Educational Equity, Adequacy, and Equal Opportunity in the Commonwealth: An Evaluation of Pennsylvania's School Finance System

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EXECUTIVE SUMMARY

A sizeable body of rigorous empirical literature validates that state school finance reforms can have substantive, positive effects on student outcomes, including reductions in outcome disparities or increases in overall outcome levels. One recent major study found "a 20 percent increase in per-pupil spending each year for all 12 years of public school for children from poor families leads to about 0.9 more completed years of education, 25 percent higher earnings, and a 20 percentage-point reduction in the annual incidence of adult poverty."[1] Several other recent studies have reported positive effects of infusion of funding into high-need and low-spending districts, on student outcomes ranging from test score gains to graduation rates.[2]

Pennsylvania has historically operated one of the nation's least equitable state school finance systems, and within that system exist some of the nation's most fiscally disadvantaged public school districts.[3] The persistent inequalities of Pennsylvania's school finance system are not entirely a result of simple lack of effort, as policies intended to mitigate inequities serve in some cases to exacerbate them.[4]

In the following report, we provide an overview of the state of school funding in Pennsylvania, a review of current conceptions of educational equity, adequacy and equal opportunity, empirical methods for measuring education costs, current policies across states and recent reforms. Our review is organized in three chapters. In the first, we summarize the current status of the school funding system and student outcomes in Pennsylvania. In the second, we outline conceptions of equity, adequacy and equal educational opportunity and provide an overview and critique of methods for measuring educational adequacy and informing state school finance policy. We conclude with an overview of the current landscape of school finance policy, and the intersection between emerging evidence on education costs and state school finance policy design.

School Funding and Student Outcomes in Pennsylvania

The current state of education in the Commonwealth is a mixture of positive fiscal and student outcome indicators, combined with serious concerns regarding adequacy and equity in school funding and student outcomes. Table 1 summarizes Pennsylvania's school finance system against standards addressed in this report. The average level of funding in the Commonwealth is relatively average among states in the region, and higher than national averages. But these averages mask substantial inequities. Revenue and spending across Pennsylvania school districts fail to meet the most basic equity standards, with significant numbers of districts serving high-need populations having substantially lower per-pupil spending than surrounding districts serving more advantaged populations. Further, spending and revenue variation remains significantly associated with district wealth and income, thus failing the wealth neutrality standard. Because large shares of high-need children attend under-

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resourced districts, the system also fails on the equal educational opportunity standard, which dictates that children should be provided resource levels necessary for having equal opportunity to achieve comparable outcomes, regardless of their personal and family circumstances, or where they reside. These equal opportunity deficiencies are additionally reflected in actual outcome disparities. Finally, while average levels of measured achievement statewide are reasonably high, and growth over time relatively strong, achievement gaps are large.

Table 1

Review of Pennsylvania's School Finance System

Standard	Below Average	Above Average	Notes
Average District Funding Level *The average level of overall funding is sufficient to produce better than average measured student outcomes.*		✔	• Has relatively high combined total state and local revenue when compared nationally, and relatively average state and local revenue compared regionally; • Has shown reasonably solid combined state and local revenue and current operating spending growth over time; and • Spends a relatively high share of gross state product in combined state and local revenue for elementary and secondary education (8th among states). See also: Is School Funding Fair?[5]
Nominal Dollar Input Equity *There exists a reasonable degree of equality in nominal dollar inputs to schooling across all students, statewide.*	✔		• Displays substantial disparity between high (95th percentile) and low (5th percentile) spending districts and significant overall variation in per-pupil spending. • Ranks third overall in the statewide percent of children attending severely financially disadvantaged districts, behind only Illinois and New Hampshire, with about 15 percent of children statewide attending financially disadvantaged districts. See also: America's Most Financially Disadvantaged School Districts[6] and Is School Funding Fair?
Fiscal Neutrality *The amount of funding available to a child's school district is not contingent on (correlated positively with) the wealth or income of the community in which a child resides (or negatively correlated with poverty).*	✔		• Districts with greater wealth and income have higher combined state and local revenues. • There was an approximately $2,000 per child difference in the total amount of revenue spent by the poorest and richest districts in 2010. • By 2013, this disparity had grown to approximately $3,000 per child. • Spending increases per child in the state's richest districts outpaced those in all other quintiles.
Average Level of Measured Outcomes *Average, statewide measured outcomes are equal to or greater than expectations, when compared among states, given average statewide student population characteristics (poverty).*		✔	• Has higher than expected NAEP scale scores in 8th grade reading and math when considering child poverty rates across states.

Standard	Below Average	Above Average	Notes
Average Growth in Measured Outcomes *Average, statewide growth in measured outcomes is equal to or greater than expectations, when compared among states, given average statewide initial scores (growth against baseline).*		✓	• Displayed greater than expected 10-year (2003 to 2013) growth in NAEP mean scale scores.
Achievement Gaps *Differences in average measured outcomes of low-income and non-low-income children are equal to or less than expected, given the income gaps between these groups, when compared among states.*	✓		• Achievement gaps between low-income and non-low-income children on the grade 4 and 8 reading and math NAEP are much larger than expected;
Equal Educational Opportunity and Adequacy *All children are provided with sufficient resources to achieve common outcome goals, inclusive of adequate outcome goals. This standard requires that school funding vary according to different student needs and relevant district costs.*	✓		• Is consistently among the most regressively funded education systems in the nation—meaning, higher poverty districts have systematically lower revenues per pupil than lower-poverty districts. See also: Is School Funding Fair?[7] • Districts in the highest poverty quintile show much larger adequacy gaps, approaching $4,000 per pupil compared to $1,200 per pupil in the lowest poverty quintile. • The 100 districts with the largest funding shortfalls, which educate 22% of the state's public school children, have average SAT scores approximately 200 points lower than the most financially advantaged districts. These same districts have about 15% lower math proficiency and 20% lower reading proficiency on state assessments. • Even when controlling for district population characteristics and labor costs, improvements to funding gaps are positively associated with improvements to PSSA proficiency rates and SAT scores.

Toward an Equitable School Finance System

Pennsylvania must mind its funding gaps toward reducing its achievement gaps. In an era of ever-increasing student outcome demands, the Commonwealth would also be wise to evaluate the extent that funding is generally sufficient and distributed appropriately amongst districts to meet its demands—that is, whether being simply "Above Average" is good enough. State school finance systems can be rationally guided by reliable and valid empirical analyses of the costs of achieving desired outcomes. Historically, such analyses have been conducted from either an input- or outcome-oriented perspective:

1. **Input-oriented** analyses identify the human resources/staffing, materials, supplies and equipment, physical space, and other elements required to provide specific educational programs and services. Those programs and services may be identified as typically yielding certain educational outcomes for certain student populations when applied in certain settings.
2. **Outcome-oriented** analyses start with measured student outcomes, of institutions or specific programs and services. Outcome-oriented analyses can then explore either the aggregate spending on those programs and services yielding specific outcomes, or explore in greater depth the allocation of spending on specific inputs.

In this report, we provide guidance on conducting state-of-the-art education cost analyses, which combine the best available statistical models of educational outcomes with the most rigorous and detailed *deep dive* investigation of the specific resources, programs and services required to achieve those outcomes. That is, combining through an iterative feedback process, statistical modeling of the relationship between actual outcome measures, school spending and context, with informed recommendations of expert panels regarding necessary resources, and further confirmatory evaluation of actual resources, programs and services in schools and districts efficiently achieving desired outcomes.

Equally important to applying rigorous costing-out methods is maintaining the integrity of the relationship between empirical findings and the subsequent school finance policies that follow. However, cost estimates are not intended to dictate but rather inform school finance policy. School finance policies are more likely to achieve equal educational opportunity or adequacy when guided by cost estimates. It is our perspective that rigorously conducted cost analyses may provide ongoing guidance in the design and revision of state school finance systems, helping to guide those systems toward providing more equal and adequate opportunities.

Case studies presented herein provide mixed evidence regarding policy adherence to empirical evidence, with Pennsylvania's prior efforts, linking the 2007 cost study to 2008 reforms, among the closest adherence. By contrast, in other states cost estimates themselves appeared to have suffered from significant political interference. But there exist some governance insights that can be gained from the case studies presented here. For example, in

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Kansas, in the midst of litigation over funding adequacy, the legislature requested an updated study of costs, seemingly seeking a lower estimate than their prior study. But with judicial oversight involved, and a constitutionally independent state board of education responsible for the determination and oversight of standards, that study was handed off to the legislature's independent research arm (Legislative Division of Post Audit)[8] which maintained a high degree of integrity and independence in its oversight of the project. This ultimately yielded cost findings that were highly correlated with the legislature's previous study conducted by independent consultants. Perhaps equally important was the degree to which the process in Kansas was subject to public scrutiny, in part necessitated by the combination of judicial oversight coupled with media coverage. Independence and public openness and communication should be guiding principles moving forward.

INTRODUCTION

Overview

A sizeable body of rigorous empirical literature validates that state school finance reforms can have substantive, positive effects on student outcomes, including reductions in outcome disparities and increases in overall achievement levels. As Pennsylvania education leaders prepare to study potential school finance reforms, we are pleased to provide foundational research to support this work.

Our report is organized into three main chapters:

Chapter 1: The State of Education Funding in Pennsylvania examines the Commonwealth's school funding system from a number of perspectives. We compare Pennsylvania's funding system to that of other states, evaluate the equity of the distribution of state education funding within Pennsylvania, and examine student outcomes related to funding distribution.

Chapter 2: Elements of a Funding Formula outlines how conceptions of equity, adequacy, and equal educational opportunity inform school finance policy. In other words, what are the basic building blocks of school funding reform?

Chapter 3: The Current Landscape of State School Finance provides an overview of how these building blocks intersect with state policy.

Our examination draws on several recent national reports as well as thorough analyses of data from both Pennsylvania and national sources.

Does School Funding Matter?

Over the past several decades, many states have pursued substantive changes to their state school finance systems, while others have not. Some reforms have come and gone. Some reforms have been stimulated by judicial pressure resulting from state constitutional challenges and others have been initiated by legislatures. In an evaluation of judicial involvement in school finance and resulting reforms from 1971 to 1996, Murray, Evans and Schwab (1998) found that "court ordered finance reform reduced within-state inequality in spending by 19 to 34 percent."[9]

Making claims that the establishment of new state school finance systems or reforms to existing systems lead to increases in spending generally and/or improved targeting of spending to student populations with additional needs (e.g., children from economically disadvantaged backgrounds) should be backed up by evidence supporting effectiveness of such reforms in terms of improved student outcomes. There exists an increasing body of evidence that substantive and sustained state school finance reforms matter for improving both the level and

distribution of short-term and long-run student outcomes. A few studies have attempted to tackle school finance reforms broadly applying multi-state analyses over time. Card and Payne (2002) found "evidence that equalization of spending levels leads to a narrowing of test score outcomes across family background groups."[10] (p. 49) Most recently, Jackson, Johnson & Persico (2014) evaluated long-term outcomes of children exposed to court-ordered school finance reforms, finding that "a 20 percent increase in per-pupil spending each year for all 12 years of public school for children from poor families leads to about 0.9 more completed years of education, 25 percent higher earnings, and a 20 percentage-point reduction in the annual incidence of adult poverty; we find no effects for children from non-poor families."(p. 1)[11]

> *"a 20 percent increase in per-pupil spending each year for all 12 years of public school for children from poor families leads to about 0.9 more completed years of education, 25 percent higher earnings, and a 20 percentage-point reduction in the annual incidence of adult poverty."*
> Jackson, Johnson & Persico, 2014

Numerous other researchers have explored the effects of specific state school finance reforms over time. [12] Several such studies provide compelling evidence of the potential positive effects of school finance reforms. Studies of Michigan school finance reforms in the 1990s have shown positive effects on student performance in both the previously lowest spending districts, [13] and previously lower performing districts. [14] Similarly, a study of Kansas school finance reforms in the 1990s, which also involved primarily a leveling up of low-spending districts, found that a 20 percent increase in spending was associated with a 5 percent increase in the likelihood of students going on to postsecondary education.[15]

Three studies of Massachusetts school finance reforms from the 1990s find similar results. The first, by Thomas Downes and colleagues found that the combination of funding and accountability reforms "has been successful in raising the achievement of students in the previously low-spending districts." (p. 5)[16] The second found that "increases in per-pupil spending led to significant increases in math, reading, science, and social studies test scores for 4th- and 8th-grade students."[17] The most recent of the three, published in 2014 in the *Journal of Education Finance*, found that "changes in the state education aid following the education reform resulted in significantly higher student performance."(p. 297)[18] Such findings have been replicated in other states, including Vermont. [19]

On balance, it is safe to say that a sizeable and growing body of rigorous empirical literature validates that state school finance reforms can have substantive, positive effects on student outcomes, including reductions in outcome disparities or increases in overall outcome levels.[20]

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CHAPTER 1. The State of Education Funding in Pennsylvania

Pennsylvania has historically operated one of the nation's least equitable state school finance systems, and within that system exist some of the nation's most fiscally disadvantaged public school districts.[21] The persistent inequalities of Pennsylvania's school finance system are not entirely a result of simple lack of effort, as policies intended to mitigate inequities have in some cases served to exacerbate them.[22]

In the aggregate, the current state of education in the Commonwealth is a mixture of positive fiscal and student outcome indicators, combined with serious concerns regarding adequacy and equity in school funding and student outcomes. For instance, Pennsylvania:

- Has relatively high combined total state and local revenue when compared nationally, and relatively average state and local revenue compared regionally;
- Has shown better than average nominal combined state and local revenue and current operating spending growth over time; and
- Spends a relatively high share of gross state product in combined state and local revenue for elementary and secondary education (8th among states).

Similarly, when it comes to commonly cited student outcomes, including the National Assessment of Educational Progress (NAEP), Pennsylvania has:

- Higher than expected NAEP scale scores in 8th grade reading and math when considering child poverty rates across states; and
- Greater than expected 10-year growth (from 2003 to 2013) in NAEP scale scores.

But these positive signs regarding average conditions in the Commonwealth mask significant concerns. Specifically, Pennsylvania:

- Is consistently among the most regressively funded education systems in the nation — meaning, higher poverty districts have systematically lower revenues per pupil than lower poverty districts; and
- Has among the region's lowest state aid contributions to public school districts. Much of the sustained level and growth in education spending has come from property tax revenues, and those revenue increases have led to a widening divide between the state's lower and higher poverty school districts.

Put simply, the state's school finance system can be characterized by reasonable averages but very large gaps. Moreover, these resource gaps are coupled with outcome gaps. For instance, in Pennsylvania:

- Achievement gaps between low-income and non-low-income children on the grade 4 and 8 reading and math NAEP are much larger than expected;

- The 100 districts with the largest funding shortfalls, which educate 22 percent of the state's public school children, have average SAT scores approximately 200 points lower than the most financially advantaged districts. These same districts have about 15 percent lower math proficiency and 20 percent lower reading proficiency on state assessments; and
- Even when controlling for district population characteristics and labor costs, improvements to funding gaps are shown to be positively associated with improvements to PSSA proficiency rates and SAT scores. This relationship indicates that funding gaps currently contribute to lower achievement in low-wealth districts.

A Brief History of Pennsylvania's School Finance System

Prior to 2008, Pennsylvania lacked a systematic, need-based state school finance formula. What existed were two major formula components: the Basic Education Funding (BEF) formula and the Special Education Funding (SEF) formula. Given the work underway in Pennsylvania, we focus here on the BEF—a variant on a foundation aid formula with a state aid share determined by a combination of property wealth and income. Pennsylvania's BEF, unlike many other state school finance formulas, contained no systematic adjustments for regional costs or student needs — instead including ad hoc supplements for poverty, English language learner (ELL) status, and small districts.

The 2007 cost study and subsequent legislation significantly altered just the BEF to mirror a more typical modern foundation aid formula. The first step was the calculation of each district's adequacy target, or that amount of funding per child deemed necessary to achieve desired outcome goals:

Adequacy Target = Basic Costs + Student Needs + District Costs (Scale & Wage)

Basic costs include the costs of providing regular education programs and services. Student needs include special adjustments for student individual and population characteristics, including poverty and language proficiency that affect the spending required (adequacy target) to achieve desired outcomes. District costs include factors such as differences in regional labor costs and costs associated with differences in economies of scale and population sparsity.

Each district's adequacy target was built on a per pupil base of $8,355. Student need weights for children eligible for free or reduced price lunch under the National School Lunch Program (0.43 times base cost) and a variable weight for children with limited English language proficiency were applied to the base, along with adjustments for various school district characteristics such as low enrollment and relative prices of local labor [see Appendix B].

The second step in the formula calculation involved determining the current adequacy shortfall, or the difference between a district's current actual spending levels and its adequacy target. Finally, the state share of responsibility for moving a district toward the adequacy target was determined, first by multiplying the market value/personal income (MVPI) aid ratio[23] times the shortfall, and then by the phase-in rate and then by a factor for local tax effort.[24]

After three years, the funding formula was discontinued, and Pennsylvania returned to its former practice of ad hoc allocations and adjustments of basic education funding. Even during initial phase in, actual current revenues and expenditures never reached a point at which they clearly reflected the underlying formula. The formula was designed to achieve a progressive relationship between per pupil spending and district poverty, but both current expenditures and revenues remained regressively distributed, as we discuss in the following section.

Pennsylvania and Funding Fairness

In the wake of the 2007 study and the short-lived reforms that followed, several reports have chastised the inequities of the Pennsylvania school finance system. Table 2, below, summarizes the ratings of Pennsylvania and neighboring states from the national report card on school funding fairness, *Is School Funding Fair?.* The report compares states on the following indicators using a three year panel (2009-2011) of national, school district level data on school funding and poverty.

> *Pennsylvania compares favorably among neighboring states on its relative spending level and share of economic capacity expended on schools, but fares poorly on measures of funding fairness, and on shares of children served by the public system.*

Funding Distribution: Ratio of state and local revenue per pupil of high-poverty districts to that of low-poverty districts, correcting for economies of scale, population sparsity and competitive wage variation

Effort: Ratio of total state and local revenue per pupil to gross state product

Funding Level: Predicted level of state and local revenue per pupil for a district in an average cost labor market, serving 10 percent children in poverty[25]

Coverage: Percent of 6- to 16-year old children attending public schools

When it comes to overall (i.e., state average) effort and funding level, Pennsylvania does quite well with reasonably high spending that matches up well with other states in the region. At first glance, average spending levels might not suggest major deficiencies in Pennsylvania's school finance system. While on average, funding levels are reasonably high, funding gaps are

large and unevenly distributed. As will be discussed later, over 300,000 students attend districts with substantial funding gaps. Thus, solving Pennsylvania's school finance problems by redistributing existing resources alone seems politically unlikely.

As mentioned, the present distribution of spending is a serious problem. The funding fairness ratio evaluates the extent to which higher poverty districts can be expected to have higher or lower state and local revenue per pupil than lower poverty districts. That is, is the system *progressive* (higher poverty districts have systematically higher revenue) or *regressive* (higher poverty districts have systematically lower revenue)?

We construct the funding fairness ratio in order to make reasonable comparisons of the progressiveness of state school finance systems across states. The ratio is created by using a statistical model of state and local revenue data on all districts, nationally, for a three-year period. That model is used to generate predicted values of state and local revenues for a proxy school district of similar characteristics[26] across states, and then used to predict the expected revenue of a district with 0 percent poverty, versus a district with 30 percent poverty (approximately equivalent to 80 to 90 percent free or reduced price lunch).[27] The fairness ratio is the ratio of predicted state and local revenue in the high-poverty district, over that of the low-poverty district.

Thus, a ratio of 1.2 indicates a progressive state where high-poverty districts have 20 percent higher state and local revenue than lower poverty districts, whereas a ratio of 0.8 indicates a regressive state where high-poverty districts have only 80 percent of the revenue of lower poverty ones.

Table 2 summarizes the ratings for Pennsylvania and bordering states from the 2014 report. Pennsylvania consistently rates poorly on measures of the relationship between child poverty and school district resources, typically falling among the worst large diverse states. New Jersey and Ohio, by contrast, have done much better in terms of providing an equitable funding distribution.

Table 2

Summary of Findings from Is School Funding Fair? [28]

		Maryland	New Jersey	New York	Ohio	Pennsylvania	West Virginia
Funding Distribution	Grade	F (90%)	B (107%)	F (84%)	A (120%)	D (91%)	B (104%)
Effort	Grade	A (4.0%)	A (4.9%)	A (4.5%)	A (4.0%)	A (4.0%)	A (4.4%)
Funding Level	Rank	9 ($12,695)	5 ($14,226)	2 ($16,752)	19 ($10,828)	8 ($12,939)	20 ($10,716)
Coverage	Rank	46 (84%/161%)	18 (87%/135%)	45 (84%/163%)	39 (85%/146%)	41 (84%/146%)	7 (92%/151%)

A July 2014 report by the Center for American Progress uses the same national data set to identify the most financially disadvantaged local public school districts nationwide. Findings of that report include:

a) In the large city category, Chicago and Philadelphia top this list.
b) In the midsized city category, Reading and Allentown top the list, with Lebanon ranking high as well.
c) Pennsylvania ranks third overall in the statewide percentage of children attending severely financially disadvantaged districts, behind only Illinois and New Hampshire, with about 15 percent of children statewide attending financially disadvantaged districts.

Figure 1 represents findings from ongoing work which tracks funding distributions over the past 20 years for all states. We show distributions of current spending per pupil (inclusive of federal funding) which tend to be somewhat more progressive or less regressive than state and local revenues alone. Ohio and New Jersey have maintained progressively financed systems for the past 20 years, with New Jersey escalating then declining substantially. By contrast, Pennsylvania and New York have maintained persistently regressive state school finance systems. These patterns are confirmed when using data from Pennsylvania state sources [see Appendix C].

Figure 1

Current Expenditure per Pupil School Funding Fairness Ratio 1993 to 2012
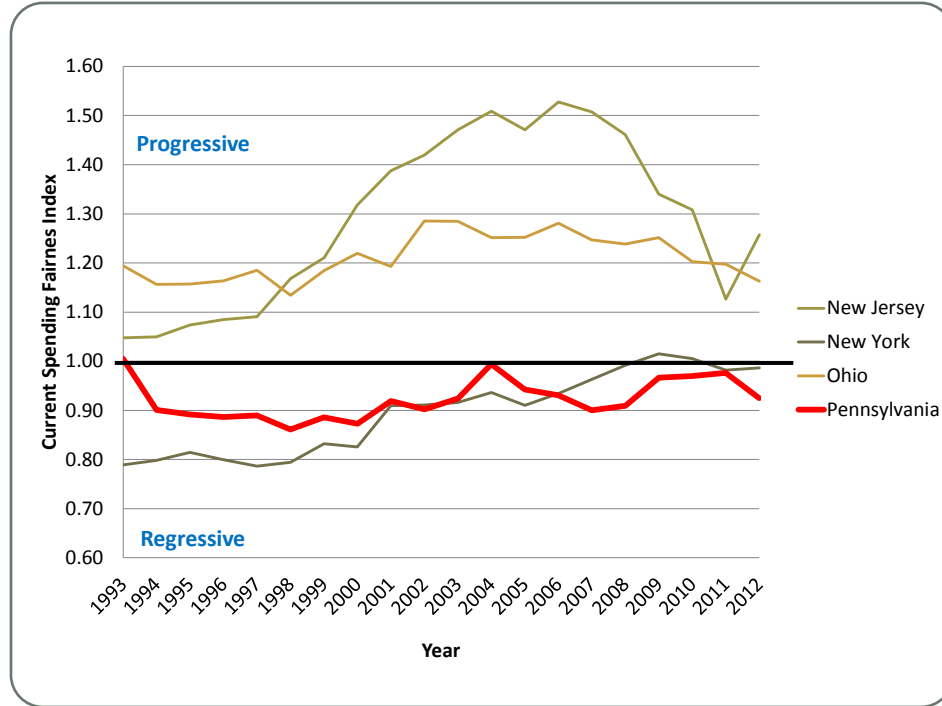
Notes: Estimated using *Funding Fairness* model, with current expenditures per pupil as dependent variable, census poverty, district enrollment and competitive wages as independent variables. Models weighted for district enrollment. See data sources in Appendix A.

Trends in Pennsylvania's School Finance Data

In this section, we explore available data on Pennsylvania's school finance system. Our data sources are laid out in Appendix A. We rely also on recent reports including *Is School Funding Fair?* from the Education Law Center of New Jersey, Rutgers University, and Educational Testing Service; and two recent reports[29] from the Center for American Progress.

We begin with descriptive analysis of recent and longer term trends. Figure 2 summarizes the revenue structure of Pennsylvania school districts organized into poverty quintiles (there are roughly 100 districts in each quintile) over the most recent four years of available data (2010 through 2013). Several key patterns are notable:

- In each year, the 100 school districts with the lowest poverty had the highest average combined revenue.

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Pennsylvania's average spending and growth in spending has remained relatively strong, but gaps between high-poverty and low-poverty districts are large and growing, and state share of responsibility persistently low.

- Over the four-year period, cumulative revenues of the lowest poverty districts continue to grow, while the cumulative revenues of the highest poverty districts remain static.

- Striking disparities in local revenue are only marginally mitigated with state aid. Lack of sufficient state support appears to be a significant source of cumulative inequity in Pennsylvania's school finance, but is not the only source (see Baker & Corcoran, 2012).[30] In some cases, state aid reinforces, rather than mitigates disparities. These inequalities are partially apparent in Figure 2 in the amount of state aid provided to the lowest poverty districts, a seemingly illogical allocation of aid, given the shortfalls of high-poverty districts.

Figure 2

Revenue Decomposition by Poverty Quintile
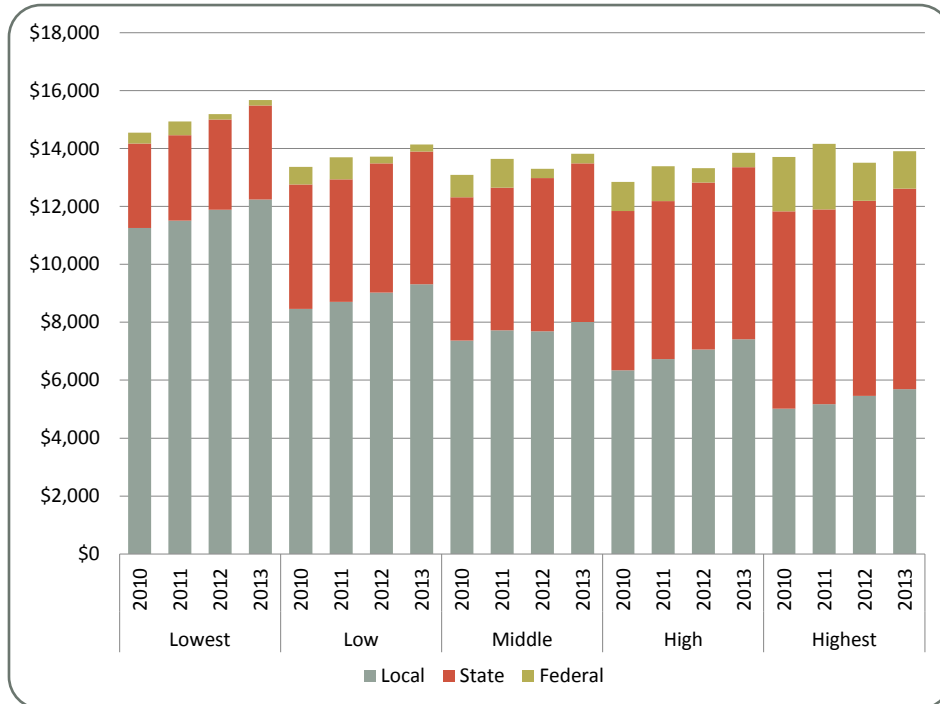
Data source: Pennsylvania Department of Education, "Summaries of Annual Financial Report Data." Averages weighted for district enrollment. See Appendix A.

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Figure 3 uses federally available data to summarize state and local revenue per pupil over time, based on the statistical model used in *Is School Funding Fair?*, predicting state and local revenue for a district of common characteristics across states.[31] Among neighboring states, Pennsylvania has relatively average total state and local revenues per pupil, and those revenues, in the aggregate, have grown steadily over time (not inflation adjusted). Pennsylvania appears to exhibit only a flattening of the trend during the recent downturn.

Figure 3

State and Local Revenue per Pupil for Regional States from 1993 to 2012
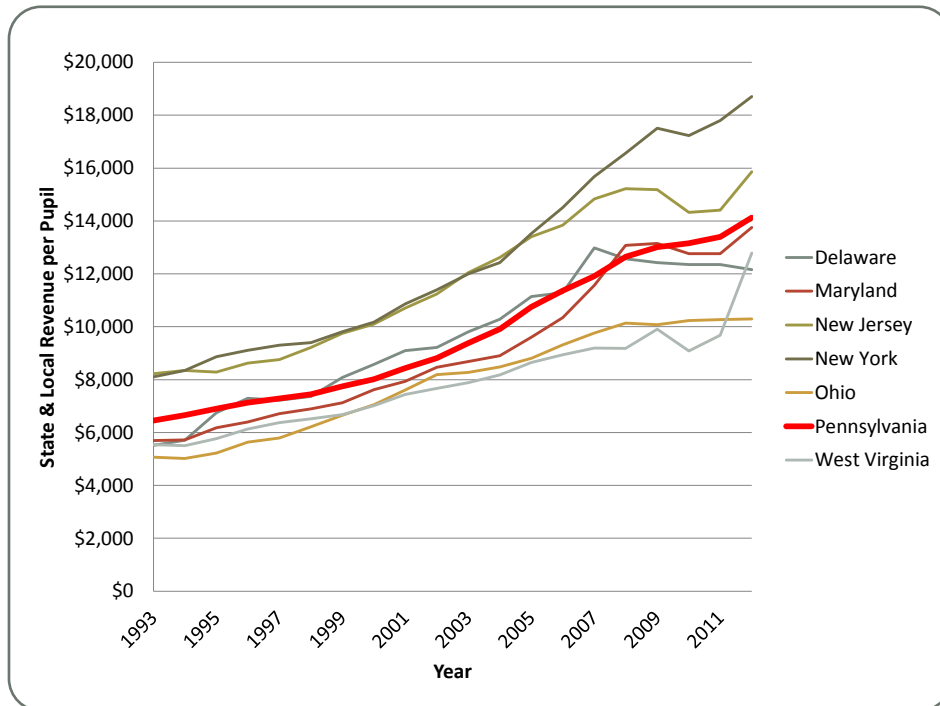
Data Source: U.S. Census Fiscal Survey of Local Governments (F-33) and Small Area Income and Poverty Estimates [see Appendix A]. [Predictions for the Average District with 10 Percent Poverty and Greater Than 2,000 Pupils].

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Figure 4 looks within the overall revenue picture to track state share from 1993 to 2012. Pennsylvania posts among the lowest state shares over time, and the state share steadily decreases over this period. Notably, New Jersey, a state whose finance system tends to be far more equitable than Pennsylvania's, also has relatively low state share. That is, low state share alone need not determine overall funding fairness. The key is to target the state aid where needed most and limit the extent to which state aid is disbursed to less needy students and districts. Further, reliance on property taxes has some virtues, most notably, revenue stability.[32] While Pennsylvania's low state share contributes to inequities, the state's heavy continued reliance on property tax revenues may also have provided a partial buffer to the recent economic downturn.

Figure 4

State Share from 1993 to 2012

Data Source: U.S. Census Fiscal Survey of Local Governments (F-33) [see Appendix A].

Figure 5 looks across districts in Pennsylvania to provide a more detailed look at state and local revenues across poverty quintiles over recent years (2010 through 2013). Here, we can see that while the poorest 100 districts lagged behind in recent years, the lower poverty quintiles extended their advantage (i.e., the trend line for the highest poverty districts proves to be flatter and diverging from those with lower poverty).

Figure 5

State and Local Revenue by Poverty Quintile from 2010 to 2013
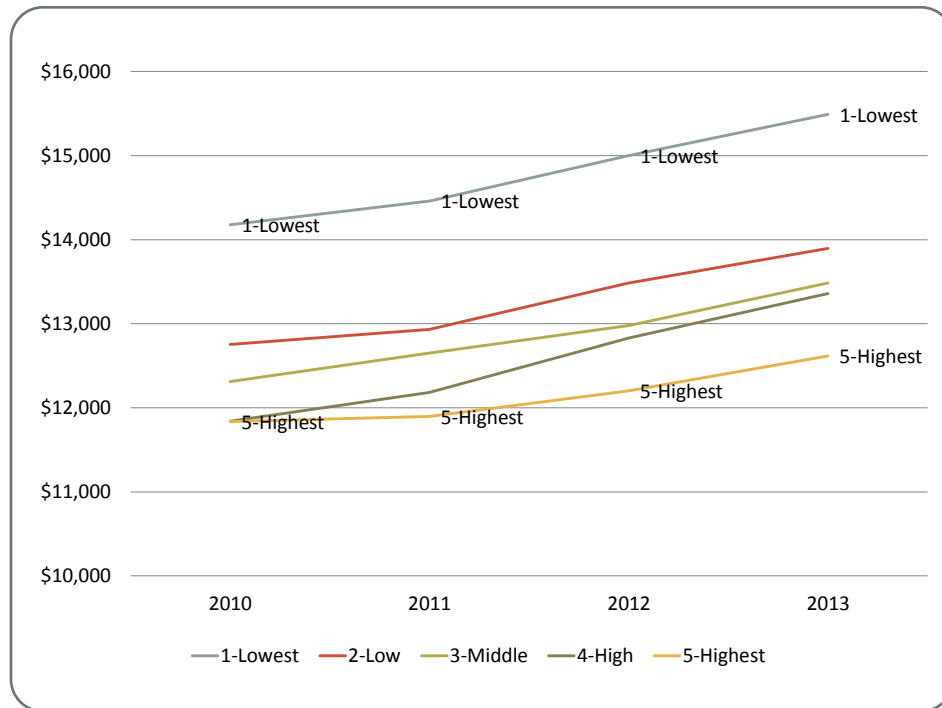
Data Source: U.S. Census Fiscal Survey of Local Governments (F-33) and Small Area Income and Poverty Estimates [see Appendix A]. Averages weighted for district enrollment.

Other notable patterns found in Figure 5 include:

- There was an approximately $2,000 per child difference in the total amount of revenue spent by the poorest and richest districts in 2010.
- By 2013, this disparity had grown to approximately $3,000 per child.
- Spending increases per child in the state's richest districts outpaced those in all other quintiles.

Figure 6 presents an alternative view in which we have taken each district's combined state and local revenue and expressed it relative to the average district's state and local revenue in its labor market. A similar method is used for identifying fiscally disadvantaged districts in the recent report *America's Most Financially Disadvantaged Schools and How They Got That Way.*[33]

Figure 6

State and Local Revenue Relative to Labor Market Averages by Poverty Quintile from 2010 to 2013
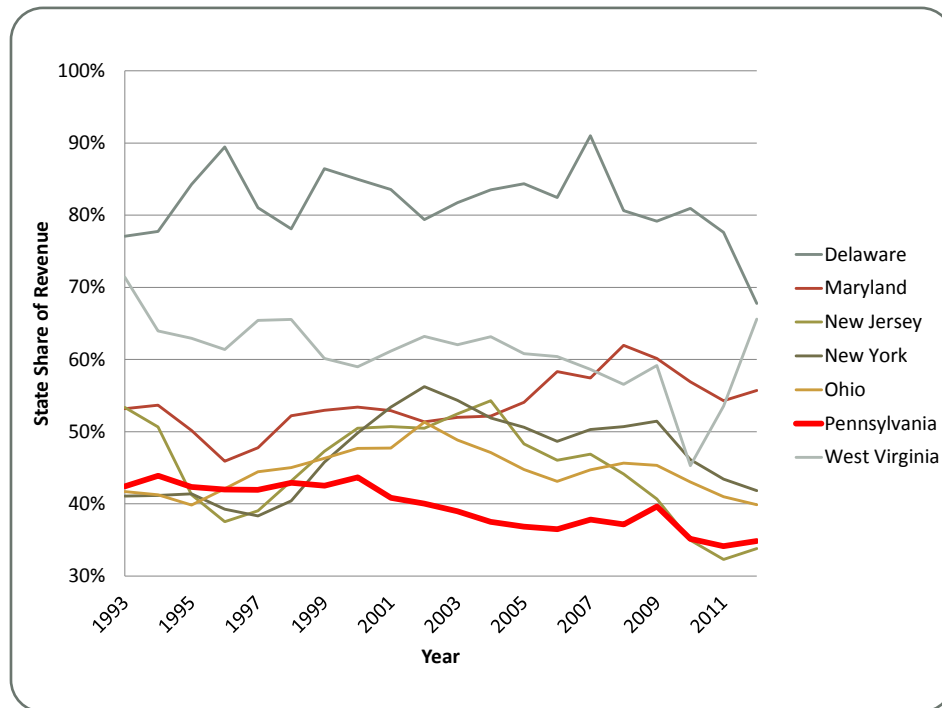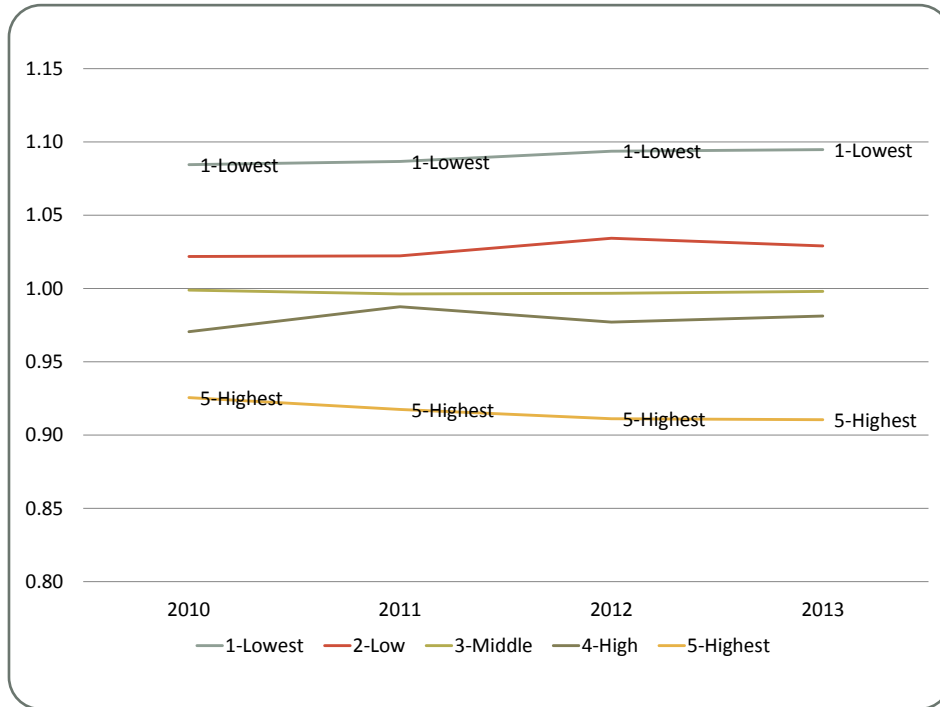

Data Source: U.S. Census Fiscal Survey of Local Governments (F-33) and Small Area Income and Poverty Estimates (see Appendix A). Averages weighted for district enrollment.

Here again, we see the highest poverty districts trailing off in relative funding over time, and an increasing gap between the lowest and highest poverty districts. The relative position of those in the middle stays constant.

Student Outcomes

Table 3 summarizes Pennsylvania's outcomes on NAEP assessments with appropriate adjustments for statewide child poverty rates. (Figures are expressed as standardized scores, given "expectations" based on the poverty rate in each state.)

The table includes three components:

1. First, we provide an analysis of NAEP mean scale scores for 2013. But, because states with higher poverty rates tend to have lower scale scores, the scale scores in the table are adjusted for the state poverty rate.

2. Second, we provide an analysis of NAEP scale score gains for 8th grade for the past 10 years (2003-2013). Because states with lower starting points tend to show higher gains on NAEP, the gains in the table are adjusted for the starting point.

3. Third, we include a measure of the achievement gap between children qualified for free or reduced price lunch and other students. Again, simple gap comparisons would be deceptive because the size of the gap in test scores between low-income and non-low income children is associated with the size of the income gap between low-income and non-low-income children. Some states simply have more income inequality across families, and that inequality influences outcome inequality. So again, we adjust the gap measure, and report as a standardized score indicating whether a state's achievement gap is bigger or smaller than expected given that state's income gap [see Appendix D].

Table 3

Pennsylvania's NAEP Outcomes in Regional Context

	Poverty Adjusted (Std.) Scale Score 2013[1]		Initial Score Adjusted (Std.) Gains 2003-2013[3]		Income Gap Adjusted (Std.) Gap 2013[4]		Income Gap Adjusted (Std.) Gap 2013[4]	
	Grade 8		Grade 8		Grade 8		Grade 4	
State	Math	Reading	Math	Reading	Math	Reading	Math	Reading
Delaware	-0.70	-0.38	-0.55	-0.65	-1.12	-1.77	-0.34	-0.48
Maryland	-0.96	0.56	0.59	2.70	0.77	0.10	0.58	-0.11
New Jersey	1.18	1.17	2.56	1.98	-0.06	0.63	-0.48	-1.10
New York	-0.07	0.40	-1.25	-0.74	-2.16	-1.17	-1.59	-1.13
Ohio	1.90	1.27	0.61	-0.14	0.14	0.86	-0.26	-0.47
Pennsylvania	0.92	1.16	1.29	1.44	1.72	2.08	1.20	0.57
West Virginia	-1.38	-1.61	-1.51	-2.24	-1.11	-0.08	-1.25	-1.15

[1] State mean scale score is regressed on state child poverty rate for each NAEP wave and standardized residuals are used to characterize the extent that states meet expectations, given their poverty rates. Correlations between poverty and scale scores. (See Appendix E.)
[3] State scale score change from 2003 to 2013 is regressed on state mean scale score for 2003 and standardized residuals are used to characterize the extent that states meet expectations for scale score change. Correlations between scale score change and initial score. (See Appendix E.)
[4] Difference between mean scale score for non-low income children and low-income children is regressed on the difference in median household income for non-low income and low-income families (based on data from the American Community Survey). Standardized residuals are used to characterize the extent that income achievement gaps are larger or smaller than expected given the income gap. Correlations between scale score gaps and income gaps. (See Appendix E.)

To summarize the results provided in Table 3, Pennsylvania:

- Exhibited better performance in 2013 on both 8th grade reading and math than would be expected given its incidence of child poverty.
- Had larger average gains from 2003 to 2013 in both 8th grade reading and math than would be expected.

- For both 4th and 8th grade in math and reading, there were larger achievement gaps between children from high-income and low-income families than would be expected given the income level gap between high- and low-income families.

Among the states in the table, only New Jersey beats Pennsylvania on measures of performance level, adjusted for poverty and average gains. But, New Jersey, unlike Pennsylvania, has smaller than expected achievement gaps on three of the four NAEP assessments (only in 8th grade reading did New Jersey exhibit a larger than expected achievement gap).

Pennsylvania exhibits better absolute performance and larger average gains than other similar states in reading and math, but also exhibits larger achievement gaps between children from high-income and low- income families.

Evaluating Input Equity and Fiscal Neutrality

This section explores commonly reported measures of variation in financial resources that can be applied to the evaluation of Pennsylvania's school finance system. Historically, school finance equity analysis involved a) assessing **variance** in measures of per-pupil spending and revenue; and b) assessing the extent to which that variance is associated with measures of local wealth and income,[34] referred to as **fiscal neutrality** analyses. The assumption behind fiscal neutrality analysis is that the resources available to a child for her education should not be contingent upon the wealth of the community in which she lives. To an extent, traditional fiscal neutrality analysis can be interpreted as the flip side of our progressiveness analysis, in that it involves evaluating whether wealthier (usually by tax base measures, like property wealth) districts have more resources than poorer ones. Where property wealth is inversely related to child poverty, which is not always the case, these correlations would reflect the same pattern but in the opposite direction.

Typically, as reported in outlets like Education Week's *Quality Counts*[35], measures of spending variation or fiscal neutrality do not include controls, or corrections for other district characteristics, as we do in our funding fairness analysis. That is, they address simple, nominal variations, without concern for whether those variations are "equitable" variations (need and cost based) or inequitable ones (wealth related). [36] (See Appendix E for correlations between traditional indicators and funding fairness indicators.)

Table 4 summarizes nominal variations two ways:

- The **Federal Range Ratio (FRR)** reflects district per-pupil spending or revenue at the 95th percentile to per-pupil spending or revenue at the 5th percentile.

- The **Coefficient of Variation (CV)** takes advantage of the fact that roughly two-thirds of a standard distribution falls within one standard deviation of the mean, and roughly 95 percent of the distribution falls within two standard deviations. CV is simply the standard deviation expressed as a percentage of the mean.

Table 4

Nominal Spending Variation across Pennsylvania School Districts

Year	Federal Range Ratio (FRR) (95th Percentile / 5th Percentile Ratio)[1]			Coefficient of Variation (CV) (Standard Deviation / Mean)[2]	
	Current Spending Per Pupil	*State & Local Revenue Per Pupil*		*Current Spending Per Pupil*	*State & Local Revenue Per Pupil*
2010	1.59	1.70		0.164	0.185
2011	1.61	1.70		0.163	0.186
2012	1.63	1.69		0.164	0.186
2013	1.63	1.66		0.157	0.181

[1] Otherwise known as the Federal Range Ratio, a ratio of the resource levels of the 95**th** percentile district to those of the 5**th** Percentile district.
[2] Coefficient of variation is the standard deviation expressed as a percent of the mean.

Table 4 shows that state and local revenue varies more widely than do current expenditures. But again, we do not know the share of this variation that is associated with legitimate cost factors versus wealth and income, though we do have insights from other studies that indicate that revenue generated under Pennsylvania's school finance system tends to be negatively associated with child poverty.

Spending and revenues vary substantially across Pennsylvania school districts and those variations remain associated with wealth and income.

- The FRRs in Table 4 tell us that the 95th percentile spending district has about 60 percent higher spending than the 5th percentile district. State and local revenue is 70 percent higher. What we don't know is whether these ratios are warranted by one or more cost factors.
- The CVs in Table 4 show us that two-thirds of children attend districts with per-pupil spending that is about 16 percent more or less than that attended by the average child. A common benchmark used in early school finance equity litigation was that the CV should not exceed 10 percent; however, this benchmark did not take into account the possibility that cost variation might warrant spending variation in excess of 10 percent.

Figure 7 shows the correlations between spending per pupil; state and local revenues per pupil; and measures of poverty, wealth and income, weighted by district enrollment from

2010 to 2013. The Market Value/Personal Income Aid Ratio (MVPI) is the share of Basic Education Funding to be paid in state aid, based on the combination of market values of taxable properties and personal income of each school district in relation to the state average. Local public school districts with greater wealth or income have lower MVPI aid ratios.

State and local revenues are consistently negatively associated with census poverty rates, and that correlation seems to be getting marginally stronger. Total expenditures, including federal dollars, shift from no correlation with poverty (2010) to slightly positive (2011), to slightly negative (2012-2013). That is, picking up where the federal data panel ends in Figure 7, current spending per pupil continues to become more regressively distributed.

Figure 7

Correlations between Spending and Revenues, and Measures of Poverty Wealth, and Income from 2010 to 2013
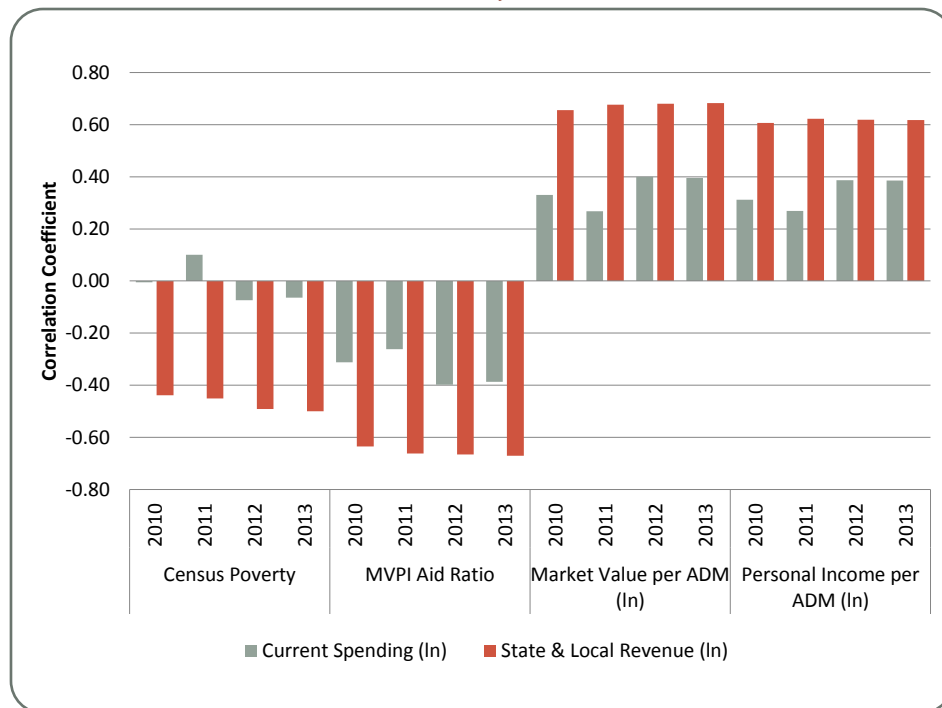
Data source: Pennsylvania Department of Education. See Appendix A.

State and local revenues per pupil are positively associated with measures of both property wealth and personal income. That is, districts with greater wealth and income tend to have higher combined state and local revenues. While the correlations are somewhat smaller, it is also the case that districts with greater wealth and income tend to have higher per-pupil spending. That is, on balance, the Pennsylvania school finance system does not appear to be fiscally neutral, a finding consistent with *Is School Funding Fair?* and the two recent Center for American Progress reports.

Table 5 takes this analysis a step further, in order to discern whether wealth (sales value of taxable property per average daily membership) and income (personal income per average daily membership) have different influences in rural, urban, and suburban communities and whether, as a result, there exist differences in changes in spending across communities by their locale. Dissecting the relationship between wealth, income and spending by locale may provide insights for revisiting how the state sets its aid ratios and whether it remains appropriate to use a common approach to setting aid ratios regardless of district geographic locale. To simplify, we have listed in Table 5 only whether the estimated relationship between the measure in question and current spending is positive or negative. Models were estimated using four years of data on all districts in the state, but some categories, like the "large city" category have only a few districts (in this case two times four years, for a total of eight observations).[37]

The last three columns in Table 5 show that over the four-year period, relative to the baseline year (2010) per-pupil spending (not inflation adjusted) tended to grow in all but the city locales, where per-pupil spending actually declined on average in 2012-13 (and even earlier for midsize cities). We also see that for districts that are suburbs of large or midsize cities, both wealth and income positively influence spending levels. The role of property wealth is less consistent in "towns" outside of urbanized areas. Income is consistently negatively associated with school spending in rural communities, while property wealth is consistently positively associated with school spending. It is not uncommon to find that income measures more strongly explain spending variation in large metropolitan areas, where suburban income variation often drives school budgets, while also finding that income variation in rural communities has little or no influence on school spending variation. Others have produced similar findings in states such as Missouri.[38] [See Appendix F for coefficients.]

Table 5

Factors Predicting Current Spending Vary by Locale

Locale[1]	N	Wealth/Income Factors		Spending by Year (Relative to Baseline Year of 2010)		
		Market Value per ADM (ln)	Personal Income per ADM (ln)	2011	2012	2013
Large City	2	+	-	+	-	-
Midsize City	2	+	+	-	-	-
Small City	12	+	-	+	-	-
Suburb/Large	171	+	+	+	+	+
Suburb/Midsize	21	+	+	+	+	+
Suburb/Small	20	-	+	+	+	+
Fringe Town	27	-	+	+	+	+
Distant Town	58	+	+	+	+	+
Remote Town	10	-	+	+	+	+
Fringe Rural	82	+	-	+	+	+
Distant Rural	82	+	-	+	+	+
Remote Rural	12	+	-	+	-	+

Note: Based on regression model of natural log of current expenditure per pupil as a function of a) market value per ADM, b) personal income per ADM, (c) year, and d) district enrollment size. Separate regressions run for each locale.
[1] See: **http://nces.ed.gov/ccd/rural_locales.asp** for details.

Evaluating Equal Educational Opportunity and Relative Adequacy

We next explore measures of equal educational opportunity and educational adequacy. We begin here with adequacy in part because Pennsylvania largely adopted the results of a study of the costs of providing an adequate education. Further, through 2010-11, the state continued reporting in its Basic Education Funding formula worksheets funding gaps between adequacy targets based on the study and current spending. In discussing adequacy, we look specifically at these reported gaps.

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We take two alternative approaches to evaluate equal educational opportunity. In the first, we use the 2010-11 adequacy targets and convert those targets into an implicit cost index.[39] We then use that cost index to "adjust" current spending for costs.[40] In this case, we are without cost adjustments for differences in special education populations or transportation, making our cost index less thorough than we would like, but still useful. Finally, we define the Equal Opportunity Gap by taking the difference between each district's cost-adjusted current spending and the cost-adjusted current spending of the average district.[41]

Our second approach of creating a research-derived weighted index (weighted index) applies findings from related research to construct a weighting system to address needs and costs, specifically poverty weighting,[42] ELL weighting[43] and regional wage variation.[44] We start by constructing a weighted pupil count, similar to the approach used in the now abandoned BEF formula,[45] which we convert into a pupil need index in two steps, first taking the ratio of weighted pupils to average daily membership,[46] and then re-centering our index around the average need district (so that an index value of 1.0 represents the cost of the average need district).[47]

The Pennsylvania school finance system fails to provide for equal educational opportunities or educational adequacy for children attending the state's highest need school districts.

We similarly re-center the NCES Comparable Wage Index (CWI) around the state average[48], and then create an overall cost index by combining our pupil need index with the re-centered CWI (competitive wage index).[49] We then use this cost index to adjust current operating expenditures per pupil for needs and costs.[50] Finally, we compare each district's operating expenditures to the average district to estimate the *Equal Opportunity Gap*.[51] In this case, we are also missing cost adjustment for special education and transportation, and we are missing cost adjustment for economies of scale. Still, while incomplete, this approach also yields important illustrative findings.

Adequacy

Figure 8 shows the differences in 2010 and 2011 between prior year actual spending and current year adequacy targets. Because the adequacy study set a high bar, districts, regardless of their poverty quintile, show substantial adequacy shortfalls. But, importantly, the figure shows that districts in the highest poverty quintile show much larger adequacy shortfalls, approaching $4,000 per pupil compared to $1,200 per pupil in the lowest poverty quintile.

Figure 8

***Basic Education Funding Adequacy Shortfalls (per ADM) by Poverty
Quintile in 2010 and 2011***
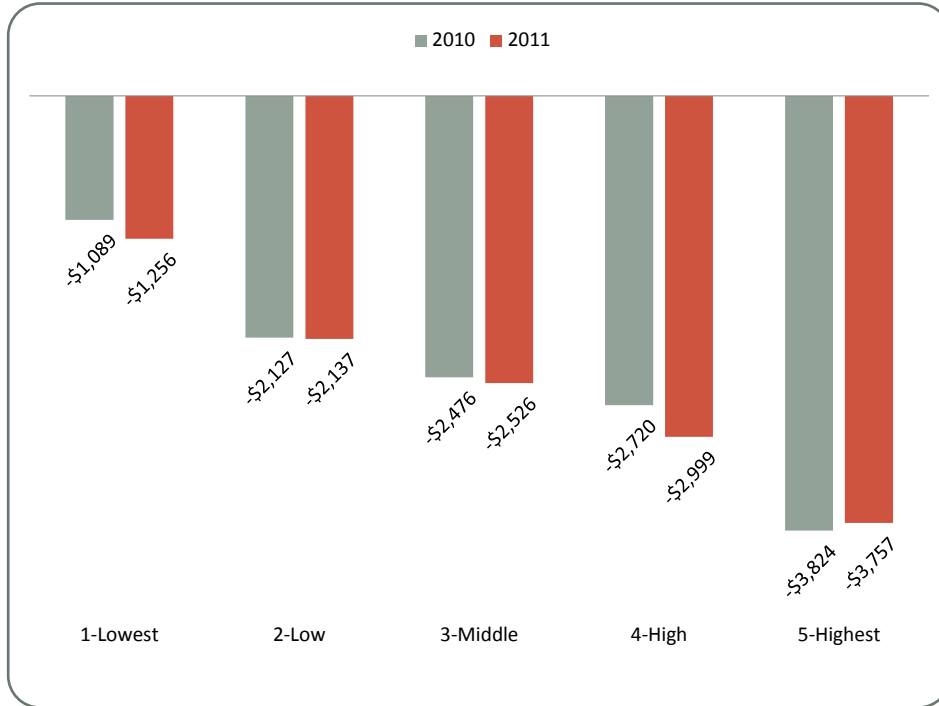
Notes: Adequacy shortfall per modified ADM from BEF worksheets. Group
averages weighted by district enrollment.

While the Commonwealth has failed to continue operating the formula, and update
these shortfalls, we do know from analyses in this report that per-pupil spending in high-
poverty cities in particular has declined, even without taking into account inflation. As such, we
can be quite confident that the adequacy shortfalls seen in 2011 have most likely gotten worse,
not better, for higher-poverty districts in particular.

Equal Educational Opportunity

Figure 9 recasts the BEF adequacy shortfalls and uses our weighting and cost adjustment system (research-derived weighted index) to calculate equal opportunity gaps relative to the district with the average cost-adjusted current expenditure. In Figure 9 we see that when using the weighted index, the lowest poverty quintile of districts has approximately $1,000 per pupil more than needed to achieve average outcomes. The next two poverty quintiles are near average. The second highest poverty quintile spends just under $1,000 less per pupil than is theoretically needed to provide an opportunity equal to the average district. The highest poverty quintile of districts has equal opportunity deficits on the order of $2,500 in the final year, and those deficits have grown systematically over the past four years. The columns on the left side of the figure show that gaps are somewhat smaller when relying on the cost adjustment system built into the Basic Education Funding formula as of 2010 and 2011.

Figure 9

Equal Educational Opportunity Surpluses and Deficits Relative to Statewide Mean from 2010 to 2013
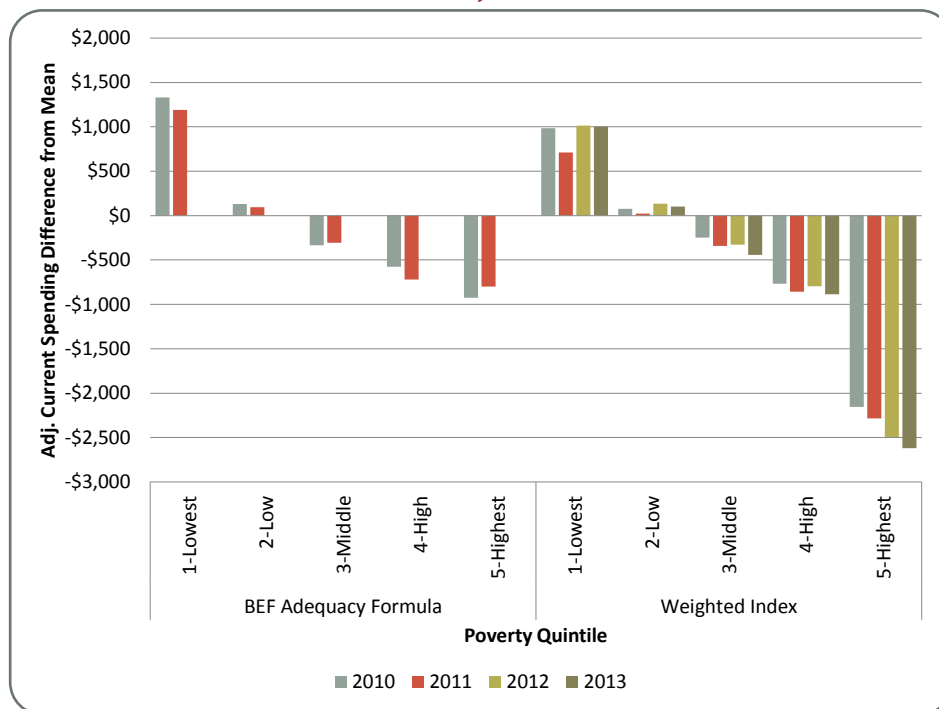
Notes: Compares each district's need- and cost-adjusted current spending to the average district. Research weights are 1.49 x census poverty & 0.60 x ELL, with Education Comparable Wage Index (ECWI) to account for wage variation. BEF cost adjustment based on district "Adequacy Target" per Modified ADM for each district (from BEF worksheets). Group averages weighted for district enrollment.

Are Funding Gaps Associated with Outcome Gaps?

The next question is whether there truly are substantive differences in student outcomes across categories of districts based on the size of their adequacy or equal opportunity deficits. This is a version of the weak validity check, which we discuss in greater detail in Chapter 2, whereby one asks of an adequacy analysis whether districts with inadequate resources in fact have inadequate outcomes. Notably, in many state school finance systems, there is some circularity to this reasoning. In many systems, like Pennsylvania, it is the districts serving higher need students that have the largest funding gaps and those are the same districts that tend to have lower average outcomes. However, additional statistical tests suggest that even when controlling for district population characteristics and labor costs, improvements to funding gaps are positively associated with improvements to PSSA proficiency rates and SAT Scores [see the models in Appendix G].

District with larger funding shortfalls, either with respect to equal opportunity or adequacy targets, have systematically lower outcomes, even after controlling for child poverty and language proficiency.

Note that the 100 districts with the largest funding gaps have average shortfalls just over $3,000 per pupil by our weighted index, compared against the mean, and over $2,000 per pupil using a cost index derived from the 2011 BEF. These districts serve about 20 percent, or over 300,000, of the state's students. Thus, correcting these gaps by redistribution alone would require shifting from wealthier to poorer districts, $600 to $900 million at a minimum.

Figure 10 shows the average combined SAT scores of districts by the size of their funding gaps. Districts with the largest funding gaps using our BEF-based indices have combined average SAT scores around 1,300 compared to districts with the largest opportunity surpluses which exceed, on average, 1,500. Gaps in outcomes are similar when using our weighted index. Districts with the largest funding gaps have average SAT combined scores between 1,300 and 1,350 compared to scores approaching the College Board's "College Ready" target of 1,550 for the districts having the greatest relative funding surpluses. [See Appendix H for comparisons of SAT and PSSA performance across districts.]

Figure 10

Equal Educational Opportunity Funding Gaps and Combined SAT Averages from 2010 to 2013
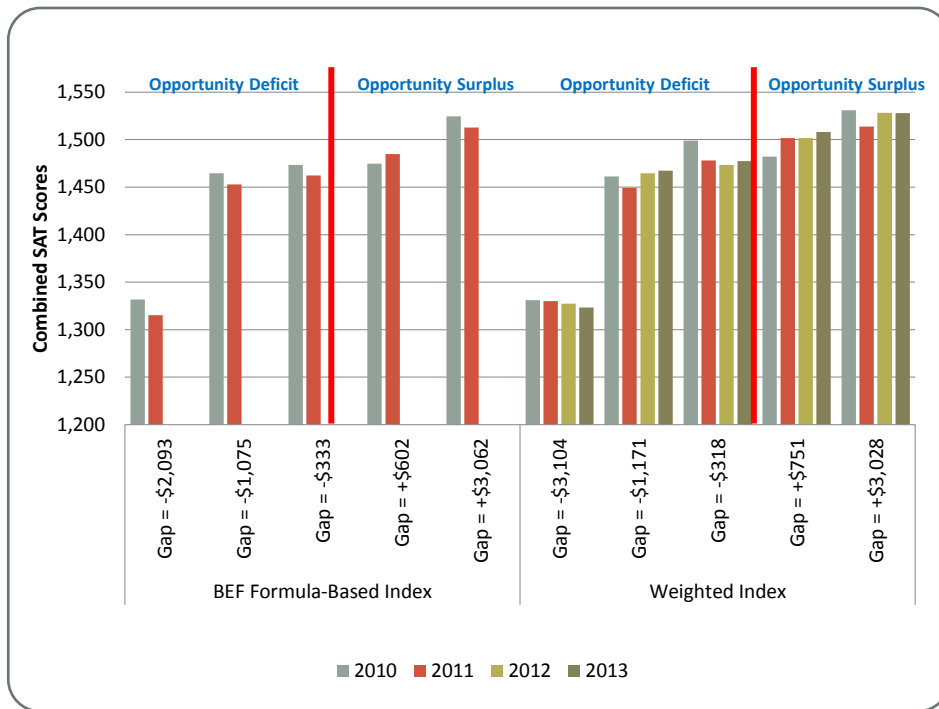
Notes: Equal Educational Opportunity Funding Gaps compare each district's adjusted current spending with the average district. Combined SAT Scores from Pennsylvania Department of Education. Group averages weighted by district enrollment. See data sources in Appendix A.

Figures 11 and 12 paint parallel pictures using PSSA districtwide proficiency rates. Those districts with the largest funding gaps have math proficiency rates around 65 percent, with the research weight approach showing declines below this rate in the two more recent years (2012 and 2013), compared to over 80 percent for the most advantaged districts. Districts with the largest funding gaps have reading proficiency at or below 60 percent and also declining in the most recent years. Advantaged districts approach and reach 80 percent reading proficiency.

Related analyses bridging PSAA math and reading proficiency to SAT college readiness benchmarks presented in Appendix H show that on average, districtwide, a district with 88 percent math proficiency and 85 percent reading proficiency is likely to have near an average SAT combined score of 1,550.

Figure 11

Equal Educational Opportunity Funding Gaps and Proficiency Rates on State Math Assessments from 2010 to 2013

Notes: Equal Educational Opportunity Funding Gaps compare each district's adjusted current spending with the average district. Pennsylvania State Assessment data from Pennsylvania Department of Education. Group averages weighted by district enrollment. See data sources in Appendix A.

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Figure 12

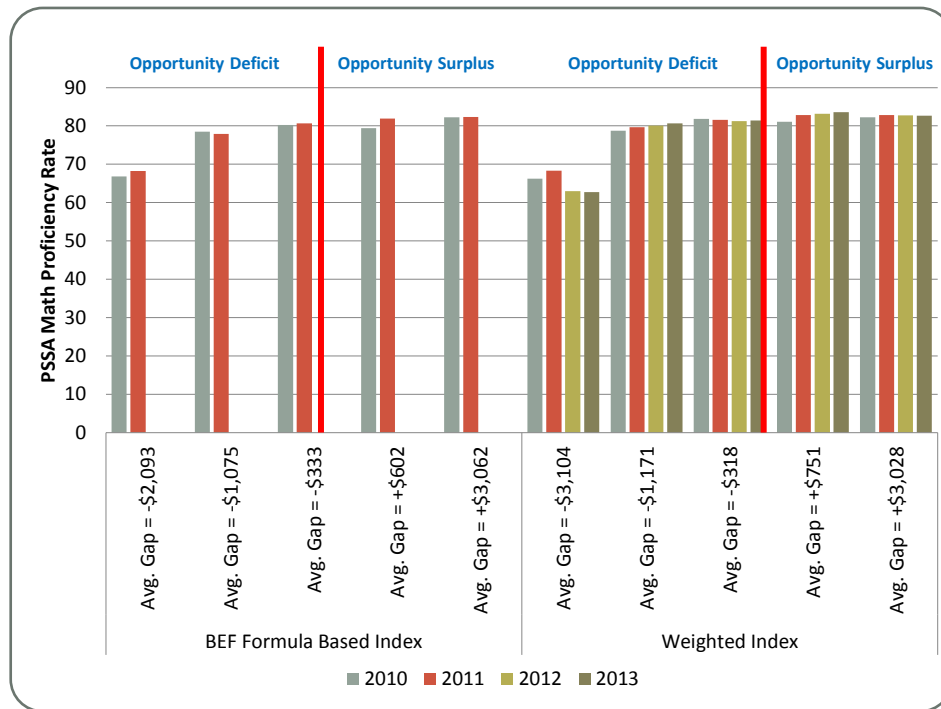*Equal Educational Opportunity Funding Gaps and Proficiency Rates on State Reading Assessments from 2010 to 2013*
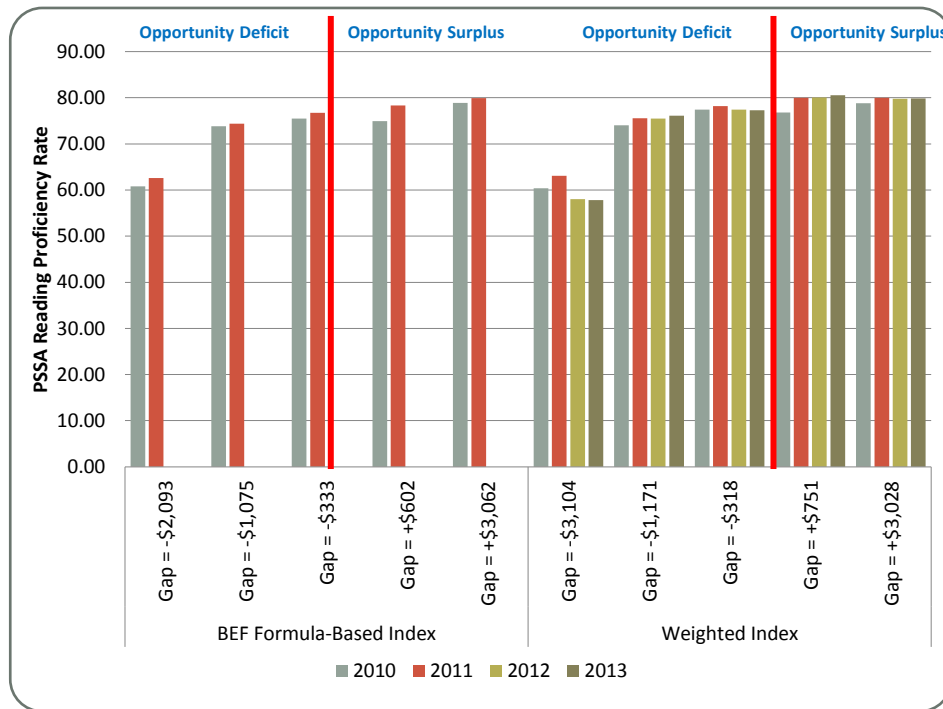
Notes: Equal Educational Opportunity Funding Gaps compare each district's adjusted current spending with the average district. Pennsylvania State Assessment data from Pennsylvania Department of Education. Group averages weighted by district enrollment. See data sources in Appendix A.

Summary

The current state of education in the Commonwealth is a mixed story. When it comes to average levels of combined state and local contributions to elementary and secondary education, Pennsylvania:

- Has relatively high combined total state and local revenue when compared nationally, and relatively average state and local revenue compared regionally;
- Has shown reasonably solid combined state and local revenue and current operating spending growth over time; and
- Spends a relatively high share of gross state product in combined state and local revenue for elementary and secondary education (8th among states).

In addition, when it comes to commonly cited measures of student outcomes, including the National Assessment of Educational Progress (NAEP), Pennsylvania:

- Has higher than expected NAEP scale scores in 8th grade reading and math after controlling for child poverty rates; and

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- Has greater than expected 10-year growth from 2003 to 2013 in NAEP mean scale scores.

However, these positive signs regarding the average conditions in the Commonwealth mask significant concerns. Analyses herein reaffirm that Pennsylvania:

- Continues to have among the lowest state aid contributions to local public school districts in the region with much of the sustained level and growth of education likely coming from property tax revenues, and those property tax revenue increases are therefore likely responsible for the widening divide in educational funding between the state's lower and higher poverty school districts;
- Is consistently among the most regressively funded – higher poverty districts having systematically lower revenues per pupil than lower poverty districts – state education systems in the nation;
- Is home to many of the most financially disadvantaged local public school districts in the nation; and
- Continues to have large gaps between actual spending levels and "adequacy target" spending levels set under the 2008 reform, and very large disparities in those gaps between higher and lower poverty districts.

Put simply, the state's school finance system can be characterized by reasonable averages but very large gaps. Moreover, these resource gaps are coupled with outcome gaps. For example, Pennsylvania:

- Has much larger than expected achievement gaps between low-income and non-low-income children in grade 4 and 8 reading and math on the NAEP, after correcting for differences in income between these groups;
- Districts in the quintile with the largest relative funding shortfalls (relative to the average district) have average SAT scores approximately 200 points lower than the most financially advantaged districts;
- Districts in the quintile with the largest relative funding shortfalls have about 15 percent lower math proficiency and 20 percent lower reading proficiency rates on state assessments; and
- Even when controlling for district population characteristics and labor costs, improvements to funding gaps are positively associated with improvements to PSSA proficiency rates and SAT Scores, and smaller funding gaps are associated with higher PSSA proficiency rates and SAT scores.

CHAPTER 2. Equity and Adequacy in School Finance: From Conceptions to Aid Formulas

Reforms across the nation to state school finance systems have been focused on simultaneously achieving equal educational opportunity and educational adequacy. While achieving and maintaining educational adequacy requires operating a school finance system that consistently and equitably meets a certain level of educational outcomes, it is important that in those cases where the funding provided falls below adequacy thresholds, equal educational opportunity is maintained. That is, whatever the outcome currently attained across the system, that outcome should be equally attainable regardless of where a child resides or attends school and regardless of his or her background.

State school finance systems may be reasonably guided by valid and reliable analyses of educational costs; these efforts might be focused on achieving equal educational opportunity or on specific adequacy goals. Pressures and tradeoffs exist at all stages of the process – from conceptualizing policy goals, to conducting and/or overseeing empirical analyses, to translating those analyses into "better" school finance policies that are more reasonably linked to the stated student outcome objectives. In other words, in the best case, valid, reliable and rigorous empirical analyses should serve to *guide* state school finance policy rationally toward defined goals. In the absence of such information, or in the presence of low-quality or invalid information, it is much less likely that state school finance systems will achieve desired goals.

Finally, a sizeable and growing body of research indicates that state school finance reforms can have substantive, positive effects on student outcomes, both in raising overall achievement and in reducing outcome gaps. Further, it stands to reason that if positive changes to school funding have positive effects on short and long run outcomes, then negative changes to school funding likely have negative effects on student outcomes. Thus, it is critically important to understand the impact of the recent recession on state school finance systems. It is also important to understand the features of state school finance systems including the composition of revenue sources that may make these systems particularly susceptible to future economic downturns.

Conceptions of Equity and Adequacy in School Finance

Conceptions of school finance equity and adequacy have evolved over the years. Presently, the central assumption is that state finance systems should be designed to provide children, regardless of where they live and attend school, with equal opportunity to achieve some constitutionally adequate level of outcomes.[52] Much is embedded in this statement and it is helpful to unpack it, one layer at a time.

The main concerns of advocates, policymakers, academics and state courts from the 1960s through the 1980s were to a) reduce the overall variation in per-pupil spending across

local public school districts; and b) disrupt the extent to which that spending variation was related to differences in taxable property wealth across districts. That is, the goal was to achieve more equal dollar inputs – or *nominal spending equity* – coupled with *fiscal neutrality* – or reducing the correlation between local school resources and local property wealth. While modern goals of providing equal opportunity and achieving educational adequacy are more complex and loftier than mere spending equity or fiscal neutrality, achieving the more basic goals remains relevant and still elusive in many states.

An alternative to nominal spending equity is to look at the *real resources* provided across children and school districts: the programs and services, staffing, materials, supplies and equipment, and educational facilities provided. (Still, the emphasis is on equal provision of these inputs.)[53] Providing real resource equity may, in fact, require that per-pupil spending not be perfectly equal if, for example, resources such as similarly qualified teachers come at a higher price (competitive wage) in one region than in another. *Real resource* parity is more meaningful than mere dollar equity. Further, if one knows how the prices of real resources differ, one can better compare the value of the school dollar from one location to the next.

Modern conceptions of equal educational opportunity and educational adequacy shift emphasis away from schooling inputs and onto schooling outcomes and more specifically equal opportunity to achieve some level of educational outcomes. References to broad outcome standards in the school finance context often emanate from the seven standards[54] articulated in *Rose v. Council for Better Education,[55]* a school funding adequacy case in 1989 in Kentucky argued by scholars to be the turning point from equity toward adequacy in school finance legal theory.[56] These days, a commonly referenced outcome standard is that students completing elementary and secondary education should be *college ready.[57]*

There are two separable but often integrated goals here – *equal opportunity* and *educational adequacy*. The first goal is achieved where all students are provided the real resources to have equal opportunities to achieve some common level of educational outcomes. Because children come to school with varied backgrounds and needs, striving for common goals requires moving beyond mere equitable provision of *real resources.* For example, children with disabilities and children with limited English language proficiency may require specialized resources (personnel), programs, materials, supplies, and equipment. Schools and districts serving larger shares of these children may require substantively more funding to provide these resources. Further, where poverty is highly concentrated, smaller class sizes and other resource-intensive interventions may be required to strive for those outcomes commonly achieved by the state's average child.

Meanwhile, conceptions of educational adequacy require that policymakers determine the desired level of outcome to be achieved. It may well be that the outcomes achieved by the average child are deemed to be sufficient. But it may also be the case that the preferences of policymakers or a specific legal mandate are somewhat higher (or lower) than the outcomes

achieved by the average child. Essentially, adequacy conceptions attach a "level" of outcome expectation to the equal educational opportunity concept.

Measuring Education Costs, Equal Opportunity and Educational Adequacy

As discussed in a 2008 National Research Council report by Baker, Taylor and Vedlitz, since the mid-1990s, numerous state legislatures, boards of education and advocacy groups have sought to derive empirical estimates of the "cost" of meeting specific state legislative and constitutional standards, including how those costs vary from one location to the next, and one child to the next. While efforts to link such cost estimates to constitutional, statutory and regulatory standards were popularized in the era following *Rose v. Council for Better Education* (1989), empirical methods for estimating education costs, including costs of specific standards, long pre-date this era.

Efforts to *cost out* these constitutional obligations can be reclassified into two straightforward categories:

- **Input-oriented** analyses identify the human resources/staffing, materials, supplies and equipment, physical space, and other elements required to provide specific educational programs and services. Those programs and services may be identified as typically yielding certain educational outcomes for certain student populations when applied in certain settings.
- **Outcome-oriented** analyses start with measured student outcomes, of institutions or specific programs and services. Outcome-oriented analyses can then explore either the aggregate spending on those programs and services yielding specific outcomes, or explore in greater depth the allocation of spending on specific inputs.

That is, the primary methodological distinction is whether one starts from an input perspective or with specific outcome measures. One approach works forward, toward actual or desired outcomes, starting with inputs; the other backwards from outcomes achieved. Ideally, both work in concert, providing iterative feedback to one another. Regardless, any measure of "cost" must consider the outcomes to be achieved through any given level of expenditure and resource allocation.[58]

Input-Oriented Methods

Setting aside for the moment the modern jargon of *costing out* studies,[59] there really exists one basic method for input-oriented analysis, which from the late 1970s had been given two names – Ingredients Method[60] and Resource Cost Model.[61] The method involves three basic steps:

1. Identifying the various resources, or ingredients necessary to implement a set of educational programs and services (where an entire school or district, or statewide system for that matter would be a comprehensive package of programs and services);

2. Determining the input price for those ingredients or resources (competitive wages, other market prices); and

3. Combining the necessary resource quantities with their corresponding prices to calculate a total cost estimate. (Resource Quantities × Price = Cost).

Resource cost modeling was applied by Jay Chambers and colleagues in both Illinois and Alaska[62] in the early 1980s to determine statewide costs of providing the desired level (implicitly "adequate") of programs and services, long before use of such methods in the context of school finance adequacy litigation in Wyoming in 1995.[63]

A distinction between the studies conducted prior to and after *Rose v. Council for Better Education* is that the pre-Rose studies in Alaska and Illinois focused on tallying the resource needs of education systems designed to provide a set of curricular requirements, programs and services intended to be available to all children. Modern analyses instead begin with goals statements – or the outcomes the system is intended to achieve – requiring consultants and/or expert panels to identify the inputs needed to achieve those goals. Nonetheless, the empirical method is still one of tallying inputs, attaching prices and summing costs.

Resource cost model (RCM) or ingredients method can be used to evaluate:

a) Resources currently allocated to actual programs and services (geared toward or measurably achieving specific outcomes);

b) Resources needed for providing specific programs and services where they are not currently being provided; and

c) Resources hypothetically needed to achieve some specific set of outcome goals – both depth and breadth.

In the first, case, where actual existing resources are involved, one must thoroughly quantify those inputs, determine their prices and sum their costs. If seeking findings that are generalizable, one must explore how input prices (from teacher wages to pencils and paper) vary across other sites where the programs and services might be implemented, and whether context (economies of scale, grade ranges) affects how inputs are organized in ways consequential to cost estimates.

Where hypothetical outcome goals are involved, a number of approaches can be taken including organizing panels of informed constituents, including professionals and researchers, to hypothesize, in effect, the resource requirements for achieving desired outcomes with specific populations of children educated in particular settings. Competing consultants have attached names including *Professional Judgment (PJ)* and *Evidence-Based (EB)* to the methods they prefer for identifying the quantities of resources or ingredients. Professional judgment involves convening focus groups to propose resource quantities for hypothetical schools to achieve specific outcomes, while Evidence-Based methods involve compilation of published research

into model schools presumed adequate regardless of context because of their reliance on published research.

One should expect a well-designed input-oriented resource cost analysis to engage informed constituents in a context-specific process that also makes available sufficient information (perhaps through prompts and advanced reading) on related "evidence." Put bluntly, these two methods should not be applied exclusively in isolation from one another.[64] Even under the best application, the result of this process is a hypothesis of resource needs toward desired outcome goals. Where RCM is applied to programs and services already associated with certain actual, measured outcomes, that hypothesis is certainly more informed, though not yet formally tested in alternative settings.

Outcome-Oriented Methods

The primary tool of outcome-based cost analysis is the *Education Cost Function (ECF)*.[65] Cost functions typically focus on the outcome-producing organizational unit, or decision making unit (DMU) as a whole – in this case, schools[66] or districts – evaluating the relationship between aggregate spending and outcomes, given the conditions under which the outcomes are produced. The conditions regularly include economies of scale (higher unit production costs of very small organizational units), variations in labor costs, and in the case of education, characteristics of the student populations which may require greater or fewer resources to achieve common outcome goals.

Identifying statistical relationships between resources and outcomes under varied conditions requires high quality and sufficiently broad measures of desired outcomes, inputs and conditions and sufficient numbers of organizational units to evaluate that exhibit sufficient variation in the conditions under which they operate. Much can be learned from the variation that presently exists across our local public, charter and private schools regarding the production of student outcomes, the aggregate spending, and specific programs and services associated with those outcomes.[67]

That said, cost functions have often been used in educational adequacy analysis as a seemingly *black box* tool for projecting the required spending targets associated with certain educational outcomes. Such an approach provides no useful insights into how resources (staffing, programs and services, etc.) are organized within schools and districts at those spending levels achieving those targets. We argue that this is an unfortunate, reductionist use of the method.

As an alternative to the black box spending prediction approach, cost functions can be useful for exploring how otherwise similar schools or districts achieve different outcomes with the same level of spending, or the same outcomes with different levels of spending. That is, there exist differences in relative efficiency. Researchers have come to learn that inefficiency found in an ECF context is not exclusively a function of mismanagement and waste, and is often statistically explainable. Inefficient "spending" in a cost function is that portion of spending

variation across schools or districts that is not associated with variation in children's outcomes, after controlling for other factors. The appearance of inefficiency might simply reflect the fact that there have been investments made that, while improving the quality of educational offerings, may not have a measurable impact on the limited outcomes under investigation. It might, for example, have been spent to expand the school's string or jazz program, which may be desirable to local constituents. These programs and services may affect other important student outcomes including persistence and completion, and college access, and may even indirectly affect the measured outcomes.

Factors that contribute to this type of measured "inefficiency" are also increasingly well-understood, and include two general categories – *fiscal capacity* factors and *public monitoring* factors.[68] For one, local public school districts with greater fiscal capacity – greater ability to raise and spend more – are more likely to do so, and may spend more in ways that do not directly affect measured student outcomes. But that is not to suggest that all additional spending is frivolous, especially where outcome measurement is limited to basic reading and math achievement. Public monitoring factors often include such measures as the share of school funding coming from state or federal sources, where higher shares of intergovernmental aid are often related to reduced local public involvement (and monitoring).

A thorough ECF model, as depicted in Figure 13, considers spending as a function of a) measured outcomes, b) student population characteristics, c) characteristics of the educational setting (economies of scale, population sparsity, etc.), d) regional variation in the prices of inputs (such as teacher wages), e) factors affecting spending that are unassociated with outcomes ("inefficiency" per se), and f) interactions among all of the above.[69]

Figure 13

Components of the Education Cost Function
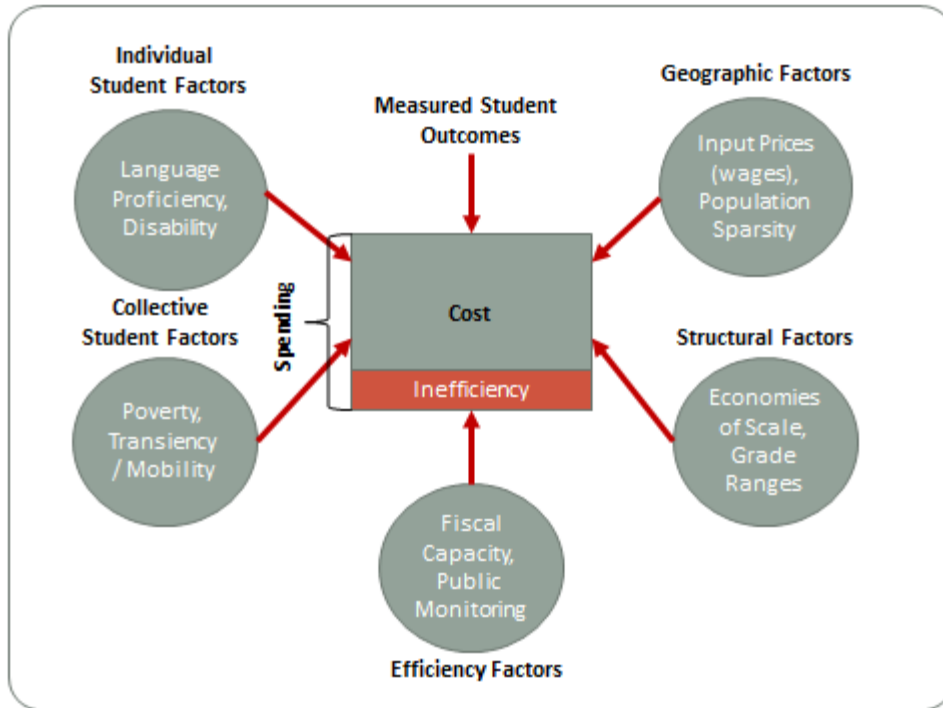
This illustration of the cost function specification helps illustrate another thorny issue regarding the consultant cottage industry of education cost analysis – that is, the use of *Successful Schools* analysis as a method for determining the "costs" of educational adequacy. In its simplest and usual form, Successful Schools (or districts) analysis simply involves taking the average expenditure of those schools or districts which currently achieve average outcomes that meet or exceed desired, perhaps adequate, levels. In some cases, consultants arbitrarily prune the sample of successful districts to include those spending the least to achieve those outcomes, claiming this screening to be a control for "inefficiency."[70] That is, the method is little more than a cost function a) without any controls for student characteristics, context or input price variation, and b) devoid of any sufficient controls for inefficiency or missing these controls altogether.[71] Put bluntly, Successful Schools analysis, in its usual application, is of negligible use for determining costs.

Table 6 summarizes our perspectives on education cost analysis as applied to measuring educational adequacy, organizing the methods into *input-oriented* and *outcome-oriented* methods, which are subsequently applied to hypothetical or actual spending and outcomes. The third column addresses the method by which information is commonly gathered, such as focus groups, or consultant synthesis of literature. The fourth column adds another dimension – the unit of analysis, which also includes the issue of sampling density. Most focus group activities can only practically address the needs of a limited number of prototypical schools and student populations, whereas cost modeling involves all schools and districts, potentially over multiple

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years (to capture time dynamics of the system in addition to cross sectional variation). It can be difficult to fully capture the nuanced differences in cost factors affecting schools and districts across a large diverse state through only 4 to 6 (or even 40) prototypes. Alternatively, one might hybridize traditional PJ approaches with survey techniques to gather information across a wider array of settings (increase sampling density).[72]

Table 6

Summary of Cost Analysis Methods in Education

General Method	Outcome/ Goal Basis	Information Gathering	Unit of Application	Strengths	Weaknesses
Input-Oriented (Ingredients Method[73] or Resource Cost Model[74])	Hypothetical	Focus Groups (Professional Judgment)	Prototypes (limited set)	Stakeholder involvement. Context sensitive.	Only hypothetical connection to outcomes. Addresses only limited conditions/settings.
	Hypothetical	Consultant Synthesis (Evidence Based)	Single model (transposed across settings)	Limited effort. Ability to use and apply boilerplate to any situation. Built on empirically validated strategies.	Aggregation of "strategies" to whole school is suspect. Transferability of "strategies" limited. Not context sensitive.
	Actual[75]	State data systems (personnel data, annual financial reports, outcome measures)	Schools/districts sampled from outcome based modeling (efficient producers of outcomes under varied conditions)	Grounded in reality (what various schools/districts actually accomplish and how they organize resources)	Requires rich personnel, fiscal and outcome data. Potentially infeasible where outcome goal far exceeds any reality.
Outcome-Oriented (Cost Function)	Actual	State fiscal data systems that provide accurate district or school-level spending estimates that account for district spending on overhead.	All districts/schools over multiple years.	Based on estimated statistical relationship between actual outcomes and actual spending. Evaluates distribution across all districts/schools.	Requires rich, high-quality personnel, fiscal and outcome data. Potentially infeasible where outcome goal far exceeds any reality. Focus on limited measured outcomes. Limited insights into internal resource use/allocation underlying cost estimate.

All methods have strengths and weaknesses, but some weaknesses are critical flaws. Note that Successful Schools is excluded from this table because it is not a credible method of cost analysis. One might argue similarly that a pure "Evidence-Based" approach, not integrated with context specific judgments is also moot, since it makes no attempt to estimate the costs of the state's own outcome goals and further, because it fails to consider how needs vary across settings and children in the state-specific context. The greatest shortcoming of the arguably more robust RCM process used in Professional Judgment is that the link between resources and outcomes is hypothetical (i.e., based solely on professional opinion). The greatest weaknesses of cost modeling are a) that predictions may understate true costs of comprehensive adequacy where outcome measures are too narrow, and b) that like any costing-out method, when desired goals far exceed those presently achieved, extrapolations may be suspect.

Evaluating Reliability and Validity

Far too little attention has been paid to methods for improving reliability and validity in education cost analysis. In this context, we consider validity and reliability as follows:

Validity: Does the cost estimate really reflect what goes into producing the desired level, depth, and breadth of educational outcomes?

Reliability: Are the costs measured consistently over time, across methods or when applied by different individuals or teams?

These two must go hand in hand, or at least reliability should be contingent on validity, because a finding can be reliably wrong (measuring the wrong thing, but consistently). In 2006, Baker[76] and Duncombe[77] proposed steps to strengthen the reliability and validity of education cost studies, especially when applied in the context of estimating the costs of achieving specific educational outcomes, or educational "adequacy."

Validity takes many forms, the simplest of which is "face validity." That is, on its face, does the estimate measure what it purports to measure? Where the goal is to measure the costs of achieving specific state standards, arguably, the Evidence-Based approach of aggregating research findings on strategies implemented in entirely different settings, evaluated by entirely different outcomes fails to achieve face validity. This is not to suggest, however, that context-specific focus group recommendations formulated without taking into account any research evidence are superior. Some hybrid of the two, with additional validation is warranted.

Predictive validity asks whether the cost estimates are actually predictive of spending levels required for achieving desired outcomes and should be included in any cost analysis. Baker (2006),[78] Chambers, Levin & Parrish (2006),[79] and Levin and Chambers (2009)[80] explain that one weak predictive validity check on educational adequacy cost studies evaluates whether those schools and districts identified as having funding shortfalls – that is, having less than they need for achieving "adequate" educational outcomes – do in fact achieve less than adequate outcomes, while those having more than adequate resources exceed adequate outcomes, and

further, whether the magnitude of the resource deficits or surpluses correlates with the magnitude of the outcome deficits or surpluses. Such checks and balances are especially warranted in focus-group-driven RCM analyses, where the association with outcomes is more speculative, or hypothetical. In cases where the relationship between input gaps and outcome gaps is very weak, findings are particularly vulnerable to skeptics, and legitimately so.[81]

For focus group driven RCM, the hypotheses of resources needed for achieving desired outcomes might be validated by comparison with the resources of actual schools and districts estimated via cost function modeling, as actually achieving the desired outcome levels with total spending and resource use that mirrors that of the RCM prescribed model.

Finally, specific to ECF modeling, alternative models should be tested for their ability to accurately predict the spending behavior of districts excluded from the model. With complex statistical models having many variables and moving parts, it is important to identify a model that is sufficiently generalizable. In this case, sufficiently generalizable means that the model characterizes well the patterns of relationship among conditions, students, resources and outcomes such that the model can be used to predict spending levels needed to achieve desired outcomes, under different conditions.[82]

Alternatives for reliability checking are also relatively straightforward. Exclusively within a focus group driven RCM format, one might convene independent panels that are provided similar tasks (identifying resources needed to meet a particular set of outcomes X, Y and Z under specific conditions A, B and C) and then compare findings across panels. That is, conduct a within-method reliability check. Alternatively, one might evaluate the correlation between findings across the RCM and ECF approaches. But again, reliability is of little concern in the absence of reasonable validity checking.

Recommendations for Cost Analysis

RCM and ECF approaches are complementary and should be used as such. Neither is sufficient as a standalone approach especially given the stakes and dollars attached to financing entire state education systems. For example, as noted above, RCM analysis applied to hypothetical outcome goals produces cost estimates which are, at best, a reasonable hypothesis of what it might take to achieve outcome goals perhaps not commonly achieved within the system. ECFs might underestimate the costs of providing an adequate educational system where the parameters of a truly adequate system are broader and deeper than the measurable outcomes included in the model. That is, it likely costs more to achieve minimally adequate test scores, while still providing all other curricular, co-curricular and extra-curricular required programs, than to merely achieve minimally adequate test scores in reading and math alone. Further, it can be difficult for focus groups to fully understand the levels of resources needed to achieve outcomes they have never achieved with students who have never had such opportunities. In this vein, weights derived from cost function models may provide guidance as to the veracity of focus group driven RCM estimates.[83]

We suggest an iterative feedback loop between ECF and RCM approaches, where the goal of ECF is less to produce a specific cost prediction, or spending target, and more about identifying existing schools or districts with specific characteristics and outcomes that fall along different regions of the *cost curve* producing adequate outcomes, and subsequently exploring the organization as well as total costs of resources within those schools or districts. These resources might then be compared with resources proposed independently by focus groups and used as a basis for revising models. Further, where focus groups have carefully considered depth and breadth requirements, one can use focus group findings to evaluate whether seemingly efficient schools are providing the necessary curricular depth and breadth, or sacrificing it to elevate narrowly measured outcomes. Use of cost functions in this way can assist in validating the link to educational outcomes in focus group driven RCM. Focus group driven RCM can assist in validating where or whether cost function estimates suffer from lost curricular depth or breadth.

Finally, it is critically important that additional checks on reliability and validity be integrated throughout this process, including:

- evaluating the validity of selected outcome goals and measures as valid representations of the objectives of the state education system,
- performing prerequisite predictive validity tests on alternative cost model specifications,
- reconciling resource configurations proposed in RCM analyses with those of schools identified via ECF,
- comparing findings of independently (blindly) convened focus groups given similar tasks to ensure reliability,
- comparing independently (blindly) generated findings from cost modeling and focus group activities to ensure reliability, and finally,
- evaluating whether those identified as having resource shortfalls do in fact have outcome shortfalls. Such tests are relatively straightforward and thus, their omission is inexcusable.

Findings from Selected Cost Studies

Few if any cost studies have applied the combination of methods, reliability and validity tests, discussed above, arguably in part because the industry around education cost analysis has sorted itself into distinct camps promoting competing methods and models, with little incentive to improve on the state of the art by exploring the best possible intersections of available alternatives. Academic literature on these topics has been largely ignored in practical applications.

Only a few comparative syntheses of existing education cost studies exist, largely because the majority of consultant-driven studies are of insufficient quality to warrant academic meta-analysis. Making comparisons across existing studies and varied, incrementally evolving methods is problematic. Further, contexts, timing, measures of student population

characteristics, among other things vary so significantly across studies it becomes difficult to make reasonable comparisons.

In an effort to address this gap, in a report for the National Research Council, Baker, Taylor and Vedlitz (2008) compiled a data set of district-level cost estimates across several cost studies from prior to 2008.[84] Their findings are in Table 7. Basically, what the authors did to equate cost studies was to take district level "adequacy cost" estimates from studies for which data were available, and fit a regression model to those cost estimates, controlling for school district size, regional cost differences and census poverty rates. Then, the authors used that model to identify the implied "base cost" – the cost estimate for a district with 0 percent poverty, of efficient size and in the lowest cost labor market. The authors used the model to identify the implicit "poverty adjustment" by using the "slope" of cost with respect to poverty and representing that slope in Table 6 as the percent increase in cost per pupil resulting from a one percentage point increase in poverty. For example, a poverty adjustment of 0.225 for Arkansas indicates that each percentage point increase in the school district's poverty rate increases the estimated cost of an adequate education by 0.225 percent. At the extreme, the implicit poverty adjustment embedded in the Arkansas EB study indicates that a school where all of the students were in poverty would have a cost of an adequate education that was 22.5 percent higher than the cost of an adequate education in a school where none of the students were in poverty, holding constant the size of the school and the prevailing wage for college graduates.

Table 7

Findings from Education Selected Cost Studies

State	Study Type	Implicit Poverty Adjustment	Baseline Cost Estimate
Arkansas	Evidence Based[85]	0.225	$6,115
Kansas	Cost Function[86]	0.965	$3,982
Kansas	Professional Judgment[87]	0.681	$6,172
Minnesota	Cost Function[88]	1.679	$4,932
Missouri	Cost Function 1[89]	0.992	$4,013
Missouri	Cost Function 2[90]	0.802	$4,900
New York	Cost Function	1.346	$5,511
New York	Professional Judgment[91]	0.915	$7,196
Pennsylvania (2007)	*Professional Judgment*	*0.616*	*$6,436*
Rhode Island	Cost Function[92]	0.672	$5,725
Texas	Cost Function[93]	0.395	$4,030
Texas	Cost Function [94]	1.273	$3,147
Washington	Professional Judgment[95]	0.581	$6,841
Note: The implicit poverty adjustments are coefficient estimates from a regression of the district-level cost of an adequate education (as a natural logarithm) on the natural logarithm of enrollment and its square, the share of students in poverty and the NCES Comparable Wage Index. In all cases, the coefficient estimates are significantly different from zero at the 1-percent level. Complete regression tables available upon request.			

From Baker, Taylor, Vedlitz (2008)

Baker, Taylor and Vedlitz (2008) also point out that estimates of cost variation with respect to district size and grade configuration vary across studies, noting that all studies find significant costs associated with small school districts, but that findings from Professional Judgment studies have tended to vary more widely than those of cost function studies, in part because of the relatively small number of prototypical models addressed in a typical Professional Judgment study.[96]

Again, the studies reviewed by the authors include few if any attempts to evaluate reliability or validity of findings. Independently conducted cost studies in Kansas and New York provide the opportunity to evaluate cross-method reliability. In Kansas, in 2002, Augenblick and Myers released a study commissioned by a legislative committee, applying a Professional Judgment approach (coupled with successful schools analysis). Later in 2006, the Kansas Legislative Division of Post Audit contracted William Duncombe and John Yinger of Syracuse University to estimate a cost function for Kansas districts, from which the Division's staff derived a formula proposal. Across all districts, the overall correlation between the two sets of estimates and studies was 0.715. That is, both efforts identified generally the same districts as requiring more or less funding.

The case is similar for the two New York State studies, one – a Professional Judgment analysis by consultants on behalf of plaintiffs in Campaign for Fiscal Equity vs. State – and the other from academic work by William Duncombe and John Yinger. Here, the correlation across districts was 0.833, again suggesting a high degree of confidence that we in fact know quite well which districts have greater needs and costs than others.

Financing Equal Educational Opportunity and Educational Adequacy

Modern state school finance formulas – aid distribution formulas – strive to achieve two simultaneous objectives: 1) accounting for differences in the costs of achieving equal educational opportunity across schools and districts, and 2) accounting for differences in the ability of local public school districts to cover those costs. Local district ability to raise revenues might be a function of either or both local taxable property wealth and the incomes of local property owners, thus their ability to pay taxes on their properties.

Calculations in modern state school finance formulas also follow a two-step process, where the first step typically involves using district-level measures to calculate the spending target or adequacy budget for each district as some combination of a base funding level, student need factors and district cost factors:

STEP 1: Target = Base + Student Needs + District Costs

The second step involves calculating the share of that target that will be paid for with local taxes and share that will be covered through state aid.

STEP 2: State Share = Target – Local Contribution

Typically, the local contribution share is determined either by applying a common local tax rate to taxable assessed property value, or by creating some ratio or measure of local fiscal capacity which considers both taxable property wealth and income.

Table 8 summarizes components of a typical state school finance formula and the roles of those components with respect to equity objectives. For example, many state school finance systems are built to some extent around foundation aid models. Those foundation aid formulas have at their core, a foundation funding level per pupil. It is generally assumed that the foundation level of funding per pupil represents the cost of minimally adequate educational services either in the district with lowest costs or for the child with no specialized needs. Alternatively, the foundation level might be set to represent the cost of educational services in the average educational setting – or district facing average costs and serving an average mix of children. Without any other considerations – alterations or adjustments – the foundation level itself provides only for equity of nominal financial inputs.

Many foundation aid formulas also contain adjustments for variations in input prices across districts – specifically adjustments variations in the competitive wages of teachers and other school staff. These adjustments are intended to provide local public school districts with sufficient funding to purchase comparable "real resources." That is, comparable quantities of comparable quality teachers and other school staff.

Additionally, foundation aid formulas also contain adjustments related to student needs, which can refer to either individual programmatic needs of specific students, or collective needs of the student population served. For example, children identified as having one or more disabilities or children with limited English language proficiency might require specific curricular and program supports, provided by specially trained staff, at higher costs. Schools with high concentrations of children in poverty might more generally have to adjust their programs/service delivery model to provide smaller class sizes for early grades, additional tutoring support and/or extended learning time, also at higher costs. These strategies are intended to yield more equal student outcomes – or close achievement gaps between low-income and non-low-income students or between those with learning disabilities and/or limited English proficiency with other children. That is, these adjustments are intended to provide for equal opportunity to achieve desired – or state mandated – outcome levels.

Finally, it is important to consider how many of these factors interact – specifically, how costs associated with student needs may interact with the context in which children are being served. For example, Duncombe and Yinger (2006)[97] and Baker (2011)[98] have each found that costs associated with child poverty concentration may escalate with increased population density, resulting in higher poverty-related costs in urban than in rural areas. Kansas school finance system currently includes a poverty/density factor whereby poverty weights are increased for the state's higher population density districts. New Jersey includes a poverty weight which scales up (from 47 to 57 percent) as poverty concentration itself increases.

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Table 8

Components of Foundation Aid Formulas and Equity Objectives

Foundation Formula Element	Purpose	Notes
Foundation Level	Intended to represent cost of "adequate educational services" and/or cost of achieving "adequate educational outcomes" in either the "average" or "lowest cost" district.	Without other considerations, guarantees only equity of nominal financial inputs (equal provision of dollars per pupil).
Input Price (Teacher Wage) Adjustment	Intended to provide local public school districts sufficient funding to purchase comparable "real resources."	May attempt to account for differences in competitive wages and other input prices across regions, or may also attempt to account for influence of local working conditions on wages required to hire high-quality teachers.
District Structure/Location Adjustments	Intended to provide local public school districts sufficient funding to offer a comparable array of real resources (programs/services).	May attempt to account for differences in transportation costs associated with population sparsity and/or program organizational costs and fixed costs associated with economies of scale.
Student Need Adjustments	Intended to provide for "equal educational opportunity" by providing financial resources to achieve appropriately differentiated programs (program intensity).	Considers both "individual programmatic needs" (as for ELL and special education) and needs related to broader socio-economic context (poverty, mobility, etc.).

Summary

To summarize, modern state school finance systems have as their main goals, to simultaneously provide equal educational opportunity and educational adequacy. While achieving and maintaining educational adequacy requires maintaining a school finance system that consistently achieves a certain level of educational outcomes, and does so equitably, it is important that in those cases where state school finance systems fall below adequacy thresholds, equal educational opportunity is maintained. That is, whatever the outcome currently attained across the system, that outcome should be equally attainable regardless of where a child resides or attends school and regardless of his or her background.

State school finance systems may be reasonably guided by valid and reliable analyses of education costs, either with emphasis on equal educational opportunity or specific adequacy goals. The goal of education cost analysis, whether applied for evaluating equal educational opportunity or for producing adequacy cost estimates, is to establish reasonable marks to provide guidance in developing more rational state school finance systems. Only with reasonable marks in hand can one make informed judgments as to whether existing policies are *wide of those reasonable marks.*[99] In keeping with these goals, we recommend the following:

First, policymakers and advocates must be reasonable in their assumptions about the extent to which empirical evidence can and should directly influence state school finance policies. It is our perspective that rigorously conducted cost analyses may provide ongoing guidance in the design and revision of state school finance systems, helping to bend those systems toward providing more equal and adequate opportunities. That is, sound empirical evidence should influence but never strictly dictate school finance system design.

Second, now is the right time to rethink how we approach those empirical analyses that guide school finance policies with a specific eye on strengthening validity and reliability. This means recognizing that RCM and ECF are the two longstanding approaches to education cost analysis that are most robust, and that they are best used in combination with one another. The current cottage industry of *costing out* has created false delineations and introduced supposed distinct methods which fail even the most basic face validity checks.

Third, state policymakers should require that cost analyses used for guiding state school finance policies meet certain basic reliability and validity checking requirements, including but not limited to the previously listed recommendations.

CHAPTER 3. The Current Landscape of State School Finance Policy

Over the past two decades, states and advocacy groups have engaged with greater frequency in attempts to determine the amount of funding that would be necessary for achieving adequate educational outcomes. This coincided with a shift in litigation strategies from emphasis on funding equity to emphasis on funding adequacy – specifically whether funding was adequate either to provide specific programs and services or to achieve specific measured educational outcomes. In some cases, states have adopted their empirical strategy in response to judicial orders that the legislature comply with state constitutional mandate for the provision of an adequate education. In other cases, states have proactively set out to validate spending targets they know they can already meet (or have already been met), to claim *school finance reform* political victory.

Overview of Formula Types and Cost Factors

There has been little change in the types of formulas used by states to distribute funding to districts over the past several years. Verstegen (2011) conducted a 50-state survey of state chief finance officers and found that while no fundamentally new state finance distribution models have been implemented in recent years, many have tailored their systems in an effort to better address the needs of specific student populations such as at risk/low income and English language learners. In addition, there has be increased emphasis on ensuring that the funding provided is deemed "adequate" in some sense (i.e., sufficient to meet definitions put forth in the state constitution).

States provide funding using one or a combination of four distinct funding mechanisms:

- Foundation Program — The state ensures that each district is entitled to a minimum level of funding through providing a uniform state guarantee per pupil that is financed through a combination of state and local district revenues.
- District Power Equalization Systems — Funding levels across districts are provided so that local tax efforts are equalized.
- Full State Funding — All school funding is derived from state revenues and distributed by the state.
- Flat Grant — A uniform amount per pupil is provided by the state to districts, which can be supplemented by individual localities.
- Combination Systems — Funding systems that include elements of the various mechanisms listed above.

Table 9 provides a listing of the number of states by type of funding system as of 2011.[100]

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Table 9

State School Finance Formula Types by State

Basic Model	State
Foundation program (36)	AK, AL, AZ, AR, CA, CO, DE, FL, ID, IN, IA, KS, ME, MA, MI, MN, MS, MO, NE, NV, NH, NJ, NM, NY, ND, OH, OR, **PA**[1], RI, SC, SD, TN, VA, WA, WV, WY
Full state funding (1)	HI
Flat grant (1)	NC
District power equalizing (DPE) (3)	CT, VT, WI
Combination/Tiered system (9)	GA, IL, KY, LA, MT, MD, OK, TX, UT

[1] Data compiled for period during which prior Pennsylvania foundation aid formula still in operation

The dominant funding mechanism currently used by states is the foundation program, with 37 of 50 states reporting using such a system. The use of district power equalizing systems has become a way of the past, with only two states using this type of mechanism as the primary formula (but others still use the method for supplemental revenues). The scant use of this type of funding model is likely due to the fact that these systems can result in widely varying per-pupil dollar allocations across districts. Similarly, only one state reports using a flat grant, which is also associated with wide variations in funding per pupil (due to a higher reliance on local revenues) and lower levels of funding in general. The use of full state funding is reported by one state. However, it should be noted that in this unique case the state (Hawaii) is also a single district and operates a statewide weighted student formula, which largely resembles a foundation program. The biggest difference from other states employing a foundation is that Hawaii does not depend on a combination of state and local revenues where the level of local funding varies across locality and the state funding is used to provide the guaranteed level of funding (should local revenues fall short). Finally, nine states report using a combination or tiered funding system that incorporates elements of the other four. For instance, Kentucky uses a foundation formula in conjunction with supplemental funding that is derived from a district power equalization mechanism.

Student Need Factors

A majority of states have attempted to allocate differential funding according to specific needs, such as coming from low-income families or other measures of being at risk, designation as an English language learner, or requiring special education services, to promote an equitable distribution of educational opportunity. Table 10 illustrates the number of states which report having funding adjustments (weights) in their funding formulas to provide additional support for students deemed low-income or at-risk and English language learners or limited English proficient. In 2011, over three-quarters of the 50 states (37) report including an adjustment for being low income or at risk, and even more (42) provide additional funding to support students that are English language learners or considered limited English proficient.

Table 10

Student Need Adjustments by State

Adjustment/Weight	Yes	No
Low-Income/At-Risk Funding	AL, CA, CO, CT, DE, GA, HI, IL, IN, IA, KS, KY, LA, MA, MD, ME, MI, MN, MS, MO, NE, NH, NJ, NY, NC, OH, OK, OR, **PA**[1], SC, TN, TX, VT, VA, WA, WI	AK, AZ, AR, FL, ID, MT, NV, NM,ND, RI, SD, UT,WV, WY
English Language Learner/ Limited English Proficient	AL, AK, AZ, AR, CA, CT, FL, HI, ID, IL, IN, IA, GA, KY, KS, LA, ME, MD, MA, MI, MN, MO, NE, NH, NJ, NM, NY, NC, ND, OK, OH, OR, RI, TN, TX, UT, VA, VT, WA, WI, WV, WY	CO, DE, MS, MT, NV,PA, SC, SD

[1] Data compiled for period during which prior Pennsylvania foundation aid formula still in operation. [101]

Comparing Funding Adjustments across States

While it is tempting to list the various funding adjustment (weights) used in an attempt to compare the level of additional support afforded different student needs across the states, this type of direct comparison would be misleading because the formulas in which the weights are applied can vary dramatically from state to state.[102] Importantly, weights simply illustrate the *relative* difference in funding that is given within a specific state funding mechanism, but provide little insight as to the differences between states in the *level* of funding provided to students with varying needs.

Interpreting Supports to Address Student Need in Funding Formulas

The following equation defines the effective yield of given student need funding adjustment under a general foundation formula:

Adjustment Yield = Base Per-Pupil Funding × Student Need Weight × Student Count

The funding adjustment yield is dependent on three components:

1) Base Per-Pupil Funding – The per-pupil dollar funding amount afforded to all students regardless of need.
2) Student Need Weight – The relative additional amount of per-pupil funding provided to support students with a specific need. For example, a weight of 1.25 for a given student need indicates that students in this category would be funded 25 percent more than a student with no additional needs who is provided just the base per-pupil funding amount.
3) Student Count – Indicates the number of students that fall under a specific need category and thus are eligible for the additional funding provided through the student need weight.

Simple comparisons of student need funding adjustments alone are of little use in illustrating how various states differentially fund students with various needs, as states differ both in the level of base per-pupil funding included in their formula and in the method by which students are counted as belonging to a given category of special needs. In turn, given an identical student need weight in two different states, the state with a higher base per-pupil funding will generate a funding adjustment yield that is larger than the one with a lower base, all else being equal. Similarly, states with more inclusive count methods will tend to provide higher levels of support.

While it is difficult to make simple comparisons of individual *explicit* formula weights, researchers and policymakers can gain a clear understanding of how a state's approach to distributing funding plays out in a given system through analysis of *implicit* weights. This analysis is useful to inform vital decisions regarding base funding and adjustments as each component together determines the extent to which equity and adequacy exist in state education funding.

Economies of Scale

Several states also explicitly acknowledge the fact that scale of operations affects the cost of providing educational services. Specifically, it is recognized that districts operating in rural and remote areas have smaller enrollment and correspondingly lower student density that put upward pressure on per-pupil costs. Alternatively put, smaller districts in remote rural areas do not benefit from the *economies of scale* enjoyed by their larger counterparts in cities, suburbs and towns as lower per-pupil costs due to economies of scale will tend to emerge when fixed costs (i.e., those that do not vary with respect to the number of students served) are spread out over larger numbers of students.[103] [See Appendix I.]

Table 11 shows that 32 states have made provisions in their funding systems that adjust for operation of small schools (25 states) and/or in areas with sparse (low density) student populations (15 states), while 18 include no adjustment for economies of scale.

Table 11

District Size and Sparsity Adjustments by State

	Yes—32	*No—18*
Sparsity/Density or Small Schools	AK, AZ, AR, CA, FL, HI, ID, IN, IA, KS, LA, ME, MI, MN, MO, NV, NM, NY, NC, ND, OH, OK, OR, SD, TX, UT, VT, VA, WA. WV, WI, WY	AL, CO, CT, DE, GA, IL, KY, MD, MA, MS, MT, NE, NH, NJ, PA, RI, SC, TN

Variations in the Price of Personnel and Non-Personnel Inputs

In addition to the variations in the cost of providing educational services due to various needs of students being served and district context such as size and student density, it is widely recognized that school districts located across different geographic regions and labor markets face different prices for personnel and non-personnel inputs.[104] Some states have made an attempt to develop accommodations in their state aid to local school districts that adjust funding distributed to support educational services to account for differences in purchasing power due to higher and lower input price levels.[105] For example, differences in cost of living (e.g., housing costs) across geographic regions impact the ability for school districts to recruit and employ personnel with comparable abilities and characteristics. In general, districts with higher costs of living will offer higher salaries in order to recruit and retain staff. However, there are factors other than cost of living that affect the willingness of staff to work in certain locations and hence the price of recruiting and retaining staff in these areas. For example, previous research reveals several issues that make it more difficult for rural districts to attract instructors, including geographic isolation, difficult working conditions, and the need for instructors to teach multiple subjects. These findings are coupled with further findings that show the cost of obtaining comparable teaching staff is significantly higher in geographically isolated labor markets (which are most often characterized as having a low cost of living).[106, 107, 108, 109]

Note: Counterbalancing Effects of Funding Adjustments

The interaction between funding adjustments to account for the multiple influences of the three cost factors mentioned above (student needs, scale of operations, and geographic variations in input prices) can further complicate the interpretation and comparison of formulas across states. The interplay of adjustments for various cost factors in a formula often results in less than simple counterbalancing effects on how funding is distributed. For example, Kansas provides relatively greater support for smaller rural districts, while Texas tends to provide more funding effort on larger urban districts that are more diverse with respect to ethnicity and socio-economic status.[110] Yet, these findings are not the result of individual funding adjustments to account for district differences in scale of operations and student needs, respectively, but rather through a combination of these types of adjustments and the fact that the different cost factors are correlated with one another.

Vignettes from the *Empirical Era* of School Finance

The following section highlights some illustrative, recent cases from the *empirical era* in school finance – cases in which states, to varied degrees, have attempted to link their school finance formulas to empirical evidence regarding the costs of providing an adequate education. The first three cases, in New Jersey, Kansas, and Pennsylvania, represent policy adoption based on input- and outcome-oriented cost analyses conducted on behalf of state government. The second two cases, in New York and Rhode Island, represent attempts to characterize school finance policy as being driven by informative cost analyses, when in fact, the validity of the analyses is highly suspect.

New Jersey

In New Jersey, state officials in the early 2000s commissioned a report that would provide estimates of education costs via Professional Judgment and Successful Schools analyses to inform a new, statewide, weighted pupil foundation aid formula. While the analyses were completed around 2003, the report was held and subsequently revised by the New Jersey Department of Education, for release in late 2006.[111]

The School Funding Reform Act (SFRA) incorporating selective evidence from the study was adopted in 2008, and subsequently litigated in state court to determine whether the formula sufficiently complied with prior judicial mandates.[112] In 2009, the act was found constitutional.[113] But since that time, the formula has not been fully funded, parameters have been altered to reduce aid to high-need districts, and aid for others has been frozen or cut.

Kansas

During the 2000s, Kansas legislators sponsored two studies of education costs. Beginning in the late 1990's at the behest of a task force convened by Governor Bill Graves, a legislative subcommittee contracted a study, conducted by Augenblick and Myers and completed in 2002, which was ultimately used as evidence against the state to hold the existing funding system unconstitutional.[114] Under judicial oversight in 2006, a new commissioned study estimated costs using a combination of Evidence-Based methods and a cost function.[115] The end result was highly correlated with the original, but included some unique features such as a poverty/density factor.

Pennsylvania

Pennsylvania represents a unique case of advocacy groups, legislators and the Governor collaborating to pursue cost analysis and subsequently redesign state school finance policy accordingly, without judicial pressure. The study, called for by the General Assembly in 2006, and conducted by Augenblick, Palaich and Associates, applied a combination of Professional Judgment and successful schools analysis.

New York

In response to a court order in *Campaign for Fiscal Equity v. State* (2006), the legislature adopted a foundation aid formula to be phased in from 2007 to 2011 where the basic funding

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level in that formula would be set as: "the cost of providing general education services…. measured by determining instructional costs of districts that are performing well" (NYSED, Primer on State Aid, 2011-12). The state defined "performing well" as a standard of 80percent of children scoring proficient or higher on state assessments, a performance level marginally lower than the statewide mean at the time. That is, the state adopted an easily manipulated successful school districts approach to calculating and updating its basic funding level for the foundation aid formula. [See Appendix J.]

Rhode Island

The basic funding level for the Rhode Island formula is set as "an amount equal to a statewide per-pupil core instruction amount as established by the department of elementary and secondary education, derived from the average of northeast regional expenditure data for the states of Rhode Island, Massachusetts, Connecticut, and New Hampshire from the National Center for Education Statistics (NCES) that will adequately fund the student instructional needs as described in the basic education program and multiplied by the district average daily membership as defined in section 16-7-22." (RIDE, 2010)[116] As with New York, this approach allowed for manipulation such that calculations did not at all reflect the true cost estimates. (See Appendix K.)

As these case studies attest, several states made efforts to adopt a cost-based formula concurrently, and many similarities in determination of costs, methodologies, and results, are found. Table 12 presents more detail on the initial cost studies and subsequent aid formulas in five states.

Translation from Cost Study to School Finance Legislation

In New Jersey, several substantive changes were made in the translation of the cost study to school finance legislation. Some of these changes were made out of mathematical convenience, including providing a weight on the grade level children attended rather than providing a cost differential for districts serving different grade ranges. Other changes were made using arguments of transparency or familiarity, including the choice to adjust labor costs across counties, rather than across labor markets, though neither was mentioned in the original study. Finally, student need adjustments were adapted and altered. Professional Judgment studies often produce varied weights on poverty or ELL status based on context. In New Jersey, state officials chose to approach poverty weighting differently, scaling up the weights with concentration based on subsequent convening with external consultants, and also chose to provide a reduced *combination* weight for children who would otherwise qualify for both the ELL and low-income weighting.

In Kansas, policymakers also adopted piecemeal components of cost studies, but then counterbalanced as they had on many previous occasions[117] with their own "cost adjustments" driving resources back to lower-need districts, including maintaining the weight on children attending new facilities, adding a weight for non-low income non-proficient students, and

adding a special taxing authority for the 17 districts with the highest priced houses, asserting that adjustment was necessary for accounting for labor cost variation.[118] None of these adjustments was validated by the cost studies.

Pennsylvania's school finance statute adopted in 2008 represents perhaps the closest adherence to a cost study with which we are familiar. Notably, the legislation went so far as to include the weightings for ELL status that varied with respect to (the natural logarithm of) enrollment, and to similarly adopt the district size weighting along a smooth economies of scale curve, as discussed previously. Our experience with other states suggests legislative discomfort with basing funding formula parameters on non-intuitive or mathematically complex factors.[119] Yet to Pennsylvania's credit, legislators there adopted the cost analyses as recommended. That said, the formula was never close to being fully phased in and has since been abandoned entirely.

Use of Methodological Adjustments to Reduce Costs

New Jersey, Kansas, New York, and Rhode Island made methodological adjustments to reduce the overall cost to the state. For example, New Jersey used questionable alterations of the usual PJ methodology,[120] leading to a lower than usual base cost and the only occasion where the calculated PJ base cost has ever been lower than the successful schools estimate.[121] In Kansas, it appears that there was an attempt under judicial pressure to yield a more favorable result by calling for a do-over – a reexamination of costs which originally required evaluating only the resources needed to achieve bare bones inputs. The parameters of that do-over were subsequently modified and strengthened under court pressure at the request of the state's constitutionally independent State Board of Education.[122] Subsequently, management of that study was handed off to the legislature's independent research arm, the Kansas Legislative Division of Post Audit (LDPA).

As presented in Appendices J and K, New York and Rhode Island also serve as examples of states manipulating data sources and calculations to reduce costs. The cases of New York and Rhode Island do not involve legitimate cost analysis to guide school finance reform, but rather hide behind a veneer of suspect empirical rigor while achieving politically palatable "reforms." Nonetheless, New York reforms were abandoned nearly as quickly as those in Pennsylvania.[123] These cases are similar to gamesmanship in Ohio and Illinois in the 1990s where constituents each created their own selection method for identifying "successful school districts" in order to achieve that sample of districts that produced a politically palatable average spending figure.[124]

Table 12

From Cost Studies to Aid Formulas in Five States

	New Jersey	Pennsylvania	Kansas	New York	Rhode Island
Context and Policy Objective					
Context	Achieve dismissal of long-running judicial oversight.		Comply with court order (and achieve dismissal).	In response to court order in *Campaign for Fiscal Equity v. State* (2006), the legislature adopted a foundation aid formula.	
Policy Objective	Eliminate "Abbott" classification & achieve unified statewide formula (and spread aid across more districts).	Achieve a unified, more equitable and adequate formula.			
Analyses					
Cost Studies	Augenblick adapted by New Jersey Department of Education (2006)[1]	Augenblick, Palaich and Associates (2007)[2]	Augenblick and Myers (2002) [3] and Kansas Legislative Division of Post Audit (LDFA) with William Duncombe, Syracuse University) (2006)[4]	Not Applicable	Not Applicable
Methods	Successful Schools and Professional Judgment	Successful Schools and Professional Judgment	Augenblick and Myers – Successful Schools and Professional Judgment, LDPA and Duncombe – Education Cost Function and Evidence-Based	Successful Schools	Successful Schools
Methodological Notes	NJDOE proposed initial resource configurations that panels were provided the opportunity to adjust.[5] NJDOE produced summary report (three years after study completed).	Professional Judgment estimates based on achieving 100 percent proficiency in 2014. Included separate Philadelphia panel.[2]	Hired consultants (Duncombe and Yinger) explored interrelationship between poverty and population density finding significant cost effect.[6]	The Foundation Amount is the cost of providing general education services by determining instructional costs of well-performing districts, defined as a standard of 80 percent of children scoring proficient or higher on state assessments, a performance level marginally lower than the statewide mean at the time.	The core instruction amount derived from the average of northeast regional expenditure data for the states of Rhode Island, Massachusetts, Connecticut, and New Hampshire from the National Center for Education Statistics (NCES).

Table 13
From Cost Studies to Aid Formulas in Five States (continued)

	New Jersey	Pennsylvania	Kansas	New York	Rhode Island
Translation to Legislation					
Base Figure	Adopted $9,649 for 2009. Cost Study yielded $8,016 (Professional Judgment) to $8,493 (Successful Schools) in 2005.[7]	Adopted $8,355 for 2008-09. Cost Study yielded $8,003 (Professional Judgment) in 2006.[8]	Adopted $4,257 for 2007. Cost Function minimum estimate was $4,565 for 2007. General fund budget only.[9]		
Other Base Adjustments	Added grade-level weighting. (Study included cost differences by grade range served).		Backed out federal funding and focused exclusively on general fund expenses.	Not applicable	Not applicable
Wage Adjustment	Estimated county-level "comparable wage" adjustment (claiming NCES ECWI as precedent). Drives funds to high-income counties.[10]	Location Cost Metric (largely based on Cost Study).[2,8]	Adopted special adjustment for 16 districts with highest housing prices. Provided additional taxing authority for wealthiest districts.[10]	Not applicable	Not applicable
Economies of Scale Adjustment	None	District Size Supplement[8]	Maintained version of previous low enrollment weight.[9]	Not applicable	Not applicable
Student Need Factors	Adopted sliding scale poverty concentration factor (from 47 to 57 percent) and constant ELL weight at 50 percent. Significantly reduced need weight by creating "combination" weight for children who are both low income and ELL (on basis of "redundant services").[5]	Adopted 43 percent low-income pupil weight ($3,593 per low-income child on top of a foundation of $8,355 per child). Adopted an ELL multiplier that varied with district enrollment, ranging from 1.5 to 2.5 (smaller weights for larger districts, based largely on APA study).[2]	Adopted high-density poverty weight (applied to select locations). Drives resources to high-need, more "urban" districts. Also adopted non-proficient non-low-income weight (not in study). Drives money to generally lower need suburban districts.[9]	Not applicable	Not applicable

Table 14

From Cost Studies to Aid Formulas in Five States (continued)

Notes:

[1] Dupree, A., Augenblick, J., Silverstein, J. (2006) Report on the Cost of Education (RCE) http://nj.gov/education/sff/archive/report.pdf

[2] Augenblick, Palaich & Associates (2007) Costing out the Resources Needed to Meet Pennsylvania's Public Education Goals. Pennsylvania State Board of Education. http://www.apaconsulting.net/uploads/reports/6.pdf

[3] Augenblick, J., Myers, J., Silverstein, J., Barkas, A. (2002) Calculation of the Cost of a Suitable Education in Kansas in 2000-2001 Using Two Different Analytic Approaches. http://skyways.lib.ks.us/ksleg/KLRD/Publications/SchoolFinanceFinalReport.pdf

[4] Kansas Legislative Division of Post Audit (2006) Cost Study Analysis. Elementary and Secondary Education in Kansas: Estimating the Costs of K-12 Education Using Two Approaches http://skyways.lib.ks.us/kansas/ksleg/KLRD/Publications/Education_Cost_Study/Cost_Study_Report.pdf. Separate study by William Duncombe & John Yinger (Syracuse, U.) embedded in Appendix C of that report.

[5] Baker, B.D. (2009) Evaluating the "Concrete Link" between Professional Judgment Analysis, New Jersey's School Finance Reform Act and the Costs of Meeting State Standards in Abbott Districts. Education Law Center of New Jersey. http://schoolfinance101.files.wordpress.com/2011/10/baker-pjp-sfra-report-web.pdf.

[6] Duncombe KS report. See also Baker, B. D. (2011). Exploring the sensitivity of education costs to racial composition of schools and race-neutral alternative measures: A cost function application to Missouri. Peabody Journal of Education, 86(1), 58-83.

[7] New Jersey Department of Education. A Formula for Success: All Children, All Communities. http://nj.gov/education/sff/reports/AllChildrenAllCommunities.pdf

[8] Basic Education Funding worksheets: http://www.portal.state.pa.us/portal/http;//www.portal.state.pa.us:80/portal/server.pt/gateway/PTARGS_0_123706_1342399_0_0_18/Finances%20BEF%202008-09%20May2013.xlsx

[9] Baker, B.D. (2011) Still Wide of Any Reasonable Mark: A Reexamination of Kansas School Finance. Schools for Fair Funding. http://www.robblaw.com/PDFs/P384.pdf (pages 65-69)

[10] Baker, B. D. (2008). Doing more harm than good? A commentary on the politics of cost adjustments for wage variation in state school finance formulas. Journal of Education Finance, 406-440.

Summary

In this section we show that over the past several decades, state school finance systems have converged on a relatively common structure of need and cost-adjusted, wealth-equalized foundation aid formulas. But justification of the elements of these formulas and quality of implementation remains varied. A notable trend of the past two decades has been increased reliance on, or at least reference to, empirical evidence to inform design of state school finance systems. However, the quality of that evidence has varied widely, and translation of empirical evidence to policy design, as well as development of the empirical evidence itself, remains subject to political pressures.

As important as applying rigorous methods is maintaining the integrity of the relationship between empirical findings and the subsequent school finance policies that follow. Cost estimates are not intended to dictate but rather inform school finance policy. School finance policies are more likely to provide equal educational opportunity or adequacy when guided by cost estimates of achieving equal educational opportunity. Policymakers and advocates must be reasonable in their assumptions about the extent to which empirical evidence can and should directly influence state school finance policies. It is our perspective that rigorously conducted cost analyses may provide ongoing guidance in the design and revision of state school finance systems, helping to inform those systems toward providing more equal and adequate opportunities.

Case studies presented herein provide mixed evidence regarding policy adherence to empirical evidence, with Pennsylvania's prior efforts, linking the 2007 cost study to 2008 reforms, among the closest adherence. By contrast, in other states, cost estimates themselves appeared to suffer from significant political interference. But there exist some governance insights that can be gained from the case studies presented above. For example, in Kansas, in the midst of litigation over funding adequacy, the legislature requested an updated study of costs, seemingly seeking a lower estimate than their prior study. But with judicial oversight involved, and a constitutionally independent state board of education, oversight of that study was handed off to the legislature's independent research arm (LDPA) which maintained a high degree of integrity and independence in its oversight of the project. This ultimately yielded cost findings that were highly correlated with the legislature's previous study conducted by independent consultants. Perhaps equally important was the degree to which the process in Kansas was subject to public scrutiny, in part necessitated by the combination of judicial oversight coupled with media coverage.

APPENDIX A. Data Sources

Table A1
National Data Sources

| Data Element		Unit of Analysis	Data Source	Years Available	Years Imputed*
District Level Fiscal Measures					
	Per-Pupil Spending	District	F-33[125]	1993-2011	
	State Revenue	District	F-33	1993-2011	
	Local Revenue	District	F-33	1993-2011	
	Federal Revenue	District	F-33	1993-2011	
District Characteristics					
	Enrollment	District	CCD[126]	1993-2011	
	Grade Ranges	District	CCD	1993-2011	
	Pupil/Teacher Ratios	District	CCD	1993-2011	
Regional Cost Variation					
	Education Comparable Wage Index	District	Texas A&M (Taylor) [127]	1997-2011	1993-1996
Population Needs/Characteristics					
	Child Poverty[128]	District	Census Small Area Income and Poverty Estimates[129]	1995, 1997, 1999, 2000-2011	1993-1994, 1996, 1998
	Family & Household Income	State	Census ACS (IPUMS)[130]	1990, 2000-2011	1990-1999 [used 1996, 1998]
Student Outcomes					
	Math/Reading Outcomes by Subsidized Lunch Status	State	NAEP[131]	Reading 4 ('98,'02, '03, '05, '07, '09, '11) Math 4 ('96, '00, '03, '05, '07, '09, '11) Reading 8 ('98,'02, '03, '05, '07, '09, '11) Math 8 ('96,'00, '03, '05, '07, '09, '11)	
	Standardized Math and Reading Outcomes	District	State Assessment Systems (AIR[132] and Global Report Card)[133]	2004 – 2009	2006
	State Math and Reading Proficiency Rates	District	State Assessment Systems (New America Foundation)[134]	2005 – 2011 (Grade 4) 2006 – 2011 (Grade 8)	

Table A2

Specific Pennsylvania Data Sources

Data Element	Unit of Analysis	Data Source	Years Available
District Level Fiscal Measures			
Expenditure Detail	District	PADE[1]	1995-96 to 2012-13
Revenue Detail	District	PADE[1]	1993-94 to 2012-13
Basic Education Funding Formula	District	PADE[2]	1995-96 to 2012-13
Aid Ratios (Wealth/Income Factors)	District	PADE[3]	1994-95 to 2013-14
Funded enrollment counts (ADM, WADM, Free or Reduced Priced Lunch, LEP)	District	PADE[3]	1991-92 to 2011-12
District Characteristics			
Enrollment	District/School	PADE[4]	1993-94 to 2013-14
Grade Ranges	District	NCES	
District Locale	District	PADE[5] [NCES]	2007-08
Cost Estimates			
APA Location Cost Metric	District	APA report	2005-06
APA 2005-06 Cost Estimates	District	APA report Appendix F (of that report)	2005-06
Population Needs/Characteristics			
Child Poverty[135]	District	Census Small Area Income and Poverty Estimates[6]	1997-2012
District Low Income Concentrations	District	PADE[3]	1995-2013 [with 2yr lag]
District ELL Concentrations	District	PADE[3]	1995-2013 [with 2yr lag]
Student Outcomes			
PSSA	District	PADE[6]	
SAT and Participation Rates	District	PADE[7]	2001-2013
Post-Secondary Attendance	District	PADE[8]	2007-08 to 2012-13

[1] http://www.portal.state.pa.us/portal/server.pt/community/summaries_of_annual_financial_report_data/7673/other_financial_information/509049.
[2] http://www.portal.state.pa.us/portal/server.pt?open=514&objID=509059&mode=2.
[3] http://www.portal.state.pa.us/portal/server.pt/community/financial_data_elements/7672.
[4] http://www.portal.state.pa.us/portal/server.pt/community/enrollment/7407/public_school_enrollment_reports/620541.
[5] http://www.portal.state.pa.us/portal/server.pt/community/data_and_statistics/7202/school_locale/509783.
[6] http://www.census.gov/did/www/saipe/data/schools/data/index.html.
[7] http://www.portal.state.pa.us/portal/server.pt/community/state_assessment_system/20965/sat_and_act_scores/1339721.
[8] http://www.portal.state.pa.us/portal/server.pt/community/graduates/7426.

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APPENDIX B. Adjustment Factors in BEF

Figure B1

ELL Supplement Multiplier, Basic Education Funding Formula 2008-09
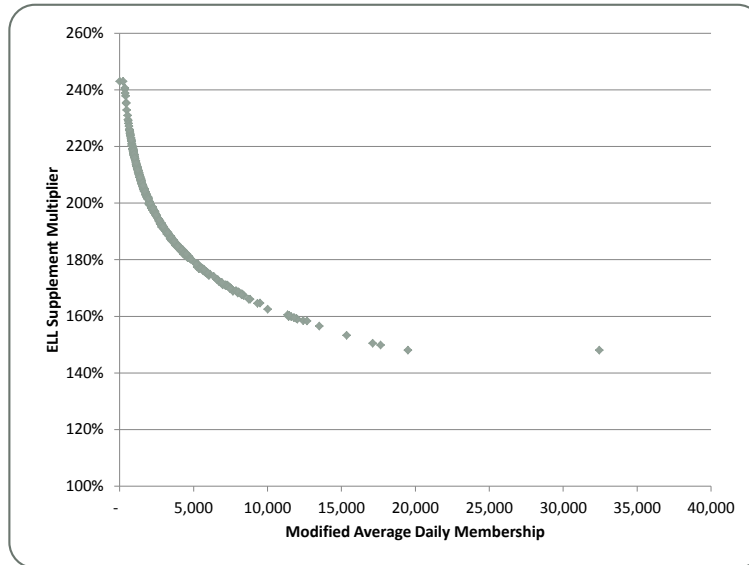
Data Source: Basic Education Funding worksheet for 2008-09. See Appendix A.

Figure B2

Original BEF District Size Supplement (Weight) 2008-09
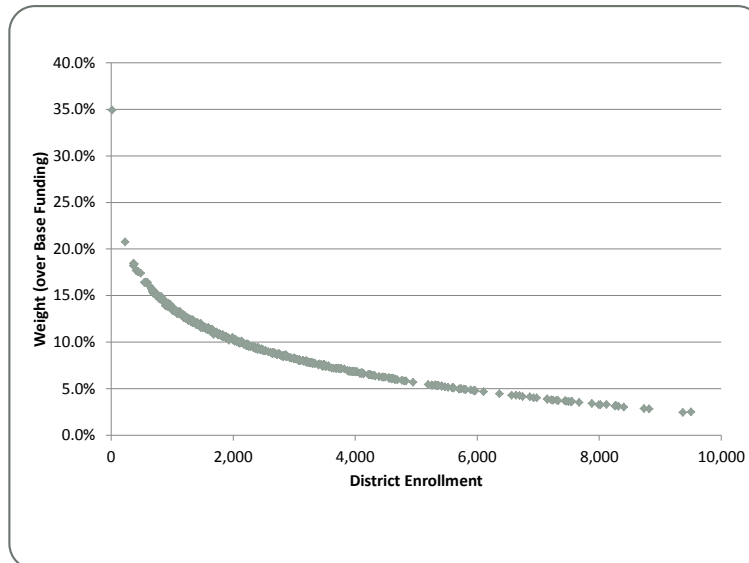

Data Source: Basic Education Funding worksheet for 2008-09. Graph takes District Size Supplement per Modified ADM and divides by Base Cost per Modified ADM to express as a weight (percent). See Appendix A.

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APPENDIX C. Pennsylvania Confirmatory Analysis

      The following two figures show that when using Pennsylvania Department of Education data in place of the federal data used in the school funding fairness report, similar patterns of funding regressiveness are revealed. Figure C1 shows the relationship between labor-market centered spending and revenue figures and labor market centered poverty rates, revealing that within labor markets, higher poverty districts have lower relative dollars. Figure C2 presents the slopes of those relationships, estimated using state data, by the same method used with federal data in the school funding fairness report.

Figure C1

Relative Spending, Revenue and Poverty for Pennsylvania Districts 2012-13
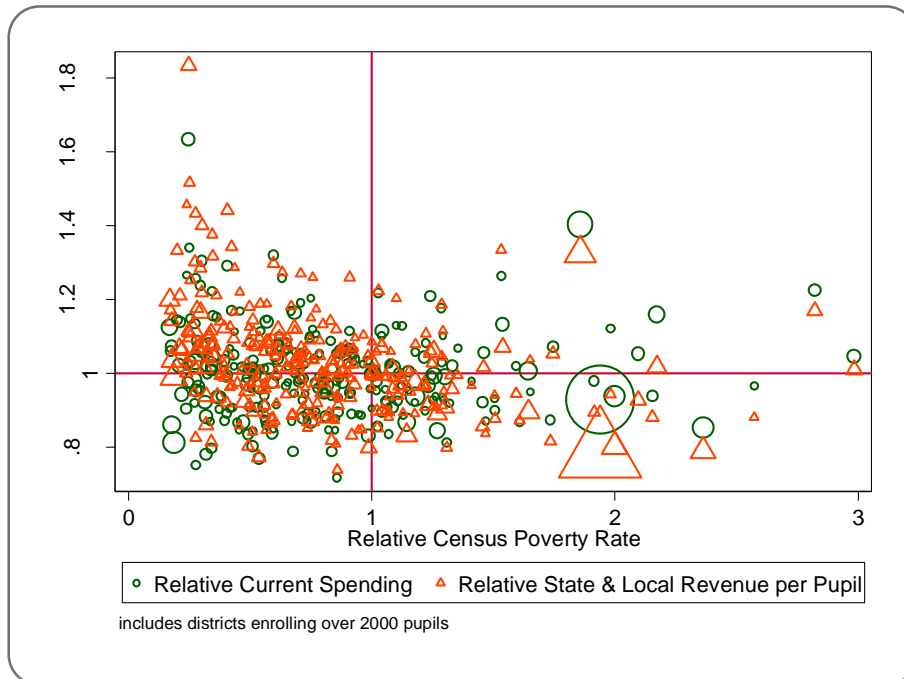
Data Source: U.S. Census Fiscal Survey of Local Governments (F-33) and Small Area Income and Poverty Estimates (see Appendix A).

Figure C2

Fairness Profiles Estimated to State Data 2010-2013
(Controlling for Locale, Size and Labor Market)
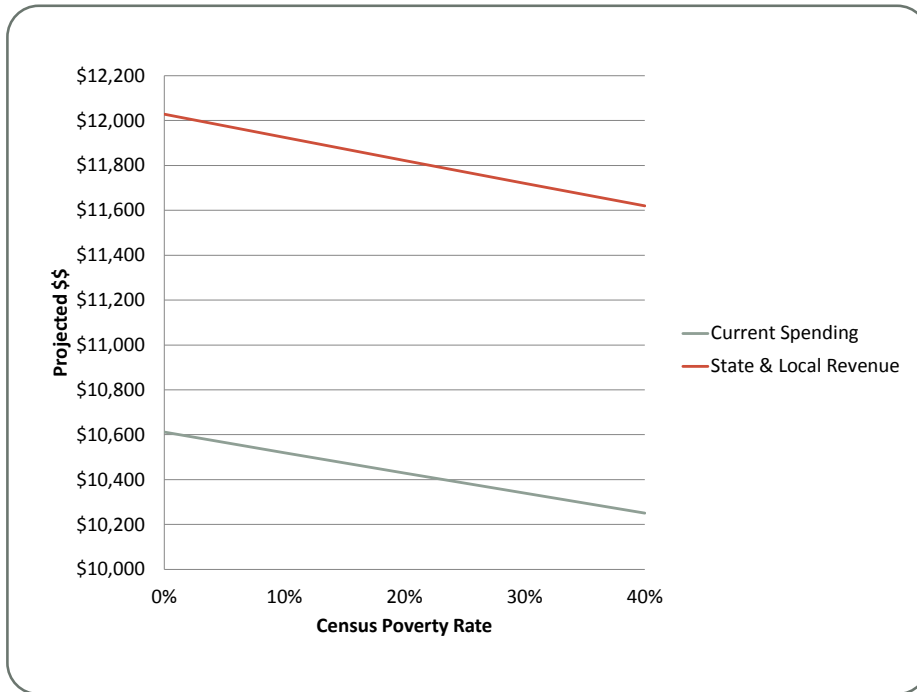
Notes: Slopes based on regression analysis of Pennsylvania Department of Education Current Spending per Pupil data from 2009-10 to 2012-13 with current spending estimated as a function of a) district size, b) regional competitive wages (NCES ECWI), c) locale, and d) Census Poverty Rate. Models weighted for district enrollment. See Appendix A.

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APPENDIX D. All States Adjusted NAEP Comparisons
Table D1
Adjusted NAEP Comparisons for All States

State	Poverty Adjusted Scale Score (Grade 8)		Initial Score Adj. Gains 2003-2013 (Grade 8)		Inc. Gap adj. Gap (Grade 8)		Inc. Gap adj. Gap (Grade 4)	
	Math 8	Read 8	Math 8	Reading 8	Math 8	Reading 8	Math 4	Reading 4
Alabama	-1.79	-0.83	-1.19	-0.59	1.59	0.64	-0.02	0.10
Alaska	-2.00	-2.68	-1.17	-0.14	0.29	2.25	1.41	2.11
Arizona	0.41	-0.30	-0.04	-0.13	0.22	0.23	-0.12	0.12
Arkansas	-0.14	0.01	0.58	-0.31	-0.19	0.87	0.75	0.45
California	-1.22	-0.68	-0.29	1.37	0.54	-0.37	2.21	1.46
Colorado	0.43	0.42	0.27	0.23	1.90	1.96	1.30	1.94
Connecticut	-0.94	1.05	-1.10	1.48	1.09	-0.42	1.00	0.71
Delaware	-0.70	-0.38	-0.55	-0.65	-1.12	-1.77	-0.34	-0.48
District of Columbia	-1.39	-2.28	2.03	-0.10	-4.23	-3.99	-2.09	-1.34
Florida	0.29	0.79	0.25	1.16	0.18	-0.55	-0.54	-0.84
Georgia	0.12	0.68	0.12	0.65	0.19	-0.29	1.16	-0.06
Hawaii	-0.58	-1.68	1.63	0.77	-2.51	-0.22	-0.12	-0.07
Idaho	0.01	0.52	0.05	0.78	-0.82	-1.25	-0.30	-0.29
Illinois	0.33	0.25	0.20	-0.83	-0.41	-0.32	1.47	1.50
Indiana	1.29	0.61	0.18	-0.30	-0.27	-0.09	-0.51	-0.45
Iowa	-0.72	-0.18	-1.20	-0.41	-0.12	-0.63	-0.45	0.59
Kansas	0.87	-0.25	0.06	-0.73	0.55	0.36	-0.36	0.20
Kentucky	1.17	2.68	-0.43	0.13	-0.30	-1.30	-0.61	-1.25
Louisiana	-0.12	-0.10	-1.06	-0.69	-0.78	0.03	-0.09	-0.11
Maine	0.23	-0.05	0.31	-0.56	-0.28	0.36	-0.34	-0.44
Maryland	-0.96	0.56	0.59	2.70	0.77	0.10	0.58	-0.11
Massachusetts	2.63	1.68	2.82	0.88	-0.20	0.14	-1.01	-0.76
Michigan	-0.42	0.33	-1.04	-0.63	0.52	-0.16	0.83	0.30
Minnesota	0.83	-0.29	0.17	0.21	0.19	-0.83	0.93	1.12
Mississippi	-0.40	-1.17	-0.38	-2.50	1.93	2.31	0.86	0.66
Missouri	0.09	0.52	-0.70	-0.97	-0.12	0.43	0.33	0.59
Montana	0.48	0.76	-0.40	-0.09	0.03	-1.11	-0.55	-0.83
Nebraska	-0.89	-0.27	-0.82	-0.03	1.02	1.16	1.34	0.61
Nevada	-0.95	-0.89	0.20	1.08	-1.05	-0.56	-0.14	0.32
New Hampshire	0.32	-0.10	1.44	0.53	-1.26	-1.18	-1.96	-1.69
New Jersey	1.18	1.17	2.56	1.98	-0.06	0.63	-0.48	-1.10
New Mexico	-0.52	-0.88	-0.41	-0.71	-0.60	-0.81	0.69	0.62
New York	-0.07	0.40	-1.25	-0.74	-2.16	-1.17	-1.59	-1.13
North Carolina	1.24	0.29	-0.45	-0.41	0.21	0.18	-0.16	0.47
North Dakota	-1.36	-2.31	-0.28	-1.41	-0.80	-1.38	-0.89	-2.31
Ohio	1.90	1.27	0.61	-0.14	0.14	0.86	-0.26	-0.47
Oklahoma	-1.41	-0.65	-1.43	-1.28	-1.18	-2.14	-1.45	-0.92
Oregon	0.49	1.06	-1.00	0.24	-0.27	0.88	1.15	0.34
Pennsylvania	**0.92**	**1.16**	**1.29**	**1.44**	**1.72**	**2.08**	**1.20**	**0.57**
Rhode Island	-0.11	-0.03	1.06	0.52	1.09	0.31	-0.01	-0.19
South Carolina	0.78	0.29	-1.31	-0.51	1.08	0.29	0.86	0.89
South Dakota	-0.23	-0.45	-0.75	-1.36	0.36	-0.02	-0.30	-0.28
Tennessee	-0.02	1.07	0.01	0.79	0.49	0.23	-0.28	-0.04
Texas	2.23	0.41	1.19	0.06	-0.94	-0.70	-0.63	-0.01
Utah	-1.31	-0.27	-0.71	0.76	-1.01	-0.46	-0.12	0.01
Vermont	0.79	0.39	1.50	0.61	0.56	0.65	-1.26	-0.11
Virginia	-0.28	-0.82	0.19	-1.02	-0.40	-0.03	-0.48	0.59
Washington	0.86	1.02	0.83	1.37	0.41	-0.11	1.09	1.29
West Virginia	-1.38	-1.61	-1.51	-2.24	-1.11	-0.08	-1.25	-1.15
Wisconsin	0.44	-0.30	-0.11	-0.63	2.32	1.98	1.20	0.55
Wyoming	-0.56	-0.16	-0.21	0.37	-1.42	-0.99	-1.82	-1.80

The following tables summarize the correlations behind the statistical adjustments used for making cross-state NAEP comparisons. First, Table D2 shows that mean scale scores are relatively highly associated with state child poverty concentrations. Higher poverty states tend to have lower average NAEP scale scores. Thus, our state comparisons consider whether mean scale scores are higher or lower than expected, given state poverty rates.

Table D2
Correlations between Poverty and Scale Score Means

Census Poverty and Scale Score Means	Correlation
Grade 8 Reading	-0.782
Grade 8 Math	-0.809

TableD3 summarizes the correlation between 10-year (2003 to 2013) gains on NAEP mean scale scores, and the initial year (2003) score. In short, states with higher starting scores tend to have lower overall gains, whatever the reason. It is illogical to assert that initially higher performing states simply did less *real* improvement over the years. Rather, one must correct for this statistical artifact, and again, compare state scale score growth according to expectations, given their starting point.

Table D3
Correlation between 2003 Baseline Year Scale Score and 10-Year Gain

2003 Baseline Score and 10-Year Gain	Correlation
Reading Gain 2003-13	-0.453
Math Gain 2003-13	-0.574

Table D4 displays the correlations between income gaps (the difference in family income for children in poor vs. non-poor families) and outcome gaps (difference in mean scale scores for children from poor vs. non-poor families). States with bigger income gaps have bigger achievement gaps. Thus again, it is most appropriate to compare state achievement gaps with respect to their income gaps.

Table D4
Correlations between Income Gap and Scale Score Gap

Income Gap and Scale Score Gap	Correlation
Math 8 Gap	0.615
Reading 8 Gap	0.637
Math 4 Gap	0.692
Reading 4 Gap	0.582

APPENDIX E. Correlations between Traditional Equity and Neutrality Indicators and Funding Fairness Indicators

Table E1 summarizes the correlations between commonly used equity indicators (as reported in Education Week's Quality Counts report) and our funding fairness measures, which more thoroughly account for variation in costs across settings. Both the funding fairness report and Quality Counts[136] use similar measures of "effort" or the share of state fiscal capacity allocated to K-12 education and those measures are highly correlated (0.929). Both include measures of funding levels, including the fairness model predicted funding level at 10 percent and scale economies (in an average cost labor market) and Ed Week's "adjusted spending" measure and "spending index"[137], and these are highly correlated (over 0.80).

But equity and fairness indicators vary more significantly. Education Week includes a measure of fiscal neutrality (relationship between district funding and property wealth), Coefficient of Variation and Federal Range Ratios and a McLoone Index (the ratio of the average of the lower half spending districts to the median district). Notably, restricted ranges and CV's are only modestly correlated with our funding fairness measure and they are positively associated, indicating that more fairly funded states actually have more variation. The McLoone Index is not correlated with our funding fairness measure, and is negatively correlated with funding level. That is, where state funding is generally more adequate (higher), districts below their state average fall further below their state average.

Table E1
Correlations between School Funding Fairness and Education Week Quality Counts Equity Measures

	Effort [Is School Funding Fair?]	Funding Fairness [Is School Funding Fair?]	Funding Level [Is School Funding Fair?]
Funding Fairness (ISFF)	-0.068		
Funding Level (ISFF)	0.592	-0.108	
Ed Week Final Score	0.628	0.039	0.865
Ed Week Neutrality	-0.093	-0.426	-0.225
Ed Week McLoone	-0.271	0.054	-0.243
Ed Week CV	0.144	0.459	0.130
Ed Week Federal Range Ratio	0.528	0.289	0.585
Ed Week Adj. Spending	0.406	0.080	0.841
Ed Week Above Median	0.326	0.069	0.861
Ed Week Spending Index	0.357	0.003	0.802
Ed Week Effort Ratio	0.929	0.002	0.571

APPENDIX F. Fiscal Neutrality Coefficients

Table F1 shows the regression coefficients for our models of the difference in relationship between income, wealth and per-pupil spending by geographic locale.

Table F1
Coefficients from Fiscal Neutrality Regression

| Locale | N | Wealth/Income Factors | | Year | | |
		Market Value per ADM(ln)	Personal Income per ADM(ln)	2011	2012	2013
Cities						
Large City	2	1.99	-1.61	0.02	-0.10	-0.15
Midsize City	2	1.03	0.42	-0.06	-0.08	-0.13
Small City	12	0.23	-0.24	0.01	-0.03	-0.03
Suburbs						
Suburb/Large	171	0.10	0.09	0.02	0.01	0.03
Suburb/Midsize	21	0.14	0.07	0.01	0.02	0.04
Suburb/Small	20	-0.17	0.25	0.05	0.03	0.07
Towns						
Fringe Town	27	-0.17	0.25	0.05	0.03	0.07
Distant Town	58	0.00	0.06	0.03	0.02	0.05
Remote Town	10	-0.05	0.09	0.04	0.05	0.07
Rural Remote						
Fringe Rural	82	0.18	-0.19	0.02	0.00	0.03
Distant Rural	82	0.16	-0.13	0.03	0.01	0.05
Remote Rural	12	0.12	-0.21	0.01	-0.03	0.04

Notes: Based on regression model of natural log of current expenditure per pupil as a function of a) market value per ADM, b) personal income per ADM, c) year, d) urban centric locale code and e) district enrollment size.

APPENDIX G. Fixed and Random Effects Models of Gaps and Outcomes

The following two tables present regression estimates from models where we tested whether changes in funding gaps over time were associated with changes in outcome measures, and second whether changes in funding, coupled with differences in funding gaps across districts, were associated with changes in and differences in outcomes. We find that reading proficiency rates, math proficiency rates and combined SAT scores are higher as funding gaps decline over time, and that scores are higher in districts with smaller gaps. This finding is robust to inclusion of student population characteristics. That is, across districts serving similar populations, smaller funding gaps are associated with higher proficiency rates and SAT scores.

Table G1
Fixed Effects

	Reading PSSA				Math PSSA				SAT Combined		
	Coef.	Std. Err.	P>t		Coef.	Std. Err.	P>t		Coef.	Std. Err.	P>t
EEO Gap ('000s)	0.383	0.111	*		0.656	0.114	*		4.306	1.688	*
ECWI	2.731	1.797			1.996	1.844			0.681	27.396	
% Free or Reduced	-2.788	2.425			-6.004	2.489	*		-41.806	37.005	
% ELL	64.147	24.877	*		59.087	25.534	*		188.417	374.169	
Constant	71.321	2.082	*		77.630	2.137	*		1465.386	31.649	*
R-Squared											
Within	0.013				0.030				0.006		
Between	0.043				0.160				0.462		
Overall	0.042				0.154				0.423		

*p<.05

Table G2
Random Effects

|	Reading PSSA				Math PSSA				SAT Combined		
	Coef.	Std. Err.	P>z		Coef.	Std. Err.	P>z		Coef.	Std. Err.	P>z
EEO Gap ('000s)	0.439	0.091	*		0.559	0.092	*		6.077	1.037	*
ECWI	11.715	1.277	*		7.357	1.281	*		87.792	15.429	*
% Free or Reduced	-30.557	1.307	*		-25.757	1.318	*		-394.220	13.699	*
% ELL	-52.418	11.377	*		-38.808	11.493	*		-26.380	110.835	
Constant	69.538	1.744	*		77.934	1.747	*		1465.093	21.915	*
R-Squared											
Within	0.002				0.013				0.003		
Between	0.623				0.518				0.702		
Overall	0.597				0.493				0.645		

*p<.05

APPENDIX H. Bridging Pennsylvania State Assessments and SAT College Readiness Benchmarks

Figure H1 and H2 show the relationship between district level proficiency rates on PSSA and district average combined SAT scores. The intent is to provide an illustration of the PSSA scores associated with average SATs considered to represent the college readiness standard. The implication of these figures is that a PSSA proficiency rate of 88 percent on math and 85 percent on reading is associated with the SAT standard for college readiness (for the average child in the district).

Figure H1
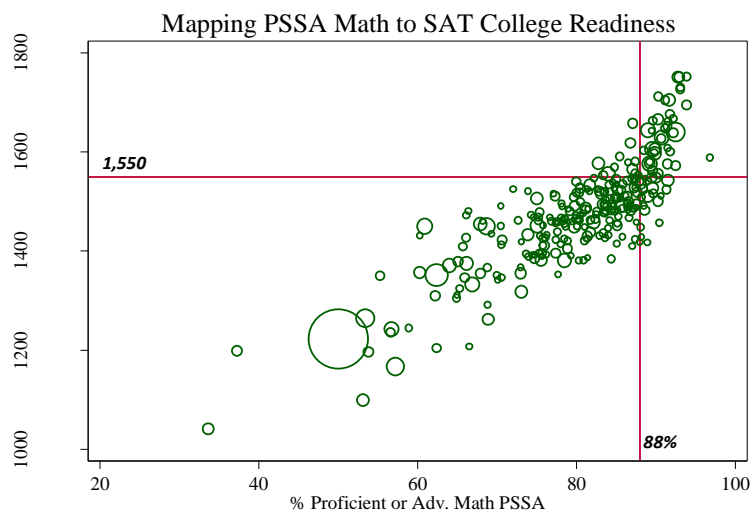
Figure H2
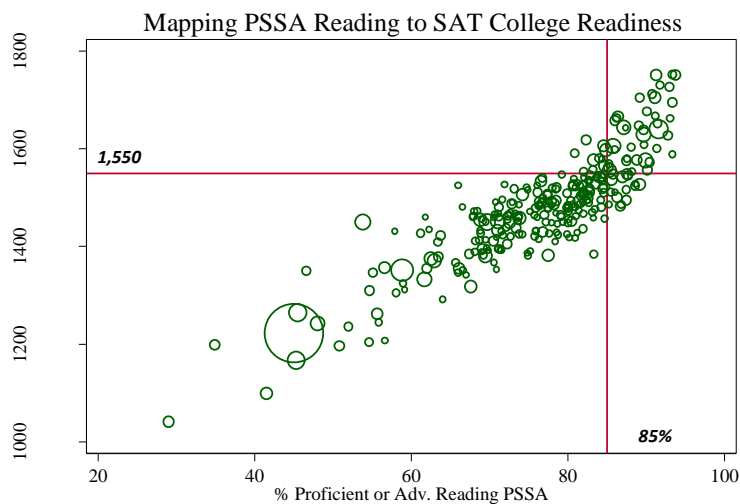
APPENDIX I. Economies of Scale in Education

A common finding is that per-pupil costs tend to be flat as district enrollment becomes larger than 2,000 (i.e., districts tend to become more or less scale efficient after this point).[138] Below this level, costs tend to increase and increase dramatically as enrollment drops below 500. Figure 6 shows an example of this general relationship between district-level operating cost per pupil and districts size, holding outcomes and other factors constant.[139] In the example, the cost per pupil has been centered such that 1.0 represents a district that is scale efficient (2,000 or more students) achieved at a given level. Costs rise for smaller districts along a curve, increasing gradually for districts with fewer than 2,000 students down to 1,000 students, and then more sharply approaching 500 students and fewer. In studies that estimate how per-pupil costs change due to economies of scale, the marginal costs for the smallest districts range from about 20 percent to 100 percent above the cost experienced in scale-efficient districts.

Figure I1

General Relationship between Per-Pupil Operating Costs and District Size

Figure 2
District size and costs
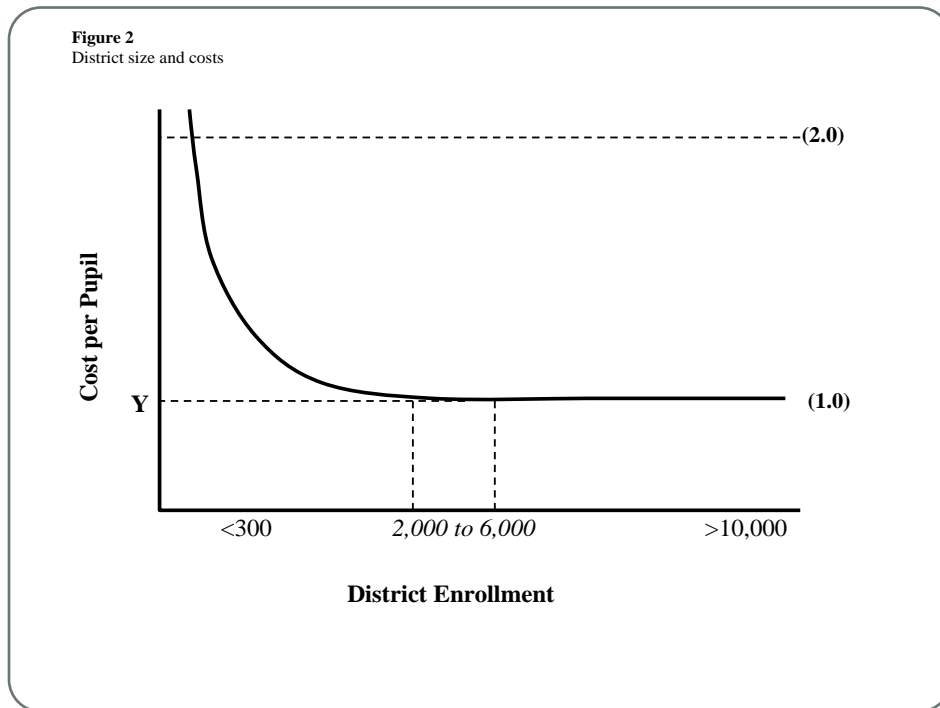
APPENDIX J. New York Reforms

In response to a court order in *Campaign for Fiscal Equity v. State* (2006), the legislature adopted a foundation aid formula to be phased in from 2007 to 2011 where the basic funding level in that formula would be set as follows:

> "The Foundation Amount is the cost of providing general education services. It is measured by determining instructional costs of districts that are performing well." (NYSED, Primer on State Aid, 2011-12)

The state defined "performing well" as a standard of 80 percent of children scoring proficient or higher on state assessments, a performance level marginally lower than the statewide mean at the time. That is, the state adopted an easily manipulated successful school districts approach to calculating and updating their basic funding level for the foundation aid formula.

In constructing their cost estimates, state officials adopted a handful of additional steps to ensure a politically palatable, low, basic cost estimate. First, state officials chose only to consider the average spending of those districts that were both "performing well" and in the lower half of spending among those performing well. By taking this step, nearly all districts in the higher cost regions of the state were excluded and thus had limited influence on the basic cost estimate. Instead, basic costs for districts statewide are measured largely against the average spending of districts lying somewhere in the triangle between Ithaca, Buffalo and Syracuse. Spending behavior of these districts has little relevance to costs of providing adequate education in and around New York City.

Another step in the process further deflated basic cost estimates. Instead of adopting a comprehensive measure of annual operating expenditures, the state chose a pruned "general instructional spending" figure. In particular, the selected spending figure was substantively lower than the state's "approved operating expense" figure for downstate districts. That is, the state school finance formula determines adequate spending based only on "general instructional expense" failing to consider (or provide funding for) other necessary operating expenses, as much as a 30 percent difference for downstate and Long Island districts [see Appendix G].

The combined a) setting of a low outcome bar to begin with, b) filtered exclusion of districts in higher cost regions of the state, and c) selection of a partial spending figure rather than a more comprehensive one guaranteed a more politically palatable minimum cost estimate, while still providing a veneer of empirical validity. Despite taking such care to generate such a low estimate of adequate spending undergirding the state foundation aid formula, in recent years, the state has failed to come even close to funding the targets established by the formula – providing less than half of the target levels of aid required for many of the state's highest need districts.

The following two figures provide evidence as to how the choices made by New York State policymakers in their successful schools analyses result in substantial reduction of foundation funding levels. First, Figure J1 shows how the state's choice to exclude the upper half spending districts from their successful schools sample on "efficiency" grounds effectively eliminates most districts in higher cost regions of the state. The second figure, J2 shows how the state's choice to use a pruned back "general instructional" spending figure produces a lower estimate than would the state's more common operating expense figure – Approved Operating Expense. Notably, districts remain fully responsible for covering categories included under Approved Operating Expense.

Figure J1

Efficiency Filter Reduction of Districts in High-Cost Regions
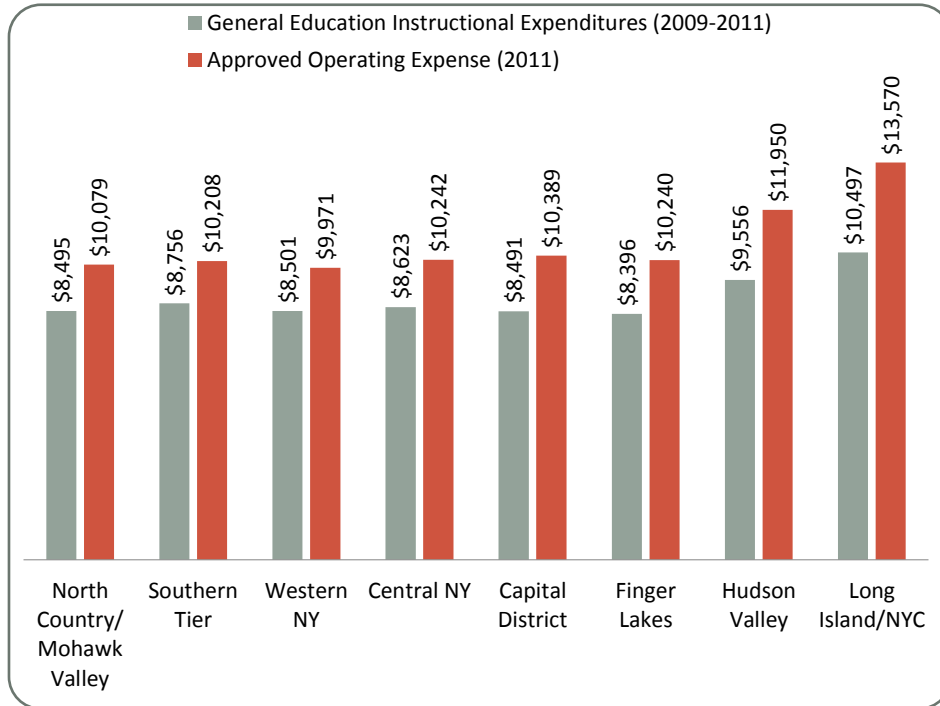*NYSED Successful School Districts 2012 Update*
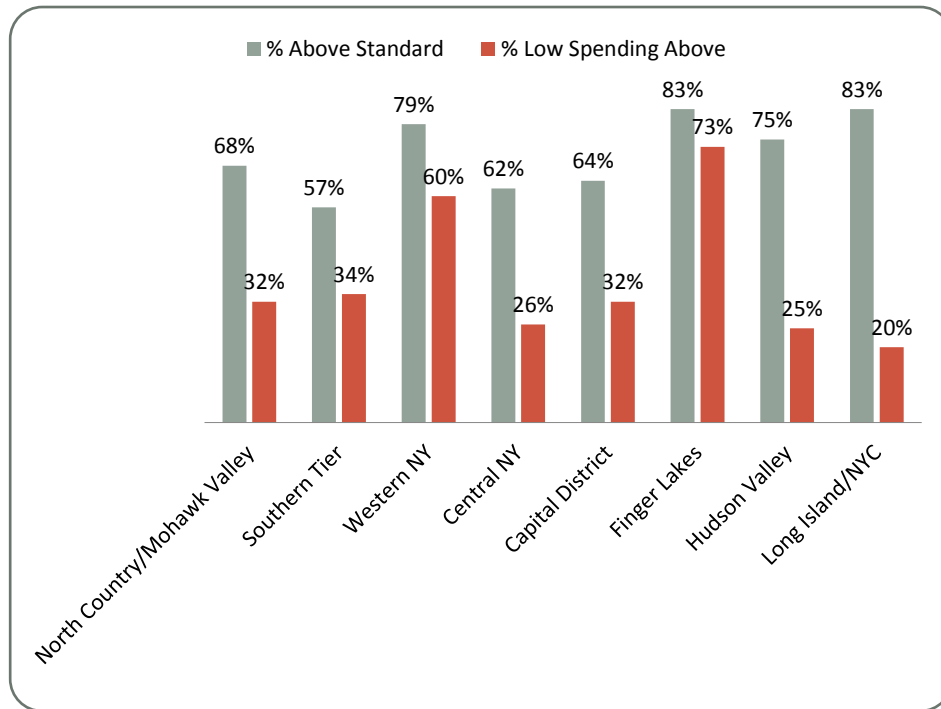
Notes:

[1] Tabulated based on RCI as reported in DBSAD1, 3-29-12, N(MI0123) 03 Regional Cost Index (RCI), using data set with RCI merged into NYSED FARU District Fiscal Profiles (http://www.oms.nysed.gov/faru/Profiles/profiles_cover.html) 2007 to 2011.

[2] Based on "successful district" classification as presented in Excel Workbook used for 2012 Successful Schools Update analysis.

[3] Based on "low spending district" classification as presented in Excel Workbook used for 2012 Successful Schools Update analysis.

Figure J2

General Instructional Spending vs. Annual Operating Spending for "Filtered" Successful Districts

Notes:

[1] Based on "successful district" classification as presented in Excel Workbook used for 2012 Successful Schools Update analysis.

[2] Based on "low spending district" classification as presented in Excel Workbook used for 2012 Successful Schools Update analysis.

[3] General Expenditure as presented in Excel Workbook used for 2012 Successful Schools Update analysis divided by enrollment (not adjusted for low income students).

[4] File DBSAC1, 3-29-12, M(WM0006) 00 2010-11 AOE/TAPU FOR EXP.

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APPENDIX K. Rhode Island Numbers Game

Rhode Island's school finance reforms gained significant attention among policy think tanks as a model of proactive political collaboration leading to progressive, empirically based but elegantly simple reform.[140] As described in official documents, the basic funding level for the Rhode Island formula is set as follows:

(1) The core instruction amount shall be an amount equal to a statewide per pupil core instruction amount as established by the Department of Elementary and Secondary Education, derived from the average of northeast regional expenditure data for the states of Rhode Island, Massachusetts, Connecticut, and New Hampshire from the National Center for Education Statistics (NCES) that will adequately fund the student instructional needs as described in the basic education program and multiplied by the district average daily membership as defined in section 16-7-22.[141] (RIDE, 2010)

As articulated by State Education Commissioner Deborah Gist:

"Our core instructional amount was based on national research, using data from the NCES, is sufficient to fund the requirements of the Rhode Island Basic Education Program, and it in no way focused on states with low per-pupil expenditures. In fact, we looked particularly carefully at our neighboring states, which have some of the highest per-pupil expenditures in the nation, and we included only those states that have an organizational structure and staffing patterns similar to ours."[142]

Several points here are worthy of note:

a) That like New York officials, Rhode Island officials chose to focus on a reduced spending figure – core instructional spending – rather than a complete current operating spending figure;
b) Average core spending of other states is hardly to be considered "national research" and average spending based on national data sources in other states is hardly indicative of what might be required to achieve Rhode Island's required outcomes unless the state's outcomes are also contingent on standards set in other states;
c) The data used to set funding targets for school year 2010-11 and beyond come from several years prior; and,
d) New Hampshire is not a neighboring state of Rhode Island.

Table K1 shows the effect of including New Hampshire among Rhode Island's "neighbors" when calculating the basic spending levels. Spending in New Hampshire is substantively lower than in Massachusetts or Connecticut, and thus brings down the average. Notably, spending in Vermont, which is much higher than in New Hampshire, is not included. Vermont might be excluded from the analysis on the basis of its more sparse population and large number of very small districts. But western Massachusetts is similar in this regard, as is

northern New Hampshire. There appears little justification, other than to lower the average, for including New Hampshire among Rhode Island's neighbors in this analysis.

Table K1

Effect of Including/Excluding New Hampshire from Mean Spending Calculations

Year	Rhode Island Current Spending	Rhode Island Core Spending	Connecticut	Massachusetts	New Hampshire	Avg. with New Hampshire	Avg. without New Hampshire
2006	$11,769	$7,466	$8,106	$7,978	$6,626	$7,828	$7,922
2007	$12,612	$7,964	$8,314	$8,492	$7,026	$8,259	$8,425
2008	$13,539	$8,551	$8,877	$9,013	$7,640	$8,806	$8,962
Data Source: U.S. Census Fiscal Survey of Local Governments, Public Elementary and Secondary School Finances.							

Eventually, in accordance with their "analyses," Rhode Island officials proposed a foundation level for 2010-11 and beyond to be set at $8,295.[143] Notably, however, the average spending in Connecticut, Massachusetts and New Hampshire which most closely approximates that figure comes from 2006-07. Further, the 2007-08 Rhode Island average core instructional spending per pupil was already over $8,500, and a more comprehensive measure of current operating spending per pupil exceeded $13,000 per pupil.

ABOUT THE AUTHORS

Bruce Baker is Professor in the Department of Educational Theory Policy and Administration in the Graduate School of Education at Rutgers, The State University of New Jersey. He is widely recognized as one of the leading scholars in the field of education finance, having published numerous peer reviewed journal articles on school finance, co-authoring a textbook on school finance (Financing Education Systems), and sitting on editorial boards of major journals in the field. He has also testified in state and federal courts on issues pertaining to school funding equity and adequacy and has consulted for numerous states and for the Organization for Economic Cooperation and Development on issues pertaining to the design of school finance systems. Professor Baker has previously worked with Dr. Levin on studies of state school finance systems in Hawaii and Nevada and has engaged in federally contracted research on the measurement of school site expenditures.

Jesse Levin is a Principal Research Scientist at AIR, where he has conducted a number of research projects investigating the adequacy and equity of school funding, allocation of educational resources, effective schooling practices. He currently serves as the project director of a U.S. Department of Education feasibility study to improve the quality of school-level expenditure data and recently completed studies examining the school finance systems of Hawaii and Nevada, all of which have involved collaboration with Professor Bruce Baker. In addition, he has previously conducted large-scale educational adequacy studies in California, New Mexico and New York. His articles have appeared in *Economics of Education Review*, *Empirical Economics*, *Labour Economics*, *Oxford Bulletin of Economics and Statistics*, and *Peabody Journal of Education* and he has served as a referee for the journals *Economics of Education Review*, *Education Finance and Policy*, and *Empirical Economics*.

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NOTES

[1] Jackson, C. K., Johnson, R., & Persico, C. (2014). *The Effect of School Finance Reforms on the Distribution of Spending, Academic Achievement, and Adult Outcomes* (No. w20118). National Bureau of Economic Research.

[2] See also: Baker, B. D. (2012). Revisiting the Age-Old Question: Does Money Matter in Education?. *Albert Shanker Institute*. http://files.eric.ed.gov/fulltext/ED528632.pdf

[3] Baker, B.D. (2014) America's Most Financially Disadvantaged Schools and How they Got That Way. Washington, DC. Center for American Progress http://cdn.americanprogress.org/wp-content/uploads/2014/07/BakerSchoolDistricts.pdf.

[4] Baker, B. D., & Corcoran, S. P. (2012). The Stealth Inequities of School Funding: How State and Local School Finance Systems Perpetuate Inequitable Student Spending. Center for American Progress.

[5] Baker, B. D., Sciarra, D. G., & Farrie, D. (2014, 2010, 2009). Is School Funding Fair? A National Report Card. *Education Law Center*. http://schoolfundingfairness.org/National_Report_Card_2014.pdf

[6] Baker, B.D. (2014) America's Most Financially Disadvantaged Schools and How they Got That Way. Washington, DC. Center for American Progress http://cdn.americanprogress.org/wp-content/uploads/2014/07/BakerSchoolDistricts.pdf

[7] Baker, B. D., Sciarra, D. G., & Farrie, D. (2014, 2010, 2009). Is School Funding Fair? A National Report Card. *Education Law Center*. http://schoolfundingfairness.org/National_Report_Card_2014.pdf

[8] http://www.kslpa.org/

[9] "Successful litigation reduced inequality by raising spending in the poorest districts while leaving spending in the richest districts unchanged, thereby increasing aggregate spending on education. Reform led states to fund additional spending through higher state taxes." (p. 789)

Murray, S. E., Evans, W. N., & Schwab, R. M. (1998). Education-finance reform and the distribution of education resources. American Economic Review, 789-812.

[10] Card, D., and Payne, A. A. (2002). School Finance Reform, the Distribution of School Spending, and the Distribution of Student Test Scores. Journal of Public Economics, 83(1), 49-82.

[11] Jackson, C. K., Johnson, R., & Persico, C. (2014). The Effect of School Finance Reforms on the Distribution of Spending, Academic Achievement, and Adult Outcomes (No. w20118). National Bureau of Economic Research.

[12] Figlio (2004) explains that the influence of state school finance reforms on student outcomes is perhaps better measured within states over time, explaining that national studies of the type attempted by Card and Payne confront problems of a) the enormous diversity in the nature of state aid reform plans, and b) the paucity of national level student performance data.

Figlio, D. N. (2004) Funding and Accountability: Some Conceptual and Technical Issues in State Aid Reform. In Yinger, J. (Ed.) p. 87-111 Helping Children Left Behind: State Aid and the Pursuit of Educational Equity. MIT Press.

[13] Roy, J. (2011). Impact of school finance reform on resource equalization and academic performance: Evidence from Michigan. Education Finance and Policy, 6(2), 137-167.

Roy (2011) published an analysis of the effects of Michigan's 1990s school finance reforms which led to a significant leveling up for previously low-spending districts. Roy, whose analyses measure both whether the policy resulted in changes in funding and who was affected, found that "Proposal A was quite successful in reducing interdistrict spending disparities. There was also a significant positive effect on student performance in the lowest-spending districts as measured in state tests." (p. 137)

[14] Papke, L. (2005). The effects of spending on test pass rates: evidence from Michigan. Journal of Public Economics, 89(5-6). 821-839.

Hyman, J. (2013). Does Money Matter in the Long Run? Effects of School Spending on Educational Attainment. http://www-personal.umich.edu/~jmhyman/Hyman_JMP.pdf.

Papke (2001), also evaluating Michigan school finance reforms from the 1990s, found that "increases in spending have nontrivial, statistically significant effects on math test pass rates, and the effects are largest for schools with initially poor performance." (p. 821)

Most recently, Hyman (2013) also found positive effects of Michigan school finance reforms in the 1990s, but raised some concerns regarding the distribution of those effects. Hyman found that much of the increase was targeted to schools serving fewer low income children. But, the study did find that students exposed to an additional "12%, more spending per year during grades four through seven experienced a 3.9 percentage point increase in the probability of enrolling in college, and a 2.5 percentage point increase in the probability of earning a degree." (p. 1)

[15] Deke, J. (2003). A study of the impact of public school spending on postsecondary educational attainment using statewide school district refinancing in Kansas, Economics of Education Review, 22(3), 275-284. (p. 275)

[16] Downes, T. A., Zabel, J., and Ansel, D. (2009). Incomplete Grade: Massachusetts Education Reform at 15. Boston, MA. MassINC.

[17] Guryan, J. (2001). Does Money Matter? Estimates from Education Finance Reform in Massachusetts. Working Paper No. 8269. Cambridge, MA: National Bureau of Economic Research.

"The magnitudes imply a $1,000 increase in per-pupil spending leads to about a third to a half of a standard-deviation increase in average test scores. It is noted that the state aid driving the estimates is targeted to under-funded school districts, which may have atypical returns to additional expenditures." (p. 1)

[18] Nguyen-Hoang, P., & Yinger, J. (2014). Education Finance Reform, Local Behavior, and Student Performance in Massachusetts. Journal of Education Finance, 39(4), 297-322.

[19] Downes had conducted earlier studies of Vermont school finance reforms in the late 1990s (Act 60). In a 2004 book chapter, Downes noted "All of the evidence cited in this paper supports the conclusion that Act 60 has dramatically reduced dispersion in education spending and has done this by weakening the link between spending and property wealth. Further, the regressions presented in this paper offer some evidence that student performance has become more equal in the post-Act 60 period. And no results support the conclusion that Act 60 has contributed to increased dispersion in performance." (p. 312)

Downes, T. A. (2004). School Finance Reform and School Quality: Lessons from Vermont. In Yinger, J. (Ed.), Helping Children Left Behind: State Aid and the Pursuit of Educational Equity. Cambridge, MA: MIT Press.

[20] Indeed, this point is not without some controversy, much of which is readily discarded. Second-hand references to dreadful failures following massive infusions of new funding can often be traced to methodologically inept, anecdotal tales of desegregation litigation in Kansas City, Missouri, or court-ordered financing of urban districts in New Jersey.

Baker, B. D., & Welner, K. G. (2011). School finance and courts: Does reform matter, and how can we tell. Teachers College Record, 113(11), 2374-2414.

Two reports from Cato Institute are illustrative (Ciotti, 1998, Coate & VanDerHoff, 1999).

Ciotti, P. (1998). Money and School Performance: Lessons from the Kansas City Desegregations Experience. Cato Policy Analysis #298.

Coate, D. & VanDerHoff, J. (1999). Public School Spending and Student Achievement: The Case of New Jersey. Cato Journal, 19(1), 85-99.

Hanushek and Lindseth (2009) provide a similar anecdote-driven approach in which they dedicate a chapter of a book to proving that court-ordered school funding reforms in New Jersey, Wyoming, Kentucky, and Massachusetts resulted in few or no measurable improvements. However, these conclusions are based on little more than a series of graphs of student achievement on the National Assessment of Educational Progress in 1992 and 2007 and an untested assertion that, during that period, each of the four states infused substantial additional funds into public education in response to judicial orders. That is, the authors merely assert that these states experienced large infusions of funding, focused on low income and minority students, within the time period identified. They necessarily assume that, in all other states which serve as a comparison basis, similar changes did not occur. Yet they validate neither assertion. Baker and Welner (2011) explain that Hanushek and Lindseth failed to even measure whether substantive changes had occurred to the level or distribution of school funding as well as when and for how long. In New Jersey, for example, infusion of funding occurred from 1998 to 2003 (or 2005), thus Hanushek and Lindseth's window includes 6 years on the front end where little change occurred (When?). Kentucky reforms had largely faded by the mid to late 1990s, yet Hanushek and Lindseth measure post reform effects in 2007 (When?). Further, in New Jersey, funding was infused into approximately 30 specific districts, but Hanushek and Lindseth explore overall changes to outcomes among low-income children and minorities using NAEP data, where some of these children attend the districts receiving additional support but many did not (Who?). In short the slipshod comparisons made by Hanushek and

Lindseth provide no reasonable basis for asserting either the success or failures of state school finance reforms. Hanushek (2006) goes so far as to title the book "How School Finance Lawsuits Exploit Judges' Good Intentions and Harm Our Children." The premise that additional funding for schools often leveraged toward class size reduction, additional course offerings or increased teacher salaries, causes harm to children is, on its face, absurd. And the book which implies as much in its title never once validates that such reforms ever do cause harm. Rather, the title is little more than a manipulative attempt to convince the non-critical spectator who never gets past the book's cover to fear that school finance reforms might somehow harm children. The book also includes two examples of a type of analysis that occurred with some frequency in the mid-2000s which also had the intent of showing that school funding doesn't matter. These studies would cherry pick anecdotal information on either or both a) poorly funded schools that have high outcomes or b) well-funded schools that have low outcomes (see Evers & Clopton, 2006, Walberg, 2006).

In equally problematic analysis, Neymotin (2010) set out to show that massive court ordered infusions of funding in Kansas following *Montoy v. Kansas* led to no substantive improvements in student outcomes. However, Neymotin evaluated changes in school funding from 1997 to 2006, but the first additional funding infused following the January 2005 Supreme Court decision occurred in the 2005-06 school year, the end point of Neymotin's outcome data.

Baker, B. D., & Welner, K. G. (2011). School finance and courts: Does reform matter, and how can we tell. Teachers College Record, 113(11), 2374-2414.

Hanushek, E. A., and Lindseth, A. (2009). Schoolhouses, Courthouses and Statehouses. Princeton, N.J.: Princeton University Press., See also: http://edpro.stanford.edu/Hanushek/admin/pages/files/uploads/06_EduO_Hanushek_g.pdf

Hanushek, E. A. (ed.). (2006). Courting failure: How school finance lawsuits exploit judges' good intentions and harm our children (No. 551). Hoover Press.

Evers, W. M., and Clopton, P. (2006). "High-Spending, Low-Performing School Districts," in Courting Failure: How School Finance Lawsuits Exploit Judges' Good Intentions and Harm our Children (Eric A. Hanushek, ed.) (pp. 103-194). Palo Alto, CA: Hoover Press.

Walberg, H. (2006) High Poverty, High Performance Schools, Districts and States. in Courting Failure: How School Finance Lawsuits Exploit Judges' Good Intentions and Harm our Children (Eric A. Hanushek, ed.) (pp. 79-102). Palo Alto, CA: Hoover Press.

Hanushek, E. A., and Lindseth, A. (2009). Schoolhouses, Courthouses and Statehouses. Princeton, N.J.: Princeton University Press., See also: http://edpro.stanford.edu/Hanushek/admin/pages/files/uploads/06_EduO_Hanushek_g.pdf

Greene and Trivitt (2008) present a study in which they claim to show that court ordered school finance reforms let to no substantive improvements in student outcomes. However, the authors test only whether the presence of a court order is associated with changes in outcomes, and never once measure whether substantive school finance reforms followed the court order, but still express the conclusion that court order funding increases had no effect.

Greene, J. P. & Trivitt, (2008). Can Judges Improve Academic Achievement? Peabody Journal of Education, 83(2), 224-237.

Neymotin, F. (2010) The Relationship between School Funding and Student Achievement in Kansas Public Schools. Journal of Education Finance 36 (1) 88-108.

[21] Baker, B.D. (2014) America's Most Financially Disadvantaged Schools and How they Got That Way. Washington, DC. Center for American Progress http://cdn.americanprogress.org/wp-content/uploads/2014/07/BakerSchoolDistricts.pdf

[22] Baker, B. D., & Corcoran, S. P. (2012). The Stealth Inequities of School Funding: How State and Local School Finance Systems Perpetuate Inequitable Student Spending. Center for American Progress.

[23] http://www.education.state.pa.us/portal/server.pt/community/financial_data_elements/7672.

[24] State Share of Phase In = Adequacy Shortfall x MVPI Aid Ratio x State Funding Target Multiplier

where the terms on the right-hand side of the equation are defined as follows:

Adequacy Shortfall = The difference between the district-specific Adequacy Target and Current Spending (as defined above);

Market Value/Personal Income Aid Ratio (MVPI) = Share of Basic Education Funding to be paid in state aid, based on combination of market values of taxable properties and personal income of each school district in relation to the state average;

State Funding Target Multiplier = multiplier to determine the rate of phase in of additional aid toward achieving each district's adequacy target. As of 2008-09, the phase in was to occur over a six-year period, so that in the first year districts would receive approximately 17 percent (1/6) of the additional state aid they would receive when the formula was to be fully funded. Districts currently adopting lower local taxes (lower than 24.7 mills) would receive only 10 percent of the additional state aid they were to receive when the formula was fully funded.

[25] scale efficient district (i.e., one with greater than 2,000 pupils)

[26] Similar scale, population density of the county of location and regional competitive wages

[27] We choose these end points because they capture the majority of poverty variation across districts, for all states. Notably, the relative ranking of states, or their rating as progressive or regressive, does not change with different end points.

[28] Baker, B. D., Sciarra, D. G., & Farrie, D. (2014, 2010, 2009). Is School Funding Fair? A National Report Card. *Education Law Center*. http://schoolfundingfairness.org

[29] Baker, B. D., & Corcoran, S. P. (2012). The Stealth Inequities of School Funding: How State and Local School Finance Systems Perpetuate Inequitable Student Spending. Center for American Progress.

Baker, B. D. (2014) America's Most Financially Disadvantaged Schools and How they Got That Way. Washington, DC. Center for American Progress.

[30] Baker, B. D., & Corcoran, S. P. (2012). The Stealth Inequities of School Funding: How State and Local School Finance Systems Perpetuate Inequitable Student Spending. Center for American Progress.

[31] 10 percent census poverty, 2,000 pupils, and average labor market costs

[32] One virtue of property tax revenues in a state school finance system is that they tend to be less responsive to economic downturns. They decline less, if they decline at all during economic downturn, and if and when they do decline, they tend to do so on a lag, declining after other revenue

sources have begun to rebound. Thus, it is reasonable to keep a strong base of property taxes underlying a state school finance system.

Dadayan, L. (2012) The Impact of the Great Recession on Local Property Taxes. Albany, NY: Rockefeller Institute. http://www.rockinst.org/pdf/government_finance/2012-07-16-Recession_Local_%20Property_Tax.pdf

[33] This relative expression of revenue is important because, as explained in the Center for American Progress Report:

"It is important to understand that the value of any given level of education funding, in any given location, is relative. That is, it does not matter whether a district spends $10,000 per pupil or $20,000 per pupil. It matters how that funding compares to other districts operating in the same regional labor market—and, for that matter, how that money relates to other conditions in the regional labor market. The first reason relative funding matters is that schooling is labor intensive. The quality of schooling depends largely on the ability of schools or districts to recruit and retain quality employees. The largest share of school districts' annual operating budgets is tied up in the salaries and wages of teachers and other school workers. The ability to recruit and retain teachers in a school district in any given labor market depends on the wage a district can pay to teachers relative to other surrounding schools or districts and relative to nonteaching alternatives in the same labor market. The second reason is that graduates' access to opportunities beyond high school is largely relative and regional. The ability of graduates of one school district to gain access to higher education or the labor force depends on the regional pool in which the graduate must compete."

[34] Berne, R., & Stiefel, L. (1984). The measurement of equity in school finance: Conceptual, methodological, and empirical dimensions (Vol. 17). Baltimore: Johns Hopkins University Press.

[35] Education Week, Quality Counts 2014, http://www.edweek.org/media/ew/qc/2014/shr/16shr.us.h33.pdf

[36]   A major shortcoming of traditional equity indicators is that they fail to parse "inequitable" and "equitable" variations in per-pupil resources. Those "equitable" variations are variations in resources intended to accommodate differences in educational needs and costs, commonly referred to as cost factors, including differences in student populations, labor costs, and factors such as population sparsity and economies of scale. "Inequitable" variations are those that occur without regard for needs and costs, and may include those variations in resources that are largely a function of local wealth and fiscal capacity.

[37]   For purposes herein, these small bin sizes are not problematic, because we are using the universe of Pennsylvania school districts and we are effectively mapping the actual averages of spending variation across all districts in each group, rather than attempting to draw generalizable conclusions by estimating a model to a sample.

[38] Slagle, M. (2010). A Comparison of Spatial Statistical Methods in a School Finance Policy Context. Journal of Education Finance, 35(3), 199-216.

[39] Implicit District Cost Index = Adequacy Target per Average Daily Membership$_{District}$ / State Average Adequacy Target per Average Daily Membership

[40] Cost Adjusted Current Operating Expenditure per Average Daily Membership = Current Operating Expenditure per Average Daily Membership / Implicit District Cost Index

[41] Equal Opportunity Gap = Cost Adjusted Current Operating Expenditure per Average Daily Membership$_{District}$ – State Average Cost Adjusted Current Operating Expenditure per Average Daily Membership

[42] Duncombe, W., & Yinger, J. (2005). How much more does a disadvantaged student cost?. Economics of Education Review, 24(5), 513-532.

[43] Baker, B. D. (2005). The emerging shape of educational adequacy: From theoretical assumptions to empirical evidence. Journal of Education Finance, 259-287.

[44] Taylor, L. L., & Fowler Jr, W. J. (2006). A Comparable Wage Approach to Geographic Cost Adjustment. Research and Development Report. NCES-2006-321. National Center for Education Statistics.

[45] Weighted Pupil Count = Average Daily Membership + (1.49 x Census Poverty Rate x Average Daily Membership) + (0.6 x ELL Rate x Average Daily Membership)

[46] Pupil Need Adjustment = Weighted Pupil Count / Average Daily Membership

[47] Pupil Need Index = District Pupil Need Index /State Average Pupil Need Index

[48] Mean Centered Education Comparable Wage Index = Education Comparable Wage Index$_{Labor\ Market}$ /State Average Education Comparable Wage Index

[49] Cost Index = Mean Centered Pupil Need Index x Mean Centered Education Comparable Wage Index

[50] Cost Adjusted Current Operating Expenditure per Average Daily Membership = Current Operating Expenditure per Average Daily Membership / Cost Index

[51] Equal Opportunity Gap = Cost Adjusted Current Operating Expenditure per Average Daily Membership$_{District}$ – State Average Cost Adjusted Current Operating Expenditure per Average Daily Membership

[52] Baker, B. D., Green, P. C. (2009) Conceptions, Measurement and Application of Educational Adequacy Standards. In D.N. Plank (Ed.) AERA Handbook on Education Policy. New York: Routledge.

Baker, B., & Green, P. (2014). Conceptions of equity and adequacy in school finance. *Handbook of research in education finance and policy*, 203-221.

Baker, B., & Green, P. (2008). Conceptions of equity and adequacy in school finance. *Handbook of research in education finance and policy*, 203-221

[53]   While often treated as a newer approach to equity analysis than measuring pure fiscal inputs, equity evaluations of real resources pre-date modern school finance equity, often being used for example to evaluate the uniformity of segregated black and white schools operating in the pre-Brown, "separate but equal" era.

Baker, B. D., & Green, P. C. (2009). Does increased state involvement in public schooling necessarily increase equality of educational opportunity? The Rising State: How State Power is Transforming Our Nation's Schools, 133.

[54]   As per the court's declaration: "an efficient system of education must have as its goal to provide each and every child with at least the seven following capacities: (i) sufficient oral and written communication skills to enable students to function in a complex and rapidly changing civilization; (ii) sufficient knowledge of economic, social, and political systems to enable the student to make informed choices; (iii) sufficient understanding of governmental processes to enable the student to understand the issues that affect his or her community, state, and nation; (iv) sufficient self-knowledge and knowledge of his or her mental and physical wellness; (v) sufficient grounding in the arts to enable each student to appreciate his or her cultural and historical heritage; (vi) sufficient training or preparation for advanced training in either academic or vocational fields so as to enable each child to choose and pursue life work intelligently; and (vii) sufficient levels of academic or vocational skills to enable public school students to compete favorably with their counterparts in surrounding states, in academics or in the job market.

Rose v. Council for Better Educ., Inc., 790 S.W.2d 186, 212(Ky. 1989).

http://law-apache.uky.edu/wordpress/wp-content/uploads/2012/06/Thro-II.pdf

[55] Rose v. Council for Better Educ., Inc., 790 S.W.2d 186 (Ky. 1989).

[56] Clune, W. H. (1994). The shift from equity to adequacy in school finance. Educational Policy, 8(4), 376-394.

[57] http://www.parcconline.org/pennsylvania

[58] Duncombe, W. D., & Yinger, J. M. (1999). Performance standards and educational cost indexes: You can't have one without the other. Equity and adequacy in education finance: Issues and perspectives, 260, 261.

[59] Consultant costing out methodologies are often categorized and summarized as follows:

- Successful Schools/Districts Analysis (SS): Derives an estimate of the "cost" of achieving a specific level of outcomes by identifying schools or districts that achieve that outcome (typically, meet or exceed) and then taking the average of their per pupil expenditures. It is common in this method to seek to identify the lower or lowest spending districts that meet the standard as representing efficient districts or schools.

- Professional Judgment Panels (PJP): Panels of informed professionals are convened and provided (or develop) goals statements for the education system including but not limited to specific measured outcome targets. Then, those panels prescribe the programs and services, including staffing, materials, supplies and equipment, learning time and environments needed to deliver those services. Prices are attached to the recommended quantities and total costs are estimated.

- Evidence Based Model (EBM): Externally hired consultants review and compile research on educational programs, services and interventions found to have positive effects on measured student outcomes to propose a model school prototype consisting of the relevant staffing, materials, supplies and equipment, learning time and environments. These models are then applied to the state(s) schooling system and total costs are estimated.

- Education Cost Function (ECF): The Education Cost Function uses a statistical model to estimate the relationship across districts and over time, between existing spending levels and measured student outcomes, while also including measures of district size, geographic location, competitive wages and student population characteristics. The model is then used to project/forecast the spending needed to achieve specific levels of outcomes, under various conditions and with various student populations.

[60] Levin, H. M. (1984). Cost-Effectiveness of Four Educational Interventions.

Levin, H. M. (1983). *Cost-effectiveness: A primer*. Beverly Hills: Sage.

[61] Chambers, J. G. (1999). *Measuring resources in education: From accounting to the resource cost model approach*. US Department of Education, Office of Educational Research and Improvement, National Center for Education Statistics.

Chambers, J. G., & Parrish, T. B. (1983). The development of a resource cost model funding base for education in Illinois. *Illinois State Board of Education*.

Chambers, J. G. (2000). Measuring Resources in Education: A Comparison of Accounting and the Resource Cost Model Approach. *School Business Affairs*, *66*(11), 26-34.

[62] Chambers, J. G., & Parrish, T. B. (1983). The development of a resource cost model funding base for education in Illinois. *Illinois State Board of Education*.

[63] Campbell v. State, 907 P. 2d 1238 (Wyo. 1995)

[64]   Delineations between PJ and EB approaches for input identification arise primarily from a) consultants' desires to sell competing services and b) consultants' interest in laying claim to using multiple methods for determining costs. The assertion is that PJ analysis draws on judgments of informed professionals, usually in a focus group format, to hypothesize the resources needed for achieving outcome goals and that alternatively and distinctly, EB analysis aggregates the best available empirical research into a whole school model for achieving those same outcome goals. Evidence based analyses may be applied by consultants alone, independent of any focus group activities. It is difficult to conceive, however, that informed professionals engaged in focus groups would bring no "research" evidence to bear on their proposals, or that a researcher overseeing such methods would permit the process to exclude entirely research evidence that might inform focus group recommendations. By contrast, where specific state outcome goals are of interest, it makes little sense to rely exclusively on a consultant aggregation of published studies on specific interventions implemented with specific populations toward outcomes objectives that differ substantially from the outcomes of interest (as does the EB method). Baker, Taylor and Vedlitz (2008) explain:

> "While proponents of Evidence-Based analysis infer a strong connection between specific comprehensive school reforms and improved outcomes, research evidence regarding the effectiveness and more specifically the cost effectiveness of these reforms is mixed at best and may not apply in all contexts (Bifulco et al. 2002; Borman and Hewes 2002; Levin 2002; Borman et al. 2003). Furthermore, there may be little connection between the outcomes such reform models are "proven" to accomplish and the outcomes policymakers hope to achieve." (p. 17)

Baker, B. D., Taylor, L. L., & Vedlitz, A. (2008). Adequacy estimates and the implications of common standards for the cost of instruction. *National Research Council*.

The presumption that Evidence-Based strategies are superior to professional recommendations because they are based on researched interventions is also problematic because those interventions are not easily aggregated into whole school models. Consultant assertions regarding the expected outcome effects of discrete interventions compiled into "whole school" models are often overstated and built on dubious summation of effects. Hanushek (2007) provides a critique of the Odden/Picus Evidence-Based model, highlighting the problems with aggregating effect sizes across interventions (studied with different outcome measures), which is a quite reasonable argument. See:

Hanushek, E. A. (2007). The Confidence Men Selling adequacy, making millions. *Education Next*, *7*(3), 73.

Odden & Archibald (2009) make similar suspect claims, regarding the statistically improbable idea of "doubling student performance" here:

Odden, A. R., & Archibald, S. J. (Eds.). (2009). Doubling student performance:.. . . And finding the resources to do it. SAGE.

[65]   This method is sometimes referred to in consultant jargon as the *statistical* or *econometric* method. However, all cost estimation methods use statistics, and the best methods for determining competitive teacher wages (input prices) in an RCM format are also *econometric.* As such we suggest that these terms are unnecessarily ambiguous. The method in question is the cost function and cost functions have been used for estimate the costs of produce specific products or services of specific quality across sectors for decades, including applications to public education systems for over 20 years.

Duncombe, W., Lukemeyer, A., Yinger, J. (2008) The No Child Left Behind Act: Have Federal Funds been Left on the Table? Public Finance Review 36 (4) 381-407.

Duncombe, W. and Yinger, J.M. (2000). Financing Higher Performance Standards: The Case of New York State. Economics of Education Review, 19 (3), 363-86.

Duncombe, W. and Yinger, J.M. (1998) "School Finance Reforms: Aid Formulas and Equity Objectives." National Tax Journal 51, (2): 239-63.

Duncombe, W. and Yinger, J.M. (1997). Why Is It So Hard to Help Central City Schools? Journal of Policy Analysis and Management, 16, (1), 85-113.

Downes, T., Pogue, T. (1994). Adjusting School Aid Formulas for the Higher Cost of Educating Disadvantaged Students. National Tax Journal XLVII , 89-110.

Garms, W. I., & Smith, M. C. (1970). Educational need and its application to state school finance. *Journal of Human Resources*, 304-317.

Imazeki, J., Reschovsky, A. (2004) Is No Child Left Beyond an Un (or under)funded Federal Mandate? Evidence from Texas. National Tax Journal 57 (3) 571-588.

[66]   Strictly speaking, cost functions at the school level don't meet all of the assumptions necessary to estimate a cost function, mainly because schools within districts do not possess the autonomy to function as independent outcome producing organizational units. They don't have influence over

their revenue levels have limited influence over their organizational attributes, programs and services. School size and the composition of student needs can be influenced by district policy related to providing options for choice, attendance boundaries, magnet programs, and policies that influence the distribution of specialized programs for certain categories of students with disabilities. Nonetheless, exploratory analyses of production and costs across schools as a preliminary step toward a deeper dive into how their resources are organized, can provide useful insights.

[67]   Some critics of education cost analysis in general, and cost function modeling in particular assert that all local public school districts are simply inefficient, mainly because they pay their personnel based on parameters not associated with improved student outcomes. Therefore, they assert that it is useless to consider the spending practices of current districts when trying to determine how much needs to be spent to achieve desired outcomes. A common version of this argument goes that if schools/districts paid teachers based on test scores they produce and if schools/districts systematically dismissed ineffective teachers, productivity would increase dramatically and spending would decline. Thus, educational adequacy could be achieved at much lower cost, and therefore, estimating costs based on current conditions/practices is a meaningless endeavor.

     The most significant problem with this logic is that there exists absolutely no empirical evidence to support it! It is entirely speculative, frequently based on the assertions that teacher workforce quality can be improved with no increase to average wages, simply by firing the bottom 5% each year and paying the rest based on the student test scores they produce. To return to the car purchasing analogy above, this is like assuming that somewhere out there is a car/truck with all the features of the Escalade, but the price of the F-150 – specifically, a version of the Escalade itself produced by a new, yet to be discovered technology with materials not yet invented that allow that vehicle to be sold at less than 1/2 its original price.

     In fact, the logical way to test these very assertions would be to permit or encourage some schools/districts to experiment with alternative compensation strategies, and other "reforms," and to include these schools and districts among those employing other strategies (production technologies) in a cost function model, and see where they land along the curve. That is, do schools/districts that adopt these strategies land in a different location along the curve? Do they get the same outcomes with the same kids at much lower spending? In fact, some schools and districts do experiment with different strategies and those schools carry their relevant share of weight in any statewide cost model.

     Pure speculation that some alternative educational delivery system would produce better outcomes at much lower expense is certainly no basis for making a judicial determination regarding constitutionality of existing funding, and is an unlikely (though not unheard of) basis for informing statewide mandates or legislation. Cost model estimates, as well as recommendations of Professional Judgment and expert panels can serve to provide useful, meaningful information to guide the formulation of more rational, more equitable and more adequate state school finance systems.

[68] Borge, L. E., Falch, T., & Tovmo, P. (2008). Public sector efficiency: the roles of political and budgetary institutions, fiscal capacity, and democratic participation. Public Choice, 136(3-4), 475-495.

[69] Some have suggested that one challenge to the validity of the cost function is that if one estimates an education production function if can be difficult if not impossible to achieve consistent results, even though the production function seems merely an algebraic substitution of the cost function:

Cost Function: Spending = *f*(Outcomes, Students, Context, Input Prices, Inefficiency)

Production Function: Outcomes = *f*(Spending, Students, Context, Input Prices)

A major problem with this assertion, as first explained by William Duncombe and John Yinger (2007b) of Syracuse University is that "efficiency" per se is partly explainable by measurable characteristics of local public school districts, including their ability to spend toward outcomes other than those specified and that in a cost function format, where spending is the dependent variable, one can account for these factors. That is, one can use variables in the model that control for the tendency of some districts or schools, more than others, to spend "inefficiently." These controls then provide opportunity to adjust the spending prediction for what districts or schools would have spent to achieve those outcomes, if they had average characteristics (such as average, rather than particularly high or low fiscal capacity). When the spending measure is on the right-hand side (an independent variable), as in the production function equation, one cannot make such corrections. As such, the coefficient attached to that spending measure in the production model has very different meaning and most likely produces very different predictions of costs.

Costrell, R., Hanushek, E., & Loeb, S. (2008). What do cost functions tell us about the cost of an adequate education? Peabody Journal of Education, 83, 198–223.

Imazeki, J. (2008). Assessing the costs of adequacy in California public schools: A cost function approach. Education Finance and Policy, 3(1), 90-108.

Duncombe, W. and Yinger, J.M. (2007b) A Comment on School District Level Production Functions Estimated Using Spending Data. Maxwell School of Public Affairs. Syracuse University.

[70] Critiquing New York State's approach to filtering out the upper half spending districts in their successful schools analysis, William Duncombe and John Yinger explain:

> "Using only the lowest spending schools is equivalent to assuming that the lowest-spending schools are the most efficient and that other schools would be just as efficient if they were better managed. Both parts of this assumption are highly questionable. The successful schools approach on which these figures are based makes no attempt to determine why some schools spend less per pupil than others; the low spending in the selected schools could be due to low wage costs and a low concentration of disadvantaged students, not to efficiency. Moreover, even if some schools get higher performance for a given spending level than others, controlling for wages and student disadvantage, there is no evidence that the methods they use would be successful at other schools."

Yinger, J., Duncombe, W. (2004) AMICUS CURIAE BRIEF OF JOHN YINGER AND WILLIAM DUNCOMBE. Campaign for Fiscal Equity v. State of New York.

http://cpr.maxwell.syr.edu/efap/about_efap/Amicus_brief.pdf

[71] Notably, one could take average spending of schools or districts in various poverty categories, of various sizes, in various labor markets, etc. and also look within fiscal capacity ranges (to address

indirect inefficiency predictors). But, by the time one has made all of these cuts through the data, one has basically converged on estimating an actual cost function, but still missing critical components.

[72] One example of this approach appears in:

Sonstelie, J. (2007) Aligning School Finance With Academic Standards: A Weighted-Student Formula

Based on a Survey of Practitioners. Public Policy Institute of California. http://cepa.stanford.edu/sites/default/files/20-Sonstelie%283-07%29.pdf

[73] Levin, H. M. (1983). *Cost-effectiveness: A primer*. Beverly Hills: Sage.

[74] Chambers, J. G., & Parrish, T. B. (1983). The development of a resource cost model funding base for education in Illinois. *Illinois State Board of Education*.

Chambers, J. G., & Hartman, W. T. (1981). A Cost-Based Approach to the Funding of Educational Programs: An Application to Special Education.

[75] Chambers, J. G. (1999). *Measuring resources in education: From accounting to the resource cost model approach*. US Department of Education, Office of Educational Research and Improvement, National Center for Education Statistics.

Chambers, J. G., & Wolman, J. M. (1998). *What Can We Learn from State Data Systems about the Cost of Special Education?: A Case Study of Ohio*. Center for Special Education Finance.

[76] Baker, B. D. (2006). Evaluating the reliability, validity, and usefulness of education cost studies. Journal of Education Finance, 170-201.

[77] Duncombe, W. (2006). Responding to the charge of alchemy: Strategies for evaluating the reliability and validity of costing-out research. Journal of Education Finance, 137-169.

[78] Baker, B. D. (2006). Evaluating the reliability, validity, and usefulness of education cost studies. Journal of Education Finance, 170-201.

[79] Chambers, J., Levin, J., & Parrish, T. (2006). Examining the relationship between educational outcomes and gaps in funding: An extension of the New York adequacy study. *Peabody Journal of Education*, *81*(2), 1–32.

[80] Chambers, J. G., Levin, J. (2009) Determining the Cost of Providing an Adequate Education for All Students. National Education Association. http://www.keysonline.org/about/education_funding.attachment/cost_of_adequate_education/Cost_of_Adequate_Education.pdf

[81]Hanushek, E. A. (2006). Science violated: Spending projections and the 'costing out'of an adequate education. Courting failure, 257-312.

See page 94: http://hanushek.stanford.edu/sites/default/files/publications/Hanushek%202006%20CourtingFailure-Science.pdf

[82]   One can test generalizability of alternative cost models by splitting the sample of schools or districts in a state, fitting a model to one group, and using it to predict spending of the other. For an application of this type of validity testing, see:

Baker, B. D. (2011). Exploring the sensitivity of education costs to racial composition of schools and race-neutral alternative measures: A cost function application to Missouri. Peabody Journal of Education, 86(1), 58-83.

     One can either split the sample down the middle, or into a smaller group for prediction checking, with the larger group for model fitting. This predictive validity check is commonly referred to as a split cross validation method. Alternatively, one can hold back subsequent years of data for prediction testing and use prior years to fit the model.

Duncombe, W. (2006). Responding to the charge of alchemy: Strategies for evaluating the reliability and validity of costing-out research. Journal of Education Finance, 137-169.

[83] Downes (2004) notes,

     "Given the econometric advances of the last decade, the cost-function approach is the most likely to give accurate estimates of the within-state variation in the spending needed to attain the state's chosen standard, if the data are available and of a high quality" (p. 9). Significant advances in data quality, model specification and validity testing have occurred since 2004.

Downes (2004) What is Adequate? Operationalizing the Concept of Adequacy for New York State. http://www.albany.edu/edfin/Downes%20EFRC%20Symp%2004%20Single.pdf.

[84] Baker, B. D., Taylor, L. L., & Vedlitz, A. (2008). Adequacy estimates and the implications of common standards for the cost of instruction. *National Research Council*.

[85] A. R. Odden, L.O. Picus, M. Fermanich. An Evidence Based Approach to School Finance Adequacy in Arkansas (Little Rock AR: Arkansas Joint Committee on Educational Adequacy, 2003).

[86] W. Duncombe and J. Yinger Estimating the Costs of Meeting Student Performance Outcomes Mandated by the Kansas State Board of Education. (Topeka, KS: Kansas Legislative Division of Post Audit, 2006 – January) Retrieved March 1, 2006 from http://www.kslegislature.org/postaudit/audits_perform/05pa19a.pdf

[87] J. Augenblick, J. Myers, J. Silverstein, and A. Barkis. Calculation of the Cost of an Adequate Education in Kansas in 2000 – 2001 Using Two Different Analytic Approaches. (Topeka, KS: Legislative Coordinating Council, State of Kansas, 2002)

[88] J. Ruggiero. Determining the Cost of an Adequate Education in Minnesota. (Minneapolis, MN: Minnesota Center for Public Finance Research, Minnesota Taxpayers Association, 2004). Retrieved March 1, 2006 from www.mntax.org/cpfr

[89] B. Baker (2006) Evaluation of Missouri School Funding. Committee for Educational Excellence. See also: Baker, B. D. (2011). Exploring the sensitivity of education costs to racial composition of schools and race-neutral alternative measures: A cost function application to Missouri. Peabody Journal of Education, 86(1), 58-83.

[90] See: Duncombe, W., & Yinger, J. (2011). Are education cost functions ready for prime time? An examination of their validity and reliability. Peabody Journal of Education, 86(1), 28-57.

[91] J. Chambers, T. Parrish, J. Levin, J. Smith, J. Guthrie, R. Seder, L. Taylor. The New York Adequacy Study: Determining the Cost of Providing All Children in New York with an Adequate Education. Volume 1 – Final Report. (New York, NY: Campaign for Fiscal Equity, 2004). Retrieved March 1, 2006 from http://www.cfequity.org/FINALCOSTINGOUT3-30-04.pdf.

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[93] T. Gronberg, D. Jansen, L. Taylor and K. Booker School Outcomes and Schools Costs: The Cost Function Approach. (College Station, TX: Busch School of Government and Public Service, Texas A&M University, 2004). Retrieved March 1, 2006 from http://bush.tamu.edu/research/faculty_projects/txschoolfinance/papers/SchoolOutcomesAndSchoolCosts.pdf

[94] J. Imazeki and A. Reschovsky "Is No Child Left Behind and Un (or Under) Funded Federal Mandate? Evidence from Texas" National Tax Journal 57 (2004): 571-588.

[95] Conley, D. T., & Rooney, K. C. (2007). Washington Adequacy Funding Study. Educational Policy Improvement Center (NJ1).

[96]   "Professional judgment studies generally indicate significant economies of scale, but tend to be very inconsistent about the district size at which those economies are realized. Various studies have indicated that a lack of economies of scale push costs upward for districts with fewer than 12,500 students (Nebraska), 11,300 students (Kansas), 8,000 students (Tennessee), 5,200 students (Colorado), 4,380 students (Missouri), 1,740 students (Montana) and 750 students (North Dakota). In Nebraska, a district with 400 pupils had costs 40 percent above the minimum, but in Missouri, a district with 364 pupils, had costs only 9 percent above the minimum.

     Cost Function studies tend to be more consistent, typically indicating that costs are minimized for districts with 2,000 to 5,000 pupils and sweep sharply upward for districts with fewer than 300 pupils. Most also show higher costs for very large districts. Cost Function studies from both sides of the recent legal battle over adequacy in Texas indicate that a district with 400 pupils has costs between 35 and 39 percent above the minimum, while a district with 50,000 pupils has costs that are at most 0.1 percent above the minimum." (p. 12-13)

Baker, B. D., Taylor, L. L., & Vedlitz, A. (2008). Adequacy estimates and the implications of common standards for the cost of instruction. *National Research Council*.

[97] Duncombe, W. and Yinger, J.M. (2006) Estimating the Costs of Meeting Student Performance Outcomes Mandated by the Kansas State Board of Education. (Topeka, KS: Kansas Legislative Division of Post Audit, 2006 – January) Retrieved March 1, 2006 from http://www.kslegislature.org/postaudit/audits_perform/05pa19a.pdf

[98] Baker, B. D. (2011). Exploring the sensitivity of education costs to racial composition of schools and race-neutral alternative measures: A cost function application to Missouri. Peabody Journal of Education, 86(1), 58-83.

[99] http://www.robblaw.com/PDFs/989816GANNONvKSBakerNovember2011.pdf.

[100] Verstegen, D. A. (2011). *A quick glance at school finance: A 50-state survey of school finance policies and programs. Vol. I: State by state descriptions. Vol. II: Finance formulae and cost differentials.* Retrieved from www.schoolfinances.info.

[101] Verstegen, D. A. (2011). *A quick glance at school finance: A 50-state survey of school finance policies and programs. Vol. I: State by state descriptions. Vol. II: Finance formulae and cost differentials.* Retrieved from www.schoolfinances.info.

[102] Baker, B., & Duncombe, W. (2004). Balancing district needs and student needs: The role of economies of scale adjustments and pupil need weights in school finance formulas. Journal of Education Finance, 195-221.

[103]   Lower per-pupil costs due to economies of scale will tend to emerge when fixed costs (i.e., those that do not vary with respect to the number of students served) are spread out over larger numbers of students. Relative (dis)economies of scale can be caused by a variety of factors include the size as measured by enrollment; student density, as measured by the enrollment per square mile; and sparseness of population (as reflected in the dispersion of population within a geographic area). Remote rural districts that are located far away from more urbanized communities may require schools to operate at necessarily small sizes to circumvent the prohibitive costs involved with transporting children to and from schools (e.g., to avoid children spending inordinate amounts of time on school buses). Schools in these districts will tend to be small and require replication of certain minimum levels of administrative and support costs (the services of principals, pupil support, and custodial personnel) that will tend to raise the cost per pupil.

[104] Note that teacher compensation (salaries and benefits) easily make up the majority of operational costs in most districts. Moreover, the compensation levels of teachers is highly correlated with the compensation levels of other staff and non-personnel inputs.

[105]   Such an adjustment focused on personnel costs associated with teachers is commonly referred to in the literature as a Geographic Cost of Education Index (GCEI). Jay Chambers developed the first hedonic wage model to analyze the patterns of variation in compensation of school personnel, which seeks to answer the following question:

How much more or less does it cost in different local school districts to recruit and employ comparable teachers or other school personnel?

Over the course of four decades Chambers and colleagues developed both a nationwide GCEI for the National Center for Education Statistics (NCES), as well as individual indices for several states. Building a GCEI involves using statistical modeling to isolate the factors outside of local control that

impact labor supply and the compensation of those personnel to local school districts (i.e., those factors influencing input prices that are <u>not</u> in the control of educational administrators).

For additional information see the following:

Chambers, J. G. (1978). Educational cost differentials and the allocation of state aid for elementary/secondary education. *The Journal of Human Resources, 13*(4), 459–481;

Chambers, J. G. (1980). The development of a cost of education index: Some empirical estimates and policy issues. *Journal of Education Finance, 5*(3), 262–281;

Chambers, J. G. (1981a). Cost and price level adjustments to state aid for education: A theoretical and empirical review. In K. Forbis Jordan (Ed.), *Perspectives in state school support programs* (Second annual yearbook of the American Educational Finance Association). Cambridge, MA: Ballinger Publishing Co.;

Chambers, J. G. (1981b). The hedonic wage technique as a tool for estimating the costs of school personnel: A theoretical exposition with implications for empirical analysis. *Journal of Education Finance*, 6(3), 330–354;

Chambers, J. G. (1995). *Public school teacher cost differences across the U.S.: The development of a teacher cost index* (Final report to the National Center for Education Statistics, Task 2 of the Elementary Secondary Education Statistics Project, NCES Report #95–758). Palo Alto, CA: American Institutes for Research;

Chambers, J., & Parrish, T. (1982). *The Development of a Resource Cost Model Funding Base for Education Finance in Illinois, Volume I – Executive Summary and Volume II – Technical Report.* Stanford, CA: Associates for Education Finance and Planning, Inc.;

Chambers, J., & Parrish, T. (1984, December). *The Development of a Program Cost Model and a Cost-of-Education Index for the State of Alaska*: *Final report, Volumes I–IV*. Stanford, CA: Associates for Education Finance and Planning, Inc.; and,

Chambers, J. G., Taylor. L., Robinson, J., & Esra, P. (2003). *Alaska school district cost study: Volume I – Summary of results*. Palo Alto, CA: American Institutes for Research.

Others have also followed this approach in other states. For instance, see the following:

Duncombe, W., & Goldhaber, D. (2003). *Adjusting for geographic differences in the cost of educational provision in Maryland.* Report Prepared for the State of Maryland.

[106] Hammer, P., Hughes, G., McClure, C., Reeves, C., and Salgado, D. (2005). *Rural teacher recruitment and retention practices: A review of the research literature, national survey of rural superintendents, and case studies of programs in Virginia*. Charleston, WV: AEL, Inc. and

Chambers, J. (1995). *Public school teacher cost differences across the United States: Introduction to a Teacher Cost Index (TCI)* (NCES 95758). Washington, DC: U.S. Department of Education, National Center for Education Statistics.

[107]   In more recent state studies, simpler and more efficient techniques have been applied to estimate the variations in personnel costs. These studies propose the use of the Comparable Wage Index (CWI) as an alternative to the hedonic wage model. Originally developed by Lori Taylor and William Fowler for the NCES, the CWI uses census data to examine the patterns of variation in wages of employees

with comparable qualifications and characteristics in non-education occupations as a benchmark for assessing the costs of education labor across geographic locations within a state. The notion is that the same factors that impact the costs of non-education labor also impact education labor markets. That is, the same factors that impact the geographic differences in wages of nurses, engineers, business managers, and other professionals also impact the wages of educators.

[108] See Chambers, J. G., Taylor. L., Robinson, J., & Esra, P. (2003). *Alaska school district cost study: Volume I – Summary of results*. Palo Alto, CA: American Institutes for Research and

Chambers, J., Levin, J., DeLancey, D., & Manship. K. (2008). *An independent comprehensive study of the New Mexico Public School Funding Formula: Volume I – Final report*. Report prepared for New Mexico State Legislature Funding Formula Study Task Force. Palo Alto, CA: American Institutes for Research.

[109] Taylor, L., & Fowler, W. (2006). A comparable wage approach to geographic cost adjustment, A Research and Development Report. Washington, DC: U.S. Department of Education, Institute of Education Sciences (NCES 2006-321).

[110] Baker, B., & Duncombe, W. (2004). Balancing district needs and student needs: The role of economies of scale adjustments and pupil need weights in school finance formulas. Journal of Education Finance, 195-221.

[111] A notable feature of the professional judgment analysis was that instead of requiring panels to recommend resource configurations on their own, State Department of Education officials provided panels with a recommended set of resources for each prototypical school and permitted them to make adjustments.

[112] The School Funding Reform Act of 2008 is posted on the State of New Jersey Department of Education's website here: http://nj.gov/education/sff/.

[113] See court syllabus at http://www.edlawcenter.org/assets/files/pdfs/abott-v-burke/Abbott_XX.pdf.

[114] Specifically, the study commissioned to determine a funding formula was used as evidence in the case of *Montoy v. Kansas,* where a lower court (2003) and eventually higher court (2005) held that the current funding system was unconstitutional.

Augenblick, J., Myers, J., Silverstein, J., Barkas, A. (2002) Calculation of the Cost of a Suitable Education in Kansas in 2000-2001 Using Two Different Analytic Approaches. http://skyways.lib.ks.us/ksleg/KLRD/Publications/SchoolFinanceFinalReport.pdf

[115] Kansas Legislative Division of Post Audit (2006) Cost Study Analysis. Elementary and Secondary Education in Kansas: Estimating the Costs of K-12 Education Using Two Approaches http://skyways.lib.ks.us/kansas/ksleg/KLRD/Publications/Education_Cost_Study/Cost_Study_Report.pdf. Separate study by William Duncombe & John Yinger (Syracuse, U.) embedded in Appendix C of that report.

[116] Gist, D. (2010) National Journal. R.I. Formula Funds Children, Not Systems. http://education.nationaljournal.com/2010/06/a-funding-formula-for-success.php

[117] Baker, B. D., & Green III, P. C. (2005). Tricks of the Trade: State Legislative Actions in School Finance Policy That Perpetuate Racial Disparities in the Post-Brown Era. American Journal of Education, 111(3), 372-413.

¹¹⁸ While the high court did not accept this reasoning:

> "Counsel for the State could not substantiate, when asked at oral arguments, its rationale that those 17 districts pay higher salaries or would pay higher salaries to teachers or that higher education costs are linked to housing prices. Further, as the plaintiffs noted, the evidence at trial demonstrated that [***37] it is the districts with high-poverty, high at-risk student populations that need additional help in attracting and retaining good teachers." (p. 28),
> http://www.robblaw.com/PDFs/Z998MONTOYCOMBINEDDECISIONS1-5.pdf.

> It ultimately declared the formula constitutional as a whole, indicating that overturning this (and other) specific piece would require additional trial court fact finding.

¹¹⁹ Baker, B. D. (2008). Doing more harm than good? A commentary on the politics of cost adjustments for wage variation in state school finance formulas. Journal of Education Finance, 406-440.

¹²⁰   In particular, having state department of education officials prescribe the original resource configurations and permitting Professional Judgment panels to adjust those configurations, rather than having the panels themselves provide those configurations, is a problematic manner in which to apply the method that likely drove (biased) the work of the panels.

¹²¹ Baker, B.D., Taylor, L.L., Vedlitz, A. (2008) Adequacy Estimates and the Implications of Common Standards for the Cost of Instruction. National Research Council.

¹²²   Initial proposals by the legislature for the follow up study requested that the LDPA (Legislative Division of Post Audit) look only at the bare bones required inputs to schooling (based on historical spending of a subset of districts) to determine the cost of their constitutional mandates. Kansas, unlike other states has a four-branch government, with an independently elected state board of education having independent constitutional authority for "general supervision of public schools." While the legislature sets the budget, the state board sets outcome standards. During oral arguments in the Spring of 2005, State Board attorney Dan Biles argued that the updated cost study must include consideration of outcomes mandated by the State Board, else, the system would remain in constitutional conflict (that meeting the Legislature's goals without regard for the State Board's constitutional authority was insufficient). The state high court agreed with Biles' argument, and the outcome based – cost function analysis – was added. As explained by the high court in its June 3, 2005 decision:

> "It also appears that the study contemplated by H.B. 2247 is deficient because it will examine only what it costs for education "inputs" -- the cost of delivering kindergarten through grade 12 curriculum, related services, and other programs "mandated by state statute in accredited schools." It does not appear to demand consideration of the costs of "outputs" -- achievement of measurable standards of student proficiency. As the Board pointed out in its brief, nowhere in H.B. 2247 is there specific reference to K.S.A. 72-6439(a) or (c), which provided the criteria used by this court in our January 2005 opinion to evaluate whether the school financing formula provided a constitutionally adequate education. [*843]," Page 31,
> http://www.robblaw.com/PDFs/Z998MONTOYCOMBINEDDECISIONS1-5.pdf.

[123] Chakrabarti, R., & Livingston, M. (2013). The long road to recovery: New York Schools in the aftermath of the Great Recession (No. 631). Staff Report, Federal Reserve Bank of New York.

[124] Baker, B. D., Taylor, L. L., & Vedlitz, A. (2008). Adequacy estimates and the implications of common standards for the cost of instruction. National Research Council.

[125] http://www.census.gov/govs/school/

[126] http://nces.ed.gov/ccd/ccddata.asp

[127] http://bush.tamu.edu/research/faculty/taylor_CWI/

[128] Baker, B. D., Taylor, L., Levin, J., Chambers, J., & Blankenship, C. (2013). Adjusted Poverty Measures and the Distribution of Title I Aid: Does Title I Really Make the Rich States Richer?. Education Finance and Policy, 8(3), 394-417.

[129] http://www.census.gov/did/www/saipe/data/schools/data/index.html

[130] https://usa.ipums.org/usa/

[131] http://nces.ed.gov/nationsreportcard/naepdata/dataset.aspx

[132] http://www.schooldata.org/DataFiles/tabid/65/Default.aspx

[133] http://globalreportcard.org/docs/Global-Report-Card-Data-11.14.12.xlsx

[134] http://febp.newamerica.net/data/k12_district-data-13.csv

[135] Baker, B. D., Taylor, L., Levin, J., Chambers, J., & Blankenship, C. (2013). Adjusted Poverty Measures and the Distribution of Title I Aid: Does Title I Really Make the Rich States Richer?. Education Finance and Policy, 8(3), 394-417.

[136] http://www.edweek.org/media/ew/qc/2014/shr/16shr.us.h33.pdf

[137] Per-pupil spending levels weighted by the degree to which districts meet or approach the national average for expenditures.

[138] Baker, B. D. (2005). The emerging shape of educational adequacy: From theoretical assumptions to empirical evidence. Journal of Education Finance, 259-287.

[139] Baker, B. D. (2005). The emerging shape of educational adequacy: From theoretical assumptions to empirical evidence. *Journal of Education Finance, 30*(3), 277–305.

[140] Wong, K. K. (2013). The Design of the Rhode Island School Funding Formula: Developing New Strategies on Equity and Accountability. *Peabody Journal of Education*, *88*(1), 37-47.

[141] RIDE (Rhode Island Department of Education) Division of School Finance (2010) http://www.ride.ri.gov/Finance/Funding/FundingFormula/Docs/H8094Aaa_FINAL_6_10_10.pdf

[142] Gist, D. (2010) National Journal. R.I. Formula Funds Children, Not Systems. http://education.nationaljournal.com/2010/06/a-funding-formula-for-success.php

[143] Gist, D. (2010) National Journal. R.I. Formula Funds Children, Not Systems.
http://education.nationaljournal.com/2010/06/a-funding-formula-for-success.php

Wong, K. K. (2013). The Design of the Rhode Island School Funding Formula: Developing New Strategies on Equity and Accountability. Peabody Journal of Education, 88(1), 37-47.

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