



A Review of Evidence That Increased Educational Spending Leads to Improved Outcomes

JUNE 25, 2020 – BRUCE BAKER

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In my 2018 book *Educational Inequality and School Finance*, I explain that rigorous, well-designed, and policy-relevant empirical research finds that:

- *Money matters for schools and in determining school quality and student outcomes.* More specifically, substantive, sustained, and targeted state school finance reforms can significantly boost short-term and long-run student outcomes and reduce gaps among low-income students and their more advantaged peers.
- *Money matters in commonsense ways.* Increased funding provides for additional staff, including reduced class sizes, longer school days and years, and more competitive compensation.
- *Cuts do cause harm.* The equity of student outcomes is eroded by reducing equity of real resources across children of varied economic backgrounds.¹

Even though the book is relatively new, reporting on studies published as recently as 2017, significant additional studies have been published since. Among those studies is a meta-analysis of high-quality recent studies prepared by Kirabo

Jackson,² from which he concludes (in an interview with Matt Barnum from *Chalkbeat* from December of 2018):

“By and large, the question of whether money matters is essentially settled,” Northwestern economist Kirabo Jackson concludes. “Researchers should now focus on understanding what kinds of spending increases matter the most.”³

And even more recently, Barnum reported on four additional studies that support the conclusions that (a) greater investment in schools lead to improved student outcomes, (b) those outcomes are more pronounced and significant for low income students/students in low income schools, and (c) that additional investments typically translated to more competitive (higher) teacher wages and additional school staff per pupil.⁴

State School Finance Reforms and Implications for Federal Policy

Studies of specific state school finance reforms may be especially useful for thinking about how national school finance reform can raise the floor for U.S. public schools. Some background on state school finance systems, their

This report can be found online at: <https://tcf.org/content/report/closing-americas-education-funding-gaps/>

design and their goals is in order. Modern state school finance formulas—aid distribution formulas—typically strive to achieve two simultaneous objectives:

- Accounting for differences in the costs of achieving equal educational opportunity across schools and districts.
- Accounting for differences in the ability of local public-school districts to cover those costs.

In most cases, local districts' ability to raise revenues is a function of both local taxable property wealth and the incomes of local property owners, thus their ability to pay taxes on their properties. Without sufficient targeted investments from the state, then, school revenues vary by the wealth of those who live in different districts—with wealthier districts having more money to spend than poor ones. States try to offset these inequalities, although they succeed to varying degrees depending on how much money they put into the system and how they allocate it across functions (e.g., foundation aid, transportation costs, facilities) and different districts.

A typical state school finance formula implies that some basic funding level should be sufficient to produce a given level of student outcomes in an average school district. Logically, then, if one wishes to produce a higher level of outcomes, the foundation level should be increased. It costs more to achieve higher outcomes, and the foundation level in a state school finance formula is the tool used for determining the overall level of support to be provided.

As a rule of thumb, for a state school finance system to provide equal educational opportunity, that system must provide sufficiently higher resources to ensure adequacy and equity in higher-need (e.g., higher-poverty) settings than in lower-need settings. Such a system is called *progressive*. By contrast, many state school finance systems barely achieve “flat” funding between high- and low-need settings, and still others remain regressive, spending more money on the education of more affluent students than on those who have greater needs.

To secure the same quality of education across districts, resource levels may need to be adjusted to permit districts in different parts of a state to recruit and retain teachers of comparable quality; that is, the wages paid to teachers affect who will be willing to work in any given school. In other words, teacher wages affect teacher quality, and in turn, they affect school quality and student outcomes. This is plain common sense, and this teacher wage effect operates at two levels.

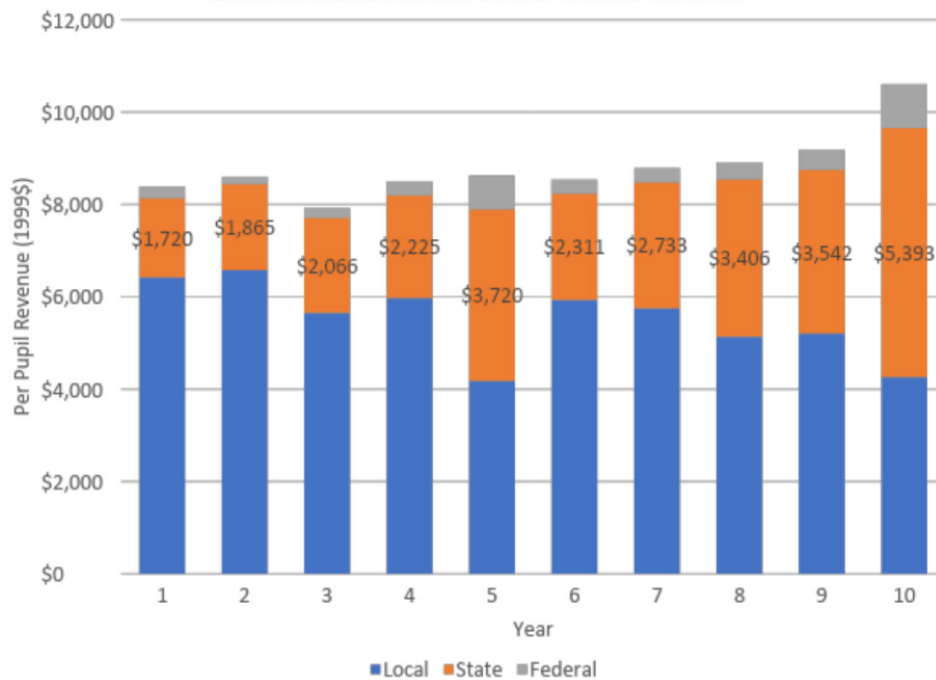
- In general, teacher wages must be sufficiently competitive with other career opportunities for similarly educated individuals. The overall competitiveness of teacher wages affects the overall academic quality of those who choose to enter teaching.
- The relative wages for teachers across local public-school districts determine the distribution of teaching quality. Districts with more favorable working conditions can pay a lower wage and attract the same teacher.

Finally, adjusting funding based on student need in state school finance formulas assumes that the additional resources can be leveraged to improve outcomes for students from low-income families or students with limited English language proficiency. First, note that some share of the additional resources is needed in higher-poverty settings simply to provide for “real resource” equity—or to pay the wage premium for doing the more complicated job, under less desirable working conditions. Second, resource-intensive strategies such as reduced class sizes in the early grades, high-quality early childhood programs, intensive tutoring, and extended learning time programs may significantly improve outcomes of students from low-income families. And these strategies all come with significant additional costs.

Here, we take a closer look at two specific state school finance reforms that have proven effective at improving student outcomes, especially in low-income and previously lower-spending schools: Massachusetts Education Reform Act and Chapter 70 school finance formula from the 1990s,

FIGURE 1

MASSACHUSETTS PER PUPIL SCHOOL REVENUE, BY SOURCE AND POVERTY QUINTILE, 1993 AND 2003



and California’s Local Control Funding Formula adopted in 2013.

Massachusetts School Finance Reforms in the 1990s

In 1993, following the *McDuffy v. Secretary of Education* lawsuit,⁵ Massachusetts adopted a package of far-reaching education reforms that included a new education funding formula under Chapter 70 of the state code.⁶ That new formula drove a significant increase in state aid to the state’s highest need school districts. Figure 1 illustrates local, state, and federal per pupil revenues adjusted for inflation and regional cost variation, from the two years before the scale-up of funding, and ten years later. Districts are organized by poverty quintiles. State aid increased for all quintiles under the new formula, but increased most significantly for the highest poverty quintile, pushing total revenues per pupil for high poverty districts to the highest levels in the state, providing for an overall progressive school funding distribution.

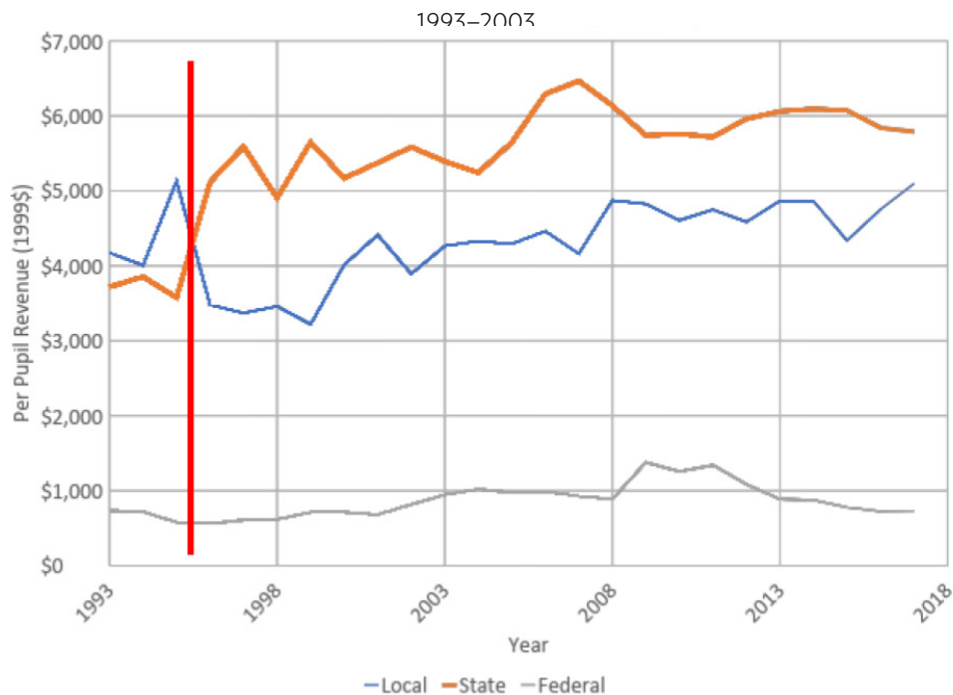
Figure 2 shows the long term trend in local, state and federal revenue per pupil for the highest poverty quintile of districts—the main beneficiaries of the Chapter 70 reforms. On implementation, state and local roles flipped, with state aid being the dominant revenue source. State aid continued to climb through about 2007, at which point the recession took hold. State aid has not since rebounded, leading to new legal challenges.

Three studies of Massachusetts school finance reforms from the 1990s find consistently positive results. The first, a non-peer-reviewed report explored, in combination, the influence on student outcomes of accountability reforms and changes to school spending. They found that “some of the research findings show how education reform has been successful in raising the achievement of students in the previously low-spending districts.”⁷ The second, study for the National Bureau of Economic Research, focused more specifically on the redistribution of spending resulting from changes to the state school finance formula, finding that

increases in per-pupil spending led to significant increases in math, reading, science, and social

FIGURE 2

MASSACHUSETTS PER PUPIL SCHOOL REVENUE FOR HIGHEST POVERTY QUINTILE, BY SOURCE,



studies test scores for 4th- and 8th-grade students. The magnitudes imply that 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.⁸

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.”⁹

California’s Local Control Formula

As described in the summary report to Getting Down to Facts II, a major statewide research effort to support the overhaul of California’s school finance system in particular and education policies more broadly:

In 2013–14, California overhauled its outdated school finance system by enacting the Local Control Funding Formula (LCFF). The LCFF established base, supplemental, and concentration grants to districts, providing more funds to districts with a greater share of high-cost students.... The transition to the LCFF was helped by additional revenue from Propositions 30 and 55: not only has average per-pupil spending for all students increased, but the new formula has meant more funds are directed to higher-needs districts and students.¹⁰

LCFF remains relatively new, but national data now are beginning to reveal the effects of LCFF increases to state aid from 2013 through 2017. Figure 3 shows the differences in district level state revenues per pupil between 2010 and 2017. State aid per pupil has been substantially increased in the state’s highest poverty quintile of districts, leading to an overall progressive distribution from low to high poverty and raising revenue levels significantly. Note that these revenue levels are adjusted for both regional variation in competitive wages and for changes to competitive wages over time. As such, the higher levels of spending in 2017 are legitimately higher.

FIGURE 3

CALIFORNIA PER PUPIL SCHOOL REVENUE, BY SOURCE AND POVERTY QUINTILE, 2010 AND 2017

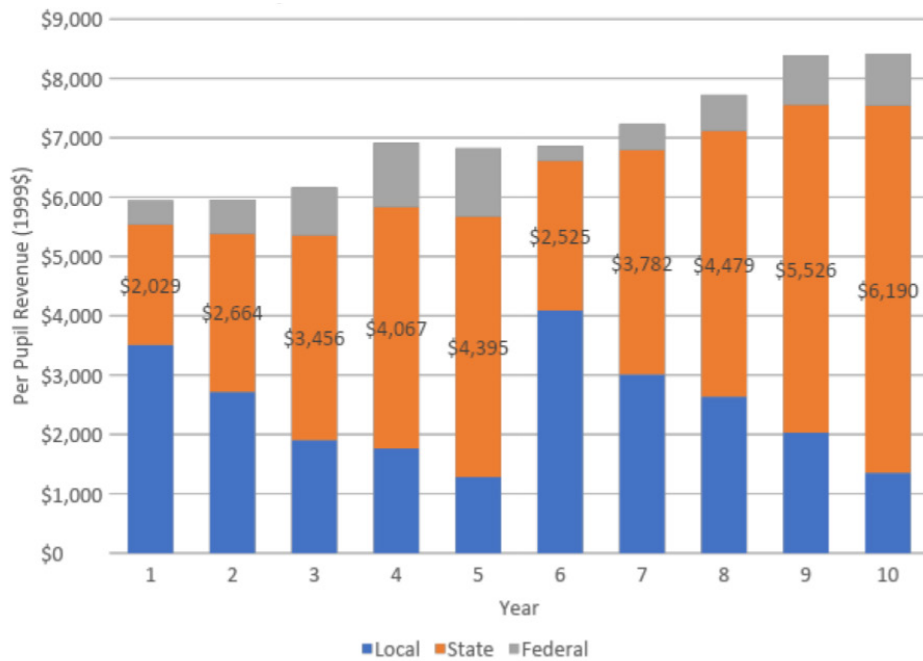


Figure 4 shows the shift in state aid per pupil that occurred on adoption of LCFF. That shift, by 2017 had raised state aid per pupil to its highest levels, above pre-recession levels. Federal aid has remained relatively flat, and has minimal impact on the overall progressiveness of funding across California (or Massachusetts) districts.

Already, researchers have begun seeing the positive effects of the boost in funding from LCFF. Rucker Johnson and colleagues explain:

We find that LCFF-induced increases in school spending led to significant increases in high school graduation rates and academic achievement, particularly among poor and minority students. A \$1,000 increase in district per-pupil spending experienced in grades 10–12 leads to a 5.9 percentage-point increase in high school graduation rates on average among all children, with similar effects by race and poverty. On average among poor children, a \$1,000 increase in district per-pupil spending experienced in 8th through 11th grades leads to a 0.19 standard-deviation increase

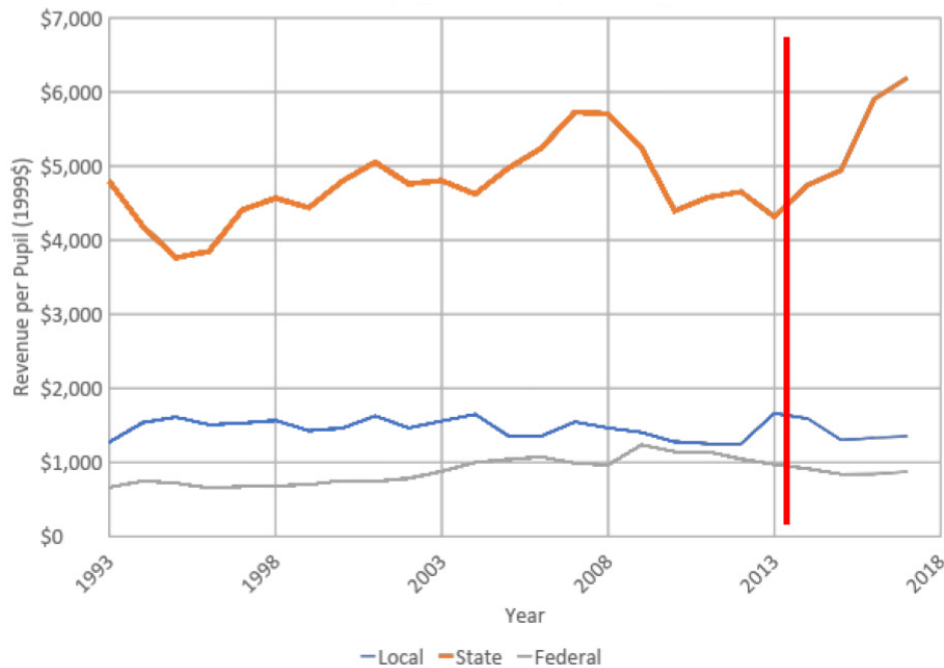
in math test scores, and a 0.08 standard-deviation increase in reading test scores in 11th grade. These improvements in high school academic achievement closely track the timing of LCFF implementation, school-age years of exposure and the amount of district-specific LCFF-induced spending increase. In sum, the evidence suggests that money targeted to students' needs can make a significant difference in student outcomes and can narrow achievement gaps.”¹¹

Learning from Education Cost Studies

Both Massachusetts and California adopted rational state school finance reforms, with increased and better targeted state aid, largely in the absence of a specific target— or outcome goal. That is, both state school finance reforms were guided by the principle that districts serving higher need children require not the same, but more resources per pupil, and that state aid must also be sufficient to offset differences in local capacity. But, in neither case were these new formulas built around rigorous empirical estimates of the “cost” of achieving any particular outcome goal or goals.

FIGURE 4

CALIFORNIA PER PUPIL SCHOOL REVENUE FOR HIGHEST POVERTY QUINTILE, BY SOURCE, 1993–2017



Historically, researchers have taken two basic approaches to estimating such costs: input-oriented analyses and outcome-oriented analyses. 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. These programs and services may be identified as typically yielding certain 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 and can then explore either the aggregate spending on those programs and services yielding specific outcomes or, in greater depth, the allocation of spending on specific inputs. One approach works forward, toward actual or desired outcomes, starting with inputs; the other works backward from outcomes achieved. Ideally, both work in concert, providing iterative feedback to one another. Regardless of the approach, any measure of cost must consider the outcomes to be achieved through any given level of expenditure and resource allocation.¹²

At large scale, across vast and diverse settings and student populations, cost modeling including explicit connections to common outcome measures is preferred. The goal of the

education cost function is to discern the levels of spending associated with efficiently producing specific outcome levels (the “cost” per se) across varied geographic contexts and schools serving varied student populations. Most published studies applying cost function methodology use multiple years of district-level data, within a specific state context, and focus on the relationship between cross-district (over time) variations in spending and outcome levels, considering student characteristics, contextual characteristics such as economies of scale, and labor cost variation. Districts are the unit of analysis because they are the governing unit charged with producing outcomes, raising and receiving the revenues, and allocating the financial and human resources for doing so. Some cost function studies evaluate whether varied expenditures are associated with varied levels of outcomes, all else being equal, while other cost function studies evaluate whether varied expenditures are associated with varied growth in outcomes.

The existing body of cost function research has produced the following (in some cases obvious) findings:

1. The per-pupil costs of achieving higher-outcome goals tend to be higher, across the board, than the

costs of achieving lower-outcome goals, all else being equal.¹³

2. The per-pupil costs of achieving any given level of outcomes are particularly sensitive to student population characteristics. In particular, as concentrated poverty increases, the costs of achieving any given level of outcomes increase significantly.¹⁴
3. The per-pupil costs of achieving any given level of outcomes are sensitive to district structural characteristics, most notably, economies of scale.¹⁵

Researchers have found cost functions of particular value for evaluating the different costs of achieving specific outcome goals across settings and children. One review of cost analysis methods in education explains: “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.”¹⁶

Recent Kansas Studies

Very few states have engaged in rigorous cost modeling to guide their state school finance formulas. A few states have relied on input-based models to set basic education funding levels.¹⁷ In the early 2000s, researchers participating in the Texas School Finance Project provided cost model estimates to the Texas legislature for their consideration, but with little eventual influence on the state school finance system.¹⁸ The first round of *Getting Down to Facts*¹⁹ in California tested but disregarded cost model estimates, and the eventual reforms adopted years later were not anchored to any input or outcome oriented cost estimation.

The Kansas legislature however, has sought two separate, independent cost modeling analyses to guide the design of remedies to ongoing school finance litigation. These studies came about in Kansas, in part, because of the unique constitutional structure of that state. Under Article 6 of

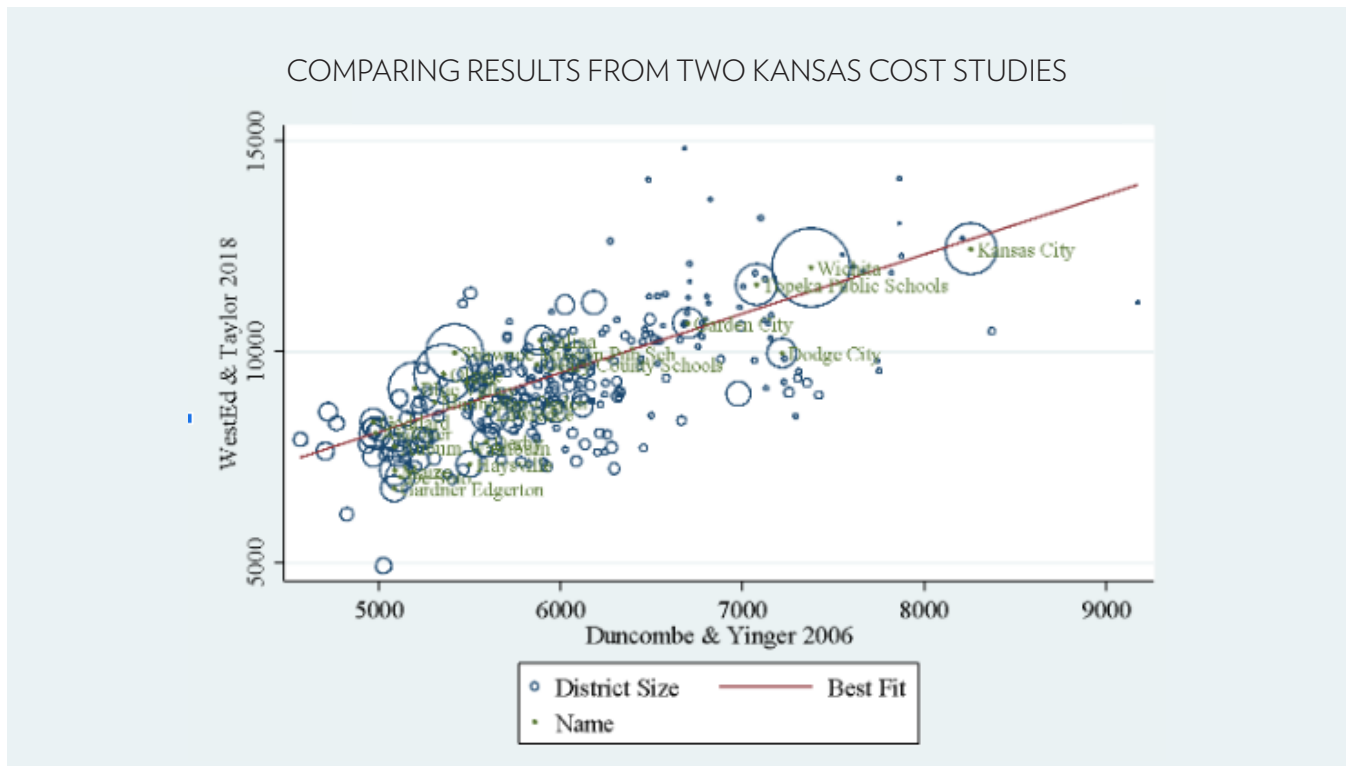
the Kansas Constitution, the independently elected state board of education is charged with general supervision of the schools and the legislature charged with making “suitable provision for finance of the educational interests of the state.” In 2005, the Kansas Supreme Court concluded that the legislature’s obligation was to provide sufficient funding to achieve the outcome standards independently articulated by the board of education, and ordered that any study intended to guide legislative deliberations must take directly into account those outcomes.

This led to a 2006 analysis by William Duncombe and John Yinger, in collaboration with the Kansas Legislative Division of Post Audit (an independent, nonpartisan research division), which involved statistically modeling (via cost function) the direct link between spending and outcomes. A unique aspect of cost modeling is the ability to determine how much changing outcome goals affects “costs.” That is, how much more does it cost to achieve some higher outcome or less to achieve some lower outcome? This is difficult if not impossible to do when prescribing inputs to schooling as a costing out method, as it is difficult to know how different outcome goals translate to specific program and service delivery models, staffing ratios and compensation rates. Cost function models facilitate this conversation with statistical estimates of the sensitivity of costs to outcome goals. Further, they reinforce the point that money does matter, that it does relate to student outcomes, and that it costs more to achieve more, all else equal.

In their 2006 model, Duncombe and Yinger found:

We found a strong association between the amounts districts spend and the outcomes they achieve. In the cost function results, a 1.0% increase in district performance outcomes was associated with a 0.83% increase in spending—almost a one-to-one relationship. This means that, all other things being equal, districts that spent more had better student performance. The results were statistically significant beyond the 0.01 level, which means we can be more than 99% confident there is a relationship between spending and outcomes.²⁰

FIGURE 5



Twelve years later, the Kansas legislature contracted another study of education costs, conducted by a team including researchers from WestEd along with Lori Taylor of Texas A&M. The WestEd/Taylor model echoed Duncombe and Yinger’s conclusion, with new and different outcome measures and even higher goals, revealing differences in the magnitude of the relationship:

Table 17 presents coefficient estimates and standard errors from the cost function analysis. As the table illustrates, the analysis finds a strong, positive relationship between educational outcomes and educational costs, once differences in scale, need and price are taken into account. Consider first the Condition NCE scores. The estimation indicates that a one percentage point increase in academic performance is associated with a 5 percent increase in cost. Similarly, a one percentage point increase in the graduation rate is associated with an 1.2 percent increase in cost at lower grades and a 1.9 percent increase in cost at the high school level.²¹ (p. 61)

These two studies, twelve years apart, provided similar estimates of which districts within the state faced higher, or lower costs of achieving those outcomes. Figure 5 shows that in the 2006 study, Kansas City, Kansas—the state’s poorest urban district—per pupil costs were among the highest in the state, to achieve the modeled outcome goals, and more than 60 percent higher than many lower cost districts (over \$8,000 per pupil compared to \$5,000 per pupil). By 2018, Kansas City, Kansas was still the highest per pupil cost large district, with costs around \$13,000 per pupil compared to only about half that for many lower-cost districts. In general, districts where costs (of achieving common outcomes) were higher in 2006, also faced higher costs in 2018.

Reforms adopted in 2007, leading to dismissal of court oversight, were largely based on findings of the 2006 models. But that funding formula eroded during the recession, with subsequent tax cuts under the Brownback administration. The updated 2018 model provided legislators consistent estimates for recalibrating the formula to new, higher outcome goals and the changing demographics of many Kansas districts. It remains to be seen whether adjustments to the formula will scale up toward the new model estimates.

But these estimates have at least played some role in guiding the level and distribution of new aid.

Similar approaches could be used to guide a new national school finance system, including the targeting of federal aid to districts within states, and involving periodic recalibration to adjust for contextual changes in new outcome goals.

Implications for Reducing Interstate Disparity

No state or federal aid program will ever be perfect. No state or federal aid program will likely ever hit, exactly, either the global per pupil costs of achieving desired outcomes or the local, district level costs. Furthermore, these model estimates are based on historical data of what is likely needed to achieve a desired outcome--data that will need to be revised and updated going forward--and so they serve only as a starting point for state legislative or congressional deliberations on funding formula design. Introducing the best quality evidence into these deliberations will help to bend formula distributions in a more equitable and adequate direction.

In our view, a new bolder federal aid program can and should apply available data with the following goals:

1. estimating national education cost models for the purpose of setting per pupil spending targets for states and local districts based on explicitly stated outcome goals;
2. using cost model estimates to evaluate whether and to what extent states, under their own school finance formulas, are targeting aid to areas of greatest need and cost;
3. tracking and recalibrating, as data become available, changes to education costs across states and districts within states, as contexts and demographics change and as outcome goals evolve; and

4. using cost models over time for benchmarking and evaluating the performance of state school finance systems, both in terms of the return on cumulative investment and on the extent to which states are leveraging financial resources to mitigate achievement gaps.

Author

Bruce Baker is professor in the Department of Educational Theory, Policy and Administration at Rutgers Graduate School of Education in New Brunswick, New Jersey.

Notes

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