pupil, but that this benefit was subsumed by a significant increase in the influence of per capita income and a significant decrease in the influence of the ratio of residential and farm property to total property, such that the counterbalancing influence of the intercept eliminated any net benefit of the latter property-related variable.

- When examining the average TACIR residual as a percentage of counties' actual local revenue per pupil within and across groups, it is evident in TSSE districts that the extent to which the TACIR model under-predicted counties' actual revenue generation was negatively associated with the impact of a full phase-in of the CBER equalization formula. That is, as the extent to which the TACIR model under-predicted counties' revenue generation increased, so did the negative impact of the CBER equalization model on districts' respective fiscal burdens. However, the opposite was true of non-TSSE districts.

- When examining the average contributions of CBER variables within and across groups, it is evident among those TSSE districts most negatively impacted that their CBER-derived fiscal capacities were defined by substantially more influential property tax wealth per pupil both in comparison to their TSSE peers across impact categories and in comparison to their non-TSSE counterparts within impact categories.

Analysis of Districts on a Case-by-Case Basis

To confirm and refine the findings of the previous analyses, those districts most negatively and those districts positively impacted by the full phase-in of the CBER equalization formula were examined on a case-by-case basis.

Specifically, districts negatively impacted more than 25% were examined for evidence of the following drivers, and their interpreted effects under CBER equalization:

- Driver: Disproportionately weaker contribution under TACIR formula of sales tax wealth per-pupil variable, or conversely stronger sales tax wealth per-pupil variable relative to all other variables under TACIR. Effect: Increase in local fiscal burden due to greater emphasis on variable in CBER formula.

- Driver: Disproportionately weaker contribution under TACIR formula of per capita income variable; Effect: Increase in local fiscal burden due to removal of variable in CBER formula.

- Driver: Disproportionately greater contribution under TACIR of ratio of residential and farm property to total property variable, net of the counterbalancing influence of the intercept. Effect: Increase in local fiscal burden due to removal of variable in CBER formula.

- Driver: Negative, substantial TACIR residual as a percentage of respective county's local revenue per pupil. Effect: Increase in local fiscal burden due to underestimation of fiscal capacity under TACIR equalization formula, and subsequent normalization of that fiscal capacity under CBER equalization formula.

- Driver: Disproportionately greater contribution under CBER of property wealth per-pupil variable, or conversely stronger property wealth per-pupil variable relative to all other variables under TACIR. Effect: Increase in local fiscal burden due to disproportionately greater emphasis of variable in CBER formula of a variable with almost no impact in TACIR formula, save for positive impact in the form of the ratio of residential and farm property to total property.

Appendix 13 summarizes each of these drivers sequentially for those districts most negatively impacted by a full phase-in of the CBER equalization formula. The mean absolute contribution of each driver (or combination of drivers) to the identified equalization formula is reported in the column headers.

Two specific indicators are reported for each district and driver combination: the difference between that district's value of the driver and the overall mean; and a flag indicating whether or not there is any evidence of the driver's role in the district's estimated increase in local fiscal burden. These flags are counted both within and across districts, and a frequency for each count reported.

The first and last drivers include a third indicator, specifically the difference between the county rank of that driver and the mean county rank of all other drivers under the TACIR equalization formula. A large, positive value indicates that the county rank of the aggregate value of this variable is disproportionately larger than the average county rank of the aggregate values of all other TACIR variables. A large, negative value indicates that the county rank of the aggregate value of this variable is disproportionately smaller than the average county rank of the aggregate values of all other TACIR variables.

In contrast, districts positively impacted were examined for evidence of the following drivers, and their interpreted effects under CBER equalization. Since the positive effects identified were substantially smaller in magnitude than the most negative of effects, it is feasible some districts would register drivers that worked in both directions, often counterbalancing themselves. With that said, the descriptions below only consider positive drivers and effects, given that negative

drivers and effects were detailed above. The accompanying appendix, however, summarizes evidence of both.

- Driver: Weak sales tax wealth per-pupil variable relative to all other variables under TACIR. Effect: Decrease in local fiscal burden given disproportionately greater emphasis on variable in the CBER equalization formula, coupled with the CBER formula's inherently less elastic relationship to sales wealth.

- Driver: Disproportionately greater contribution under TACIR formula of per capita income variable. Effect: Decrease in local fiscal burden due to removal of variable in CBER formula.

- Driver: Disproportionately lesser contribution under TACIR of ratio of residential and farm property to total property variable, net of the counterbalancing influence of the intercept. Effect: Decrease in local fiscal burden due to removal of variable in CBER formula.

- Driver: Disproportionately lesser contribution under TACIR of ratio of ADM to total population. Effect: Decrease in local fiscal burden due to removal of variable in CBER formula.

- Driver: Positive, substantial TACIR residual as a percentage of respective county's local revenue per pupil. Effect: Decrease in local fiscal burden due to overestimation of fiscal capacity under TACIR equalization formula, and subsequent normalization of that fiscal capacity under CBER equalization formula.

- Driver: Weak property wealth per-pupil variable relative to all other variables under TACIR. Effect: Decrease in local fiscal burden given disproportionately greater emphasis of variable in CBER formula, coupled with previously noted removal of second, mitigating property-related variable.

Appendix 14 summarizes each of these drivers sequentially for those districts positively impacted by a full phase-in of the CBER equalization formula. The mean absolute contribution of each driver (or combination of drivers) to the identified equalization formula is reported in the column headers.

Two specific indicators are reported for each district and driver combination: the difference between that district's value of the driver and the overall mean; and a flag indicating whether or not there is any evidence of the driver's role in the district's estimated decrease in local fiscal burden. Green flags represent a positive effect; red flags a counterbalancing negative effect. These flags are counted in total and by type both within and across districts, and a frequency for each count reported.

The first and last drivers include a third indicator, specifically the difference between the county rank of that driver and the mean county rank of all other drivers under the TACIR equalization formula. A large, positive value indicates that the county rank of the aggregate value of this

variable is disproportionately larger than the average county rank of the aggregate values of all other TACIR variables. A large, negative value indicates that the county rank of the aggregate value of this variable is disproportionately smaller than the average county rank of the aggregate values of all other TACIR variables.

Appendix 15 provides the raw data underpinning these analyses on a district by district, with districts sorted in descending order based on magnitude of impact. Appendix 16 is identical to Appendix 16, however districts are sorted alphabetically.

Findings of Driver Analyses

Four principal findings emerged from these analyses:

- The dynamic by which individual districts would be negatively or positively impacted by a full phase-in of the CBER equalization formula is not nearly as clean or uniform as indicated by the group analyses. The evidence suggests that there might be multiple reasons why an individual district would be impacted, and that the magnitude of these reasons might vary substantially within and across districts.

- The complexity of this dynamic would be particularly apparent among districts benefiting from a full phase-in of the CBER equalization formula. Relative to those districts most negatively impacted, these districts appear to be characterized by economic circumstances responsive to both equalization formulas. As such, attempts to reconcile the differential impact between the CBER and TACIR scenarios would likely spawn a varied, and perhaps even conflicting, response among this group of districts.

- In contrast, the districts most negatively impacted (of which all but three are members of TSSE) appear singularly predisposed to poor outcomes under a full phase-in of the CBER equalization formula. On close inspection, the reasons why exhibit a fair amount of nuance. Nevertheless, most of these poor outcomes could be attributed to the lack in the CBER equalization formula of controls for per capita income and for the ratio of residential and farm property to total property, and the disproportionately greater emphasis in this formula on sales and property wealth.

- Of these two variables, property wealth would appear the most influential, given: first, that its counterpart variable in the TACIR formula accounted on average for only 1% of counties' derived fiscal capacities; and second, that the TACIR ratio of residential and farm property to total property actually helped lessen the fiscal burden on more rural counties and districts. The role of sales wealth is slightly less obvious, owing to the fact that the variable's impact would stem not only from its prominence within the calculation of the CBER equalization formula, but also the CBER formula's lower sensitivity to sales wealth working to the advantage of larger districts.

What are plausible policy options to address these effects?

In light of these findings, TSSE should consider exploring the following policy options as means to address the largely negative impact of the CBER equalization formula on its membership:

- *Identification of a differential treatment approach to district types under the CBER formula through a weighting and/or grouping scheme* – Under a weighting scheme, districts' fiscal capacity indices would be weighted by one or more variables unique to the TACIR formula (or some proxies thereof) to a degree dependent upon district type (or upon some combination of district attributes that help distinguish these types). Under a grouping scheme, districts would be assigned to one of a limited series of groups based upon shared attributes, and their respective fiscal capacities calculated relative to their peer districts within those groups.

- *Incorporation of additional variable(s) into the CBER equalization formula to account, in whole or part, for the unique variables of the TACIR formula* – One or more variables similar to those proposed under the weighting scheme would added to the CBER formula, thereby counterbalancing the predominant influence of property wealth, and perhaps increasing the elasticity of the model to sales wealth.

- *Incorporation of a more refined collar on districts' respective increases in local responsibility* – Such a collar not only would function in the near term like a weighting scheme, but also permit for minor adjustments to evolving local economies over time. A metric such as the simulated change in districts' respective share of all districts' local fiscal burdens in the aggregate would standardize the treatment of districts over the course of the phase-in of the CBER formula, and could be employed to mitigate, at least in part, substantial increases in certain counties' fiscal capacity indices under the new model.

- *Identification of an alternative, but equally transparent county-level model* – Such a model might propose state subvention of the disparity between actual aggregate costs of education and local property- and sales tax-based fiscal capacity, with collared local opportunity to raise and allocate revenue beyond prescribed funding levels.

- *Identification of a system-level equalization formula, as opposed to the present county-level models, given both districts' and counties' operational and economic idiosyncrasies* – Such a model would need to account for the apparent complexity rooted in these idiosyncrasies, yet be sufficiently transparent to permit for forecasting and adjustment over time. Mechanisms such as weighting and grouping schemes, as well as collars, could be employed to reconcile the need for, and the associated weaknesses of, a single formula that addresses all districts and counties and their singular circumstances.